

LABOR

5th year Medical Students

JU

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November/2023

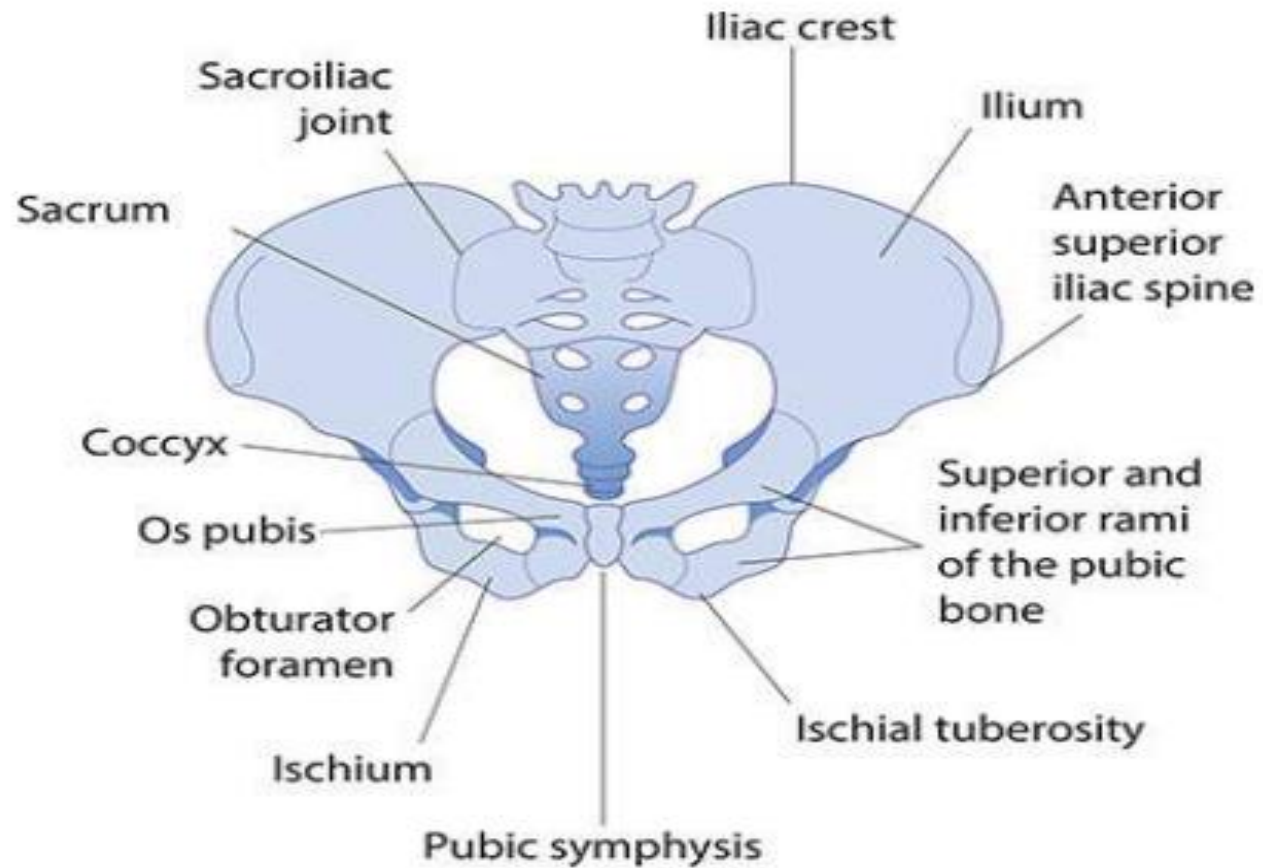
LABOR

- **Anatomy of the female pelvis**
- **Anatomy of the fetal skull**
- **The changes that occur in the uterus during pregnancy**
- **The factors that are involved in the onset of labor**
- **Definition of labor**
- **The mechanism of normal labor and birth**
- **Stages of labor**
- **How to monitor progress in labor?**

