



# *Normal Labor*

## *429 OB/GYN Team*

*Sources: Dr. Lulu's lecture ppt., Sakala (BRS & High-Yield), and Hacker & Moore*

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# Normal Labor

## Definitions

### Labour

- The process at the end of which a fetus is delivered after 24 weeks of gestation
- **Definition:** the point when:
  - Uterine contractions become **regular**.
  - Cervical effacement (thinning) and dilatation become **regular**.
  - This occurs every 5 minutes minimum, and last 30 to 60 seconds.
- **Onset and Characteristics**
  - Uterine contractions increase in frequency, duration and strength over time.
  - The cervix dilates and becomes effaced.
  - The membranes rupture, and the fluid leaks (with or without Spontaneous Rupture of the Membranes; SROM)
  - The presenting part (vertex or breech) descends through the birth canal
  - Birth of the baby
  - Delivery of the placenta.

### False Labour

Painless, irregular contractions without cervical dilatation & effacement (Braxton Hicks contractions)

### Term

- The period in between a 37 completed weeks till 42.
  - **Date of confinement:** 40 weeks
  - **Post-Date:** 41 weeks
  - **Post-Term:** >42 weeks

### Pre-term, premature labour

- The period in between 24 weeks and till 37 weeks
- It is referred to as the **Period of Viability**;
  - After 24 weeks, bears a practically pre-mature baby who can survive
  - At 34-37 weeks; is the TERM; bears a practically mature baby.

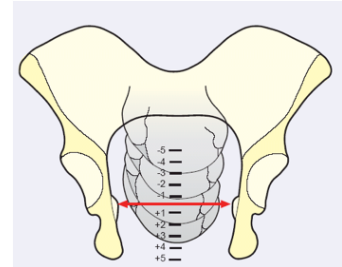
### Initiation of labour

- The events leading to the initiation of labour in humans remain unclear.
- It is suspected that biochemical substances produced by the fetus induce labour.
- Among these substances are fetal hormones e.g. oxytocin and placental inflammatory molecules:
  - Increased placental and maternal production of inflammatory molecules in late pregnancy has been strongly linked to the initiation of labour.
  - Prostaglandins (produced by placenta in response to various biochemical signals) can induce inflammation and are present in increased levels during labour.

- Factors that increase the production of prostaglandins include oxytocin, which stimulates the force and frequency of uterine contractions

### Engagement

- Occurs when the widest diameter of the fetal presenting part has passed through the pelvis inlet
- **The station:** the level above or below the ischial spines where the presenting part lies in the pelvic canal. In most women, it is at the level of the ischial spine, where the head is engaged
- **Lightening:** descent of the fetal head into the pelvis



### Mechanics of normal labour

- The ability of the fetus to negotiate the pelvis is dependent on the interaction of 3 variables; **the 3Ps:**
  1. **Powers:** the forces generated by the uterine musculatures (contractions).
  2. **Passenger:** the fetus.
  3. **Passage:** the bony pelvis and the resistance provided by soft tissues.

### The Powers

- Uterine contractions AND maternal efforts. 3 key processes:

### Myometrial activity:

- During pregnancy: low frequency, irregular and painless (Braxton's Hicks contractions)
- During Labour; high frequency, regular and with high intensity (3-5 contractions in 10 minutes – defines adequate labour)

### Cervical Changes;

- Softening, shortening and dilataion, involving 5 variables, according to Bishop's score:
  - Length, effacement or shortening
  - Consistency
  - Dilatation
  - Position
  - Station