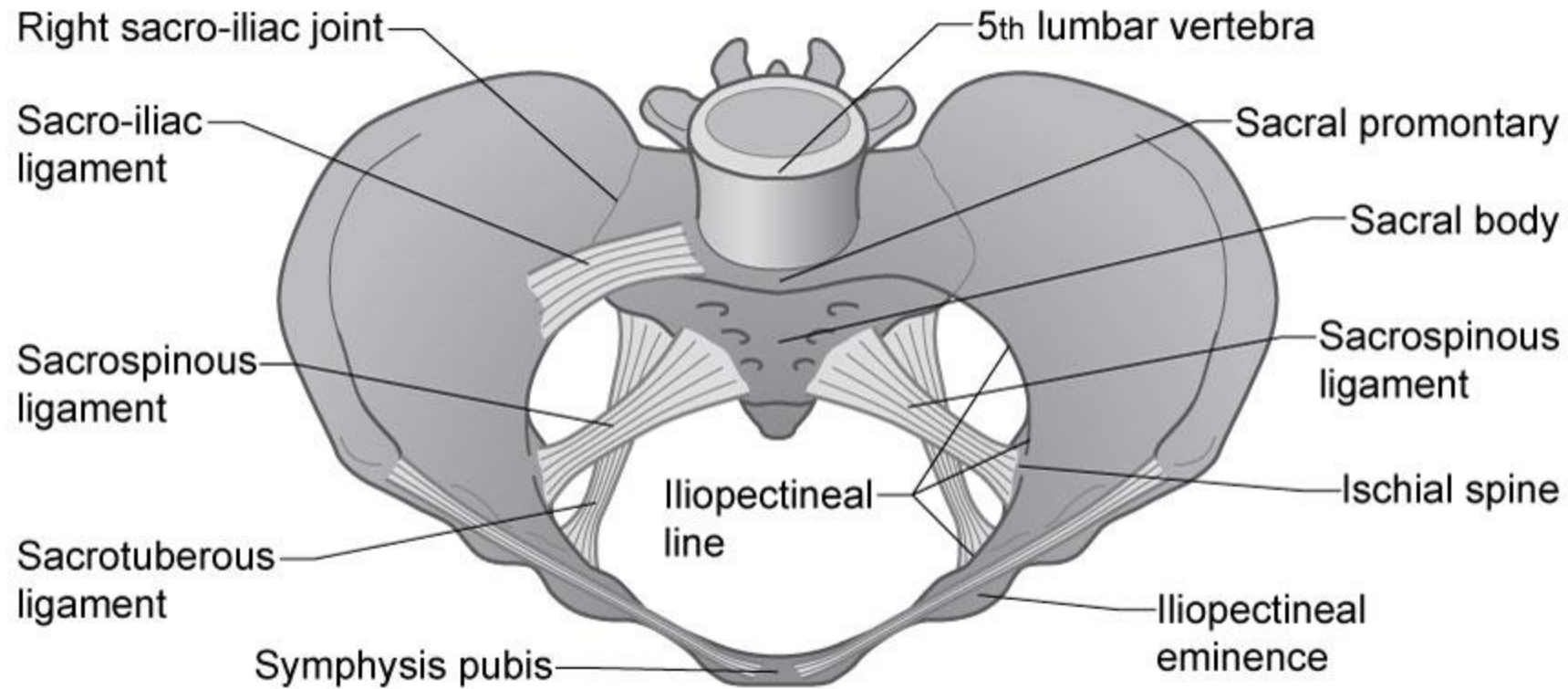
Anatomy of the female pelvis

- ✓ **The Female Bony Pelvis**
 - The Pelvic inlet(The Brim)
 - The Midpelvis (The Midcavity)
 - The Pelvic outlet
- ✓ **The Pelvic Floor**
- ✓ **The Perineum**