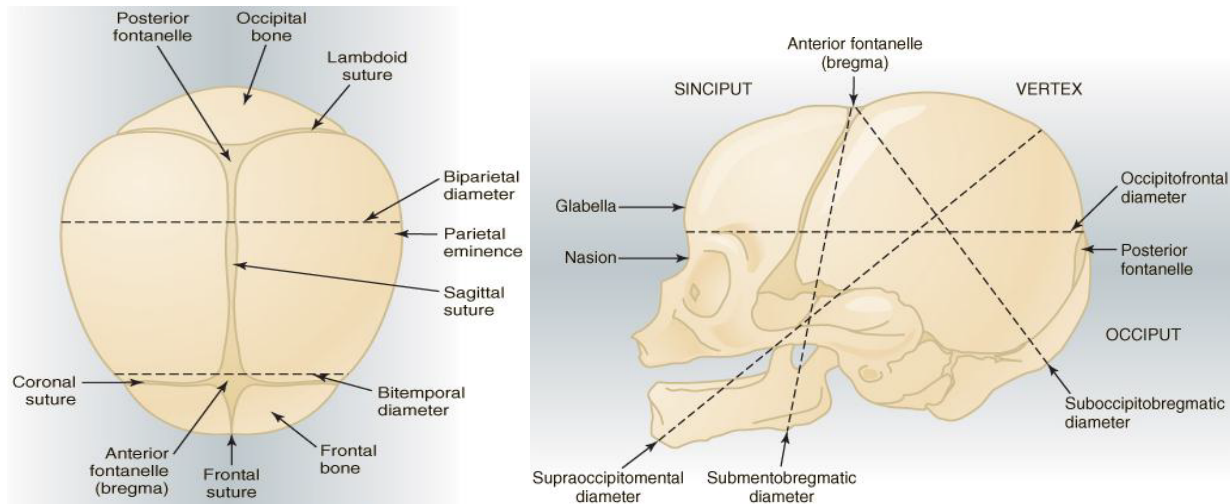
### Spontaneous Rupture of the Membranes

- When the amniotic sac ruptures, production of prostaglandins increases and the cushioning between the fetus and uterus is decreased.
- These two processes increase the frequency and intensity of the uterine contractions

### The Passenger (Fetal Head)

- It is the largest, least compressible and most important part of the fetus. The skull is divided into:
  - **Base:** large, ossified, firmly united and uncompressible part, to protect the brainstem.

- **Vault (cranium):** tin, partially ossified, easily compressible and interconnected 7 bones through a membrane. The bones are:
  - Occipital bone
  - 2 parietal bones
  - 2 frontal bones
  - 2 temporal bones



- The **Sutures**: membrane occupied spaces between the cranial bones, the sagittal suture, the lambdoid suture and the frontal suture.
- The **Fontanelles**; are membrane filled spaces located at the point where the sutures intersect. Only two are the most important:
  - **Bregma**: the anterior fontanelle, found at the intersection between the sagittal, frontal and coronal sutures, its shape is diamond, and it ossifies at the **18 months antenatally**.
  - **Lamboid**: the posterior fontanelle, found at the junction of the sagittal and the lambdoid sutures, its Y or T shaped, and it ossifies at **6-8 months antenatally**.
- The **Head Diameters**:
  - **Anteroposterior Diameters**:
    - Sub-occipito-bregmatic; is **9.5cm**
    - Occipito-frontal; is **11cm**
    - Supra-occipito-mental is **13.5cm**
    - Sub-mento-bregmatic is **9.5cm**
  - **Transverse Diameters**:
    - Biparietal (longest) **9.5cm**
    - Bitemporal (shortest) **8cm**
- **Regions of the fetal head**: different regions that help describing the presenting part of the fetal head during vaginal examination in labour;
  - **Occiput**: the bony prominence behind the posterior fontanelle
  - **Vertex**: diamond shaped area between the anterior fontanelle, posterior fontanelle and the parietal eminences.
  - **Bregma**: around the anterior fontanelle

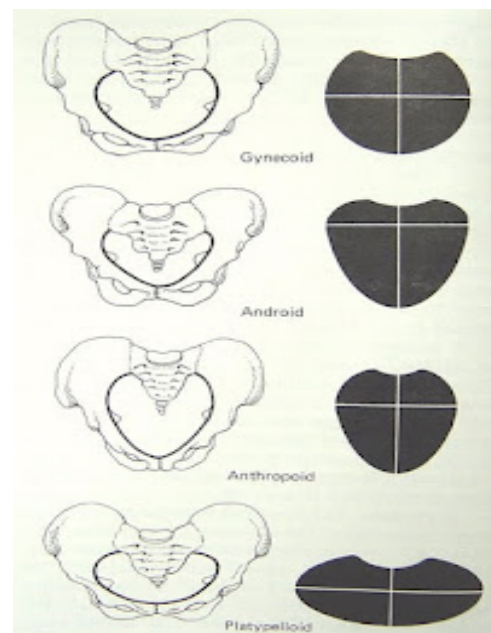
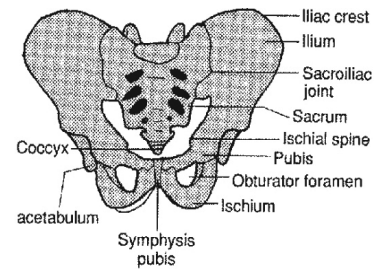


- **Sinciput:** area in front of the anterior fontanelle, containing the brow (supraorbital ridges) and the face

**Caput (Caput succedaneum):** a tissue swelling beneath the skin of the fetal scalp, resulting from the pressure of the dilating cervix during labour. This is due to the prevention of the venous blood & lymphatic fluid from flowing normally. It is soft and boggy to touch, usually disappears within 24hrs.

### The Passage (Pelvic anatomy)

- **Bony Pelvis:** 4 bones:
  - Sacrum
  - Coccyx
  - 2 symmetrical innominate bones (ilium, ischium and pubis)
- **Pelvic Planes:** imaginary flat surfaces extending through the pelvis at different levels.
  - **Pelvic Inlet:**
    - **Borders:** Pubic crest, iliopectineal line of the innominate bones, and sacral promontory.
    - **Diameters:** it is widest in **transverse** and narrowest **Anteroposteriorly**, and so the head enters it in **transverse** direction.
  - **Plane of greatest diameter:**
    - **Borders:** posterior mid-point of pubis, upper border of obturator foramen and the space between the 2<sup>nd</sup> and 3<sup>rd</sup> sacral vertebrae
    - **Diameters:** The site suitable for head rotation.
  - **Plane of smallest diameter:**
    - **Borders:** lower edge of pubis, ischial spine, sacrospinous ligament and lower sacrum.
    - **Diameter:** It is the site for low transverse arrest.
  - **Pelvic Outlet:**
    - **Borders:** coccyx, ischial tuberosity and the lower border of the symphysis pubis.
    - **Diameter:** transverse and bituberous
- **Pelvic Shapes:**
  - **Gynaecoid:** the classical female pelvis, with a transversely oval inlet, and a roomier pelvic cavity. The fetal head rotates into the **occipitoanterior position** in this type.
  - **Anthropoid:** a long, narrow and oval shaped pelvis (due to the assimilation of the sacral body to the fifth lumbar vertebrae). The fetal head is forced to be in the **occipitoposterior position**. Arrest of descent is common at midpelvis.
  - **Android:** a heart-shaped inlet, with a funnel-shaped cavity and a contracted



outlet. The fetal head is forced to be in the **occipitoposterior position**.

- **Platypolloid:** a wide pelvis flattened at the brim with a sacral promontory that is pushed forward. The fetal head has to engage in the **transverse diameter**.

## Stages of Labor

### First Stage

From the onset of true labor to complete dilation of the cervix

#### Phases

**The first stage of labor consists of two phases:**

- A latent phase → cervical effacement and early dilatation
- An active phase → more rapid cervical dilatation occurs

During the first stage of labor the entire cervical length is retracted into the lower uterine segment. (However, cervical softening and early effacement may occur before labor).

#### Length

- The length of the first stage may vary in relation to parity

Characteristic	Primipara	Multipara
Duration of 1 <sup>st</sup> stage	6-18 hrs	2-10 hrs
Cervical dilatation during active phase	1 cm/hr	1.2 cm/hr
Duration of 2 <sup>nd</sup> stage	30 min-3 hrs	5-30 min
Duration of 3 <sup>rd</sup> stage	0-30 min	0-30 min

- The duration of the latent phase is highly variable and may be influenced by factors such as sedation and stress
- The active phase begins when the cervix is 3 to 4 cm dilated.
  - Minimal dilatation = 1-1.2 cm/hr
  - If progress is slower than **the minimal dilatation**, evaluate for uterine dysfunction, fetal malposition, or cephalopelvic disproportion.