The Female Bony Pelvis



The Female Bony Pelvis



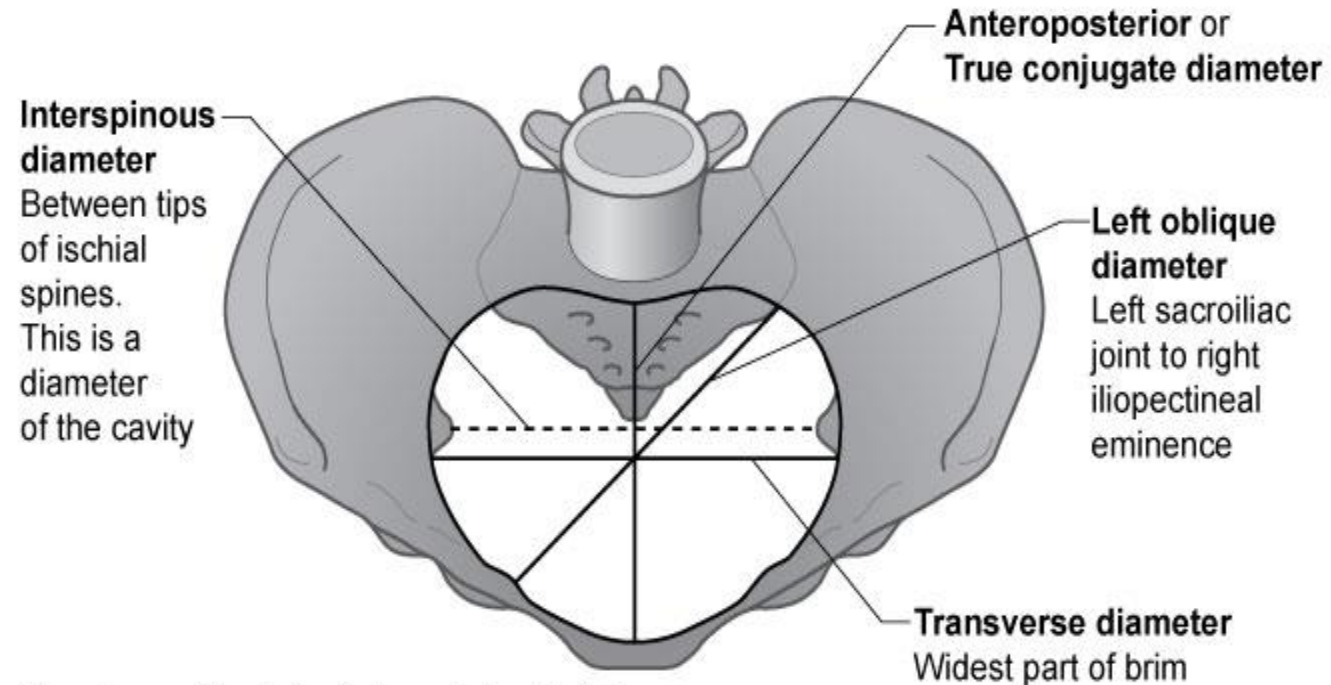
The Pelvic Inlet (Brim)

- **The plane of the brim is bounded:**
- anteriorly by the upper border of the symphysis pubis.
- laterally by the upper margin of the pubic bone, iliopectineal lines & the ala of the sacrum.
- posteriorly by the alae and promontory of the sacrum.

The Pelvic Inlet (Brim)

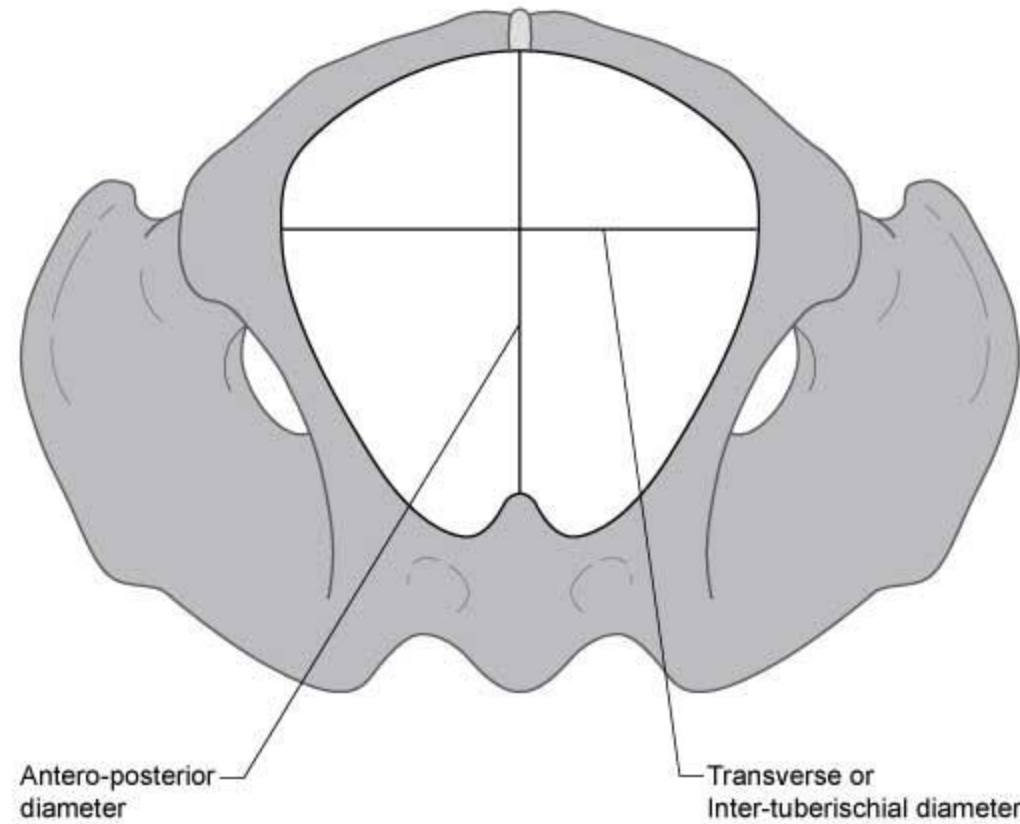
- The normal transverse diameter in the pelvic inlet is 13.5 cm and is wider than the anterior–posterior (A–P) diameter, which is normally 11.0 cm.
- The fetal head typically enters the pelvis orientated in a transverse position in keeping with the wider transverse diameter.