### Measurement of Progress

- 1<sup>st</sup> stage: Cervical effacement, cervical dilatation, and descent of the fetal head. Uterine contractions alone are not an adequate indication of progress.
- 2<sup>nd</sup> stage: Descent, flexion, and rotation of the presenting

### Management

#### Maternal Position

- The mother may ambulate
- If she is lying in bed → lateral recumbent position (ensure perfusion of the uteroplacental unit)

#### Fluids

- **Oral fluids are best avoided** (Because of decreased gastric emptying during labor)
- IV during the active phase → hydrate w/crystalloids + administer oxytocin after the delivery of the placenta

## Investigations

- Hematocrit/hemoglobin
- Blood group, rhesus (Rh) type, and an antibody screen
- Hepatitis-B status
- Urine for protein and glucose

## Maternal Monitoring

- Pulse rate
- Blood pressure
- Respiratory rate
- Temperature
- Urine output and intake

Recorded every 1-2 hours

## Fetal Monitoring

- Fetal heart rate (auscultation with a DeLee stethoscope, Doppler, or fetal scalp electrode)
- In patients with no significant obstetric risk factors → fetal heart rate/electronic monitor tracing
  - Active phase: Every 30 minutes
  - 2<sup>nd</sup> stage: Every 15 minutes
- In patients with obstetric risk factors → fetal heart rate/electronic monitoring tracing evaluated
  - Active phase (immediately after a contraction): Every 15 minutes
  - 2<sup>nd</sup> Stage: Every 5 minutes

## Uterine Activity

- Uterine contractions should be monitored every 30 minutes by palpation for their **frequency, duration, and intensity**.
- **For high-risk pregnancies, uterine contractions should be monitored continuously along with the fetal heart rate.**

## Vaginal Examination

- During the latent phase, vaginal examinations should be done sparingly to decrease the risk of an intrauterine infection.
- **In the active phase, the cervix should be assessed approximately every 2 hours to determine the progress of labor.**



## Amniotomy

- The artificial rupture of fetal membranes
- May provide information on the volume of amniotic fluid and the presence or absence of meconium.
- In addition, rupture of the membranes may cause an increase in uterine contractility.
- **Risk of**
  - Chorioamnionitis if labor is prolonged and of
  - Umbilical cord compression or cord prolapse if the presenting part is not engaged

## Second Stage

- The mother bears down with each contraction = abdominal pressure + uterine contractile force → expel the fetus
- Fetal descent must be monitored carefully to evaluate the progress of labor
  - Descent is measured in terms of progress of the presenting part through the birth canal
  - Molding and caput can create a false impression of fetal descent

## Mechanism

<b>Engagement</b>	The passage of the largest transverse diameter (biparietal diameter) through the pelvic brim = at station zero = the head is 2/5 palpable per abdomen	
<b>Descent</b>	Brought about by the force of the uterine contractions & maternal bearing-down (Valsalva) efforts	
<b>Flexion</b>	<p>Resistance from the cervix, pelvic walls, and pelvic floor → further flexion</p> <ul style="list-style-type: none"> <li>- Occipitoanterior position: flexion changes the presenting diameter from the occipitofrontal to suboccipitobregmatic</li> <li>- Occipitoposterior position: complete flexion may not occur → larger presenting diameter (longer labor)</li> </ul>	 <p>A</p>
<b>Internal Rotation</b>	<p>Happens after engagement</p> <p>Occipitoanterior positions: the fetal head rotates → occiput is toward the symphysis pubis</p> <p>Occipitoposterior positions: the fetal head may rotate posteriorly → occiput is toward the sacrum</p>	 <p>B</p>





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**Extension** Because the vaginal outlet is directed upward and forward, extension **must** occur before the head can pass through it

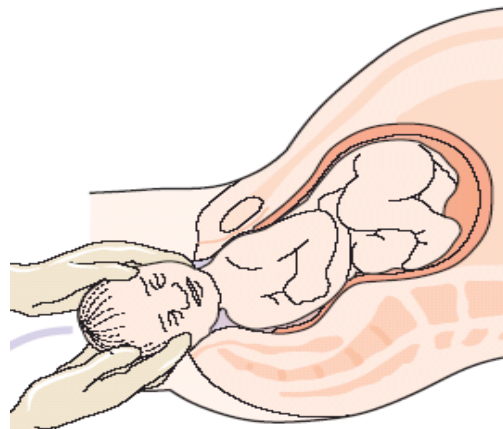
- Bulging of the perineum followed by crowning
- **Crowning** occurs when the largest diameter of the fetal head is encircled by the vulvar ring
- **Episiotomy** may aid in reducing perineal resistance



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**External Rotation**

- Restitution is rotation of head by  $45^\circ$  and external rotation is further rotation by  $45^\circ$
- Delivered head now returns to its original position at the time of engagement to align itself with the fetal back and shoulders



**Expulsion** Anterior shoulder delivers under the symphysis pubis, followed by the posterior shoulder over the perineal body and the body of the child

## Management

## Maternal Position, Bearing Down & Vaginal Examination

- Avoid supine position.
- The mother should be encouraged to hold her breath and bear down with expulsive efforts (Important for patients with regional anesthesia because their reflex sensations may be impaired)
- Progress should be recorded **every 30 minutes**
  - Descent and flexion of the presenting part
  - Extent of internal rotation
  - Development of molding or caput

## Fetal Monitoring

- Fetal heart rate should be monitored continuously or evaluated every 5 minutes in patients with obstetric risk factors.
- Fetal heart rate decelerations (head compression or cord compression) with recovery following the uterine contraction may occur normally during this stage

## Delivery

- The left lateral position may be used to deliver patients with hip or knee joint deformities that prevent adequate flexion, or for patients with a superficial or deep venous thrombosis in one of the lower extremities
- An episiotomy may be performed to prevent perineal lacerations.
  - Studies indicate that the performance of episiotomies may result in ↑ proportion of lacerations involving the anal sphincter (3<sup>rd</sup> degree) or anal mucosa (4<sup>th</sup> degree) → complication of anal incontinence of gas or feces
- To facilitate delivery of the fetal head, a Ritgen maneuver is performed:

Right Hand	Left Hand
Upward pressure on distended perineal body	Downward pressure on the occiput
First to the supraorbital ridges then to the chin	
Upward pressure → ↑ extension of the head & prevents it from slipping back between contractions	Downward pressure prevents rapid extension of the head and allows a controlled delivery

- Once the head is delivered, the airway is cleared of blood and amniotic fluid using a bulb suction device.
  - Suction of the nares is not performed if fetal distress or meconium-stained liquor is present because it may result in gasping and aspiration of pharyngeal contents.
  - After the airway has been cleared, an index finger is used to check whether the umbilical cord encircles the neck. If so, the cord can usually be slipped over the infant's head. If the cord is too tight, it can be cut between two clamps
- Delivery of the anterior shoulder is aided by gentle downward traction on the externally rotated head. The brachial plexus may be injured if excessive force is used.
- The posterior shoulder is delivered by elevating the head. Finally, the body is slowly extracted by traction on the shoulders
- Usually, the cord is clamped and cut within 15 to 20 seconds.

- Delayed cord clamping can result in neonatal hyperbilirubinemia as additional blood is transferred to the newborn infant

### Third Stage

The cervix and vagina should be thoroughly **inspected for lacerations** and surgical repair performed if necessary.