The Female Bony Pelvis

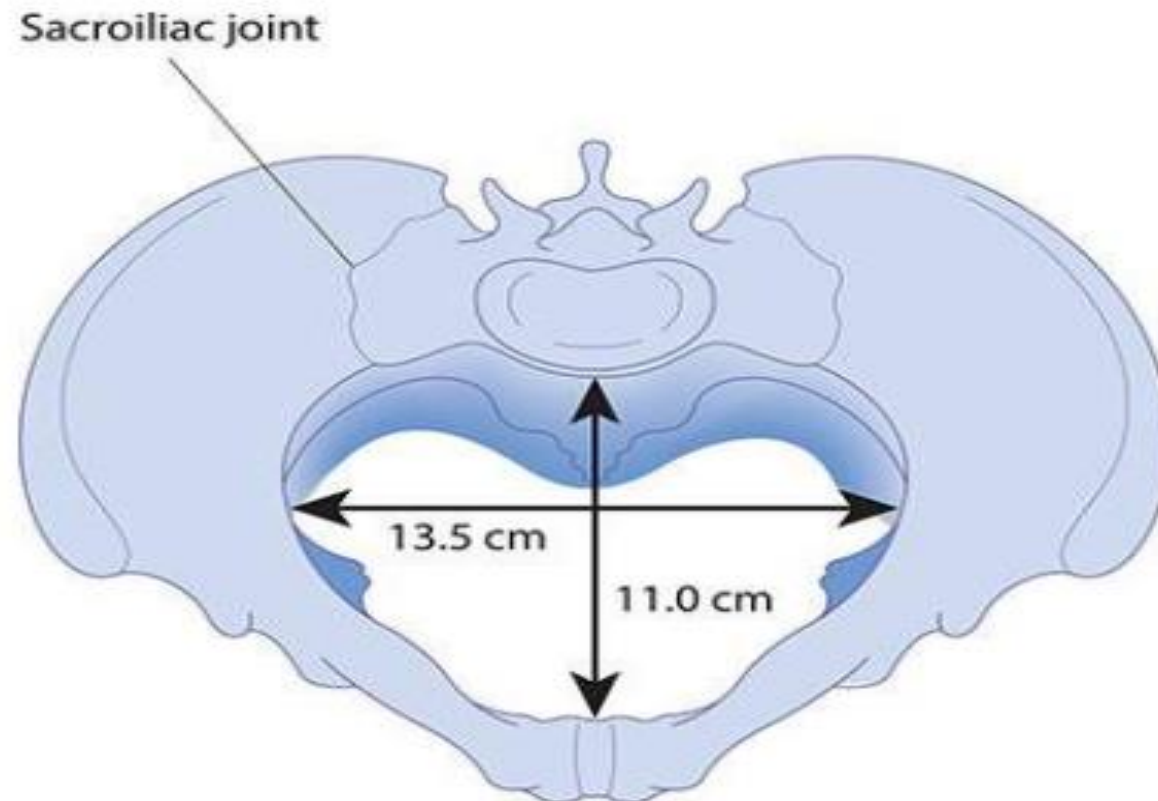


The plane of the brim is bounded anteriorly by the pubis, laterally by the iliopectineal lines, posteriorly by the alae and promontory of the sacrum