### Delivery of the Placenta

- Occurs within 2 to 10 minutes of the end of the second stage of labor
- Signs of placental separation are as follows:
  - A fresh show of blood from the vagina
  - The umbilical cord lengthens outside the vagina
  - The fundus of the uterus rises up & the uterus becomes firm and globular
- When these signs appear → apply gentle traction + counterpressure between the symphysis and fundus → prevent descent of the uterus into the pelvis
- After delivery of the placenta,
  - Check for any uterine bleeding that may originate from the placental implantation site.
  - Uterine massage + oxytocin may ↑ contractions → reduce this bleeding
  - Examine placenta to ensure complete removal & detect placental abnormalities
  - If patient is at risk of postpartum hemorrhage (e.g., anemia, prolonged oxytocic augmentation, multiple gestation, or hydramnios) → manual removal, manual exploration of the uterus, or both may be necessary

### Perineal Lacerations

Perineal lacerations (± episiotomy), may be classified as follows:

- **1<sup>st</sup> degree:** involving the vaginal **epithelium** or perineal **skin**
- **2<sup>nd</sup> degree:** extending into the **subepithelial** tissues of the vagina or perineum ± the **muscles** of the perineal body
- **3<sup>rd</sup> degree:** involving the **anal sphincter**
- **4<sup>th</sup> degree:** involving the **rectal mucosa**

### Fourth Stage

- **Close observation** of the patient during the hour immediately after delivery (postpartum hemorrhage usually occurs during this time)
  - Blood pressure, pulse rate, and uterine blood loss
  - Occult bleeding (e.g., vaginal hematoma formation) may manifest as pelvic pain
- **Causes of postpartum hemorrhage:** uterine relaxation, retained placental fragments, or unrepaired lacerations

### Summary

Labor Stage	Defintion	Duration
<b>Stage 1 Latent Phase (Effacement)</b>	Begins: Onset of regular contractions Ends: Acceleration of cervical dilation Purpose: Prepares cervix for dilation	<20 hours <14 hours
<b>Stage 1 Active Phase</b>	Begins: Acceleration of cervical dilatation	≤ 1.2 cm/hr in primipara

<b>(Dilation)</b>	Ends: 10 cm (complete) Purpose: Rapid cervical dilation	≥ 1.5 cm/hr in multipara Add 1 hr if epidural
<b>Stage 2 (Descent)</b>	Begins: 10 cm (complete) Ends: Delivery of baby Purpose: Descent of fetus	< 2 hr in primipara < 1 hr in multipara
<b>Stage 3 (Expulsion)</b>	Begins: Delivery of baby Ends: Delivery of placenta	< 30 minutes

### General Principles of Management

- Observation and appropriate and timely intervention to prevent fetal or maternal morbidity
- Assess fetal and maternal well-being
  - Categorize high or low risk pregnancy
  - Cardio tocographic Trace (CTG)
  - Abdominal and vaginal examination to assess progress of labour
- Support mother, with provision of pain relief, nutrition where appropriate and emotional support.
- Respect the parents' wishes

### Malpresentations

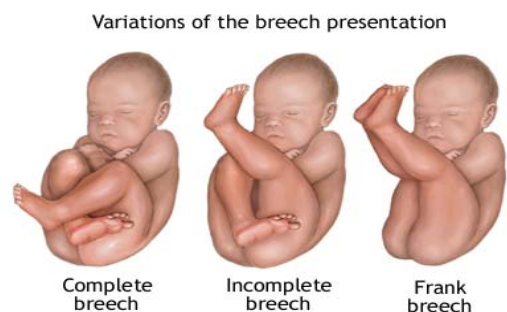
- The term 'Malpresentation' includes ANY fetal presentation of which is other than **vertex** (breech, face, brow, shoulder and compound presentations)
- Common causes of malpresentation:
  - **Maternal:** multiparity, pelvic tumors, congenital uterine anomalies and contracted pelvis
  - **Fetal:** prematurity, multiple pregnancy, intrauterine death and fetal abnormality (including hydrocephalus, acephaly and cystic hygroma)
  - **Placental:** placenta previa, polyhydramnios and amniotic bands.

### Breech Presentation

- When fetal buttocks/lower extremities present into the maternal pelvis.
- Breech incidence; 4% of all pregnancies

#### Etiology:

- Whenever there's a **prematurity** (preterm deliveries; before 28 weeks), 25% of the fetuses will be in breech position
- Prematurity is the major etiological factor
- Other factors:
  - Multiple pregnancy
  - Fetal malformations
  - Hydramnios
  - Lax uterus
  - Abnormal shape of pelvic brim or uterus
  - Placenta previa



### Classification:

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- Complete
- Incomplete or Footling
- Frank Breech

### Diagnosis:

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- **Leopold maneuver:** palpating fetal head in the fundal region, while a softer, small breech occupies the lower uterine segment above the symphysis pubis.
- **Vaginal Examination:** in a frank breech in labour; the fetal buttocks, anus, sacrum and ischial tuberosities can be palpated.
- **US:** may be required after vaginal examination to confirm the diagnosis in incomplete breech.

### Management:

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#### Pregnancy Management:

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- Exclude fetal and uterine anomalies after 43 weeks (uterine myomas, mullerian anomaly or fetal structural abnormality)
- **External Cephalic Version (ECV):** a procedure of manually converting the breech fetus to a vertex presentation, done by an obstetrician; through the external manipulation under US guidance. (carried out after 36-37 weeks and till labour).

ECV is **contraindicated** in:

- **Uteroplacental insufficiency**
- **Placenta previa**
- **Nonreassuring fetal monitoring**
- **Hypertension**
- **IUGR**
- **Oligohydramnios**
- **History of previous uterine surgery**

#### Labor Management

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##### Vaginal Delivery:

- Randomized trials had demonstrated the increased PNMR of a vaginally delivered breech in comparison with a C-section
- It's not made unless the fetus meets a strict criteria
- Standards of care now is to **deliver all breeches by caesarean birth**
- This is to avoid the morbidities of umbilical cord prolapse, head entrapment, birth asphyxia and trauma.

##### Assisted Breech Delivery:

- Sometimes the breech presentation can present in which c-section is impossible or unsafe
- Done through instruments such as piper forcers, of which does the process of head delivery with the least amount of trauma to the fetus

##### Cesarean Delivery:

- Premature fetuses are preferentially delivered by C-section; due to the head-abdominal size disparity.
- It is currently preferred for both; preterm and term breech infants.
- Significant trauma still occurs if care is not taken with the delivery of the arms and the head.



## Complications

- PMNR for breech is higher than vertex presentations
- Lethal congenital anomalies, prematurity, birth trauma and asphyxia; are factors that contribute to the increased PNMR
- Birth trauma; occurs whenever traction is exerted on the fetus, and can involve the brachial plexus (**Erb's palsy**), pharynx and liver.

## Face Presentation

- Incidence is 1:500 deliveries
- A result of an entrance of the fetal head with an 'extended' head rather than flexed
- Factors contributing: prematurity, high maternal parity, congenital anomalies (such as fetal goiter) or idiopathic.
- **Diagnosis:** done with Vaginal examination during labour, when soft tissue of the mouth and nose are noted adjacent to the malar bones and orbital ridges, then confirmed by US
- **Anencephaly should be ruled out when face presentation is suspected.**

## Other Presentations

- **Brow Presentation:**
  - With the supra-occipitomenal as presenting diameter.
  - The large presenting diameter makes vaginal delivery impossible, unless the fetus is very small or the maternal pelvis is very large, it must be accomplished by C-section
- **Compound presentation:** occurs with the fetal extremities (usually the hand) prolapse alongside the presenting part (the head) and both parts enter the maternal pelvis at the same time.

Name..... Gravida..... Para..... Hospital No. ....

Date of Admission..... Time of Admission..... Ruptured membranes.....hrs

FETAL HEART RATE

LIQUOR MOULDING

(cm)

Plot X

Descent of Head Plot O

Hours

Time

Latent Phase

Active Phase

Alert

Action

CONTRACTIONS PER 10 MINS

Oxytocin LM drops/min

DRUGS GIVEN AND I.V. FLUIDS

• PULSE

B.P.

TEMP °C

URINE { PROT ACET VOL

Partogram or Friedman Curve: Graphical representation of the progress of labour against time.