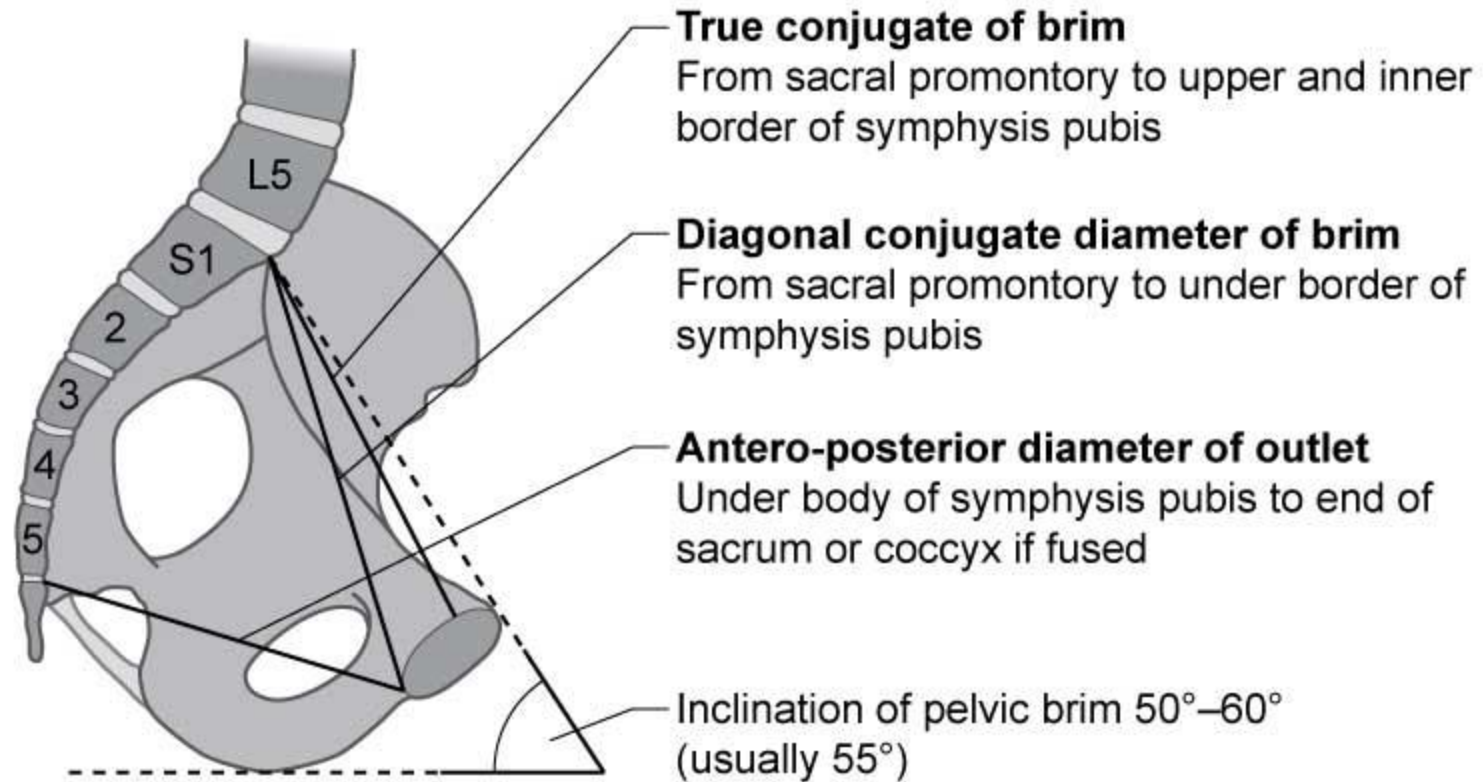
The Female Bony Pelvis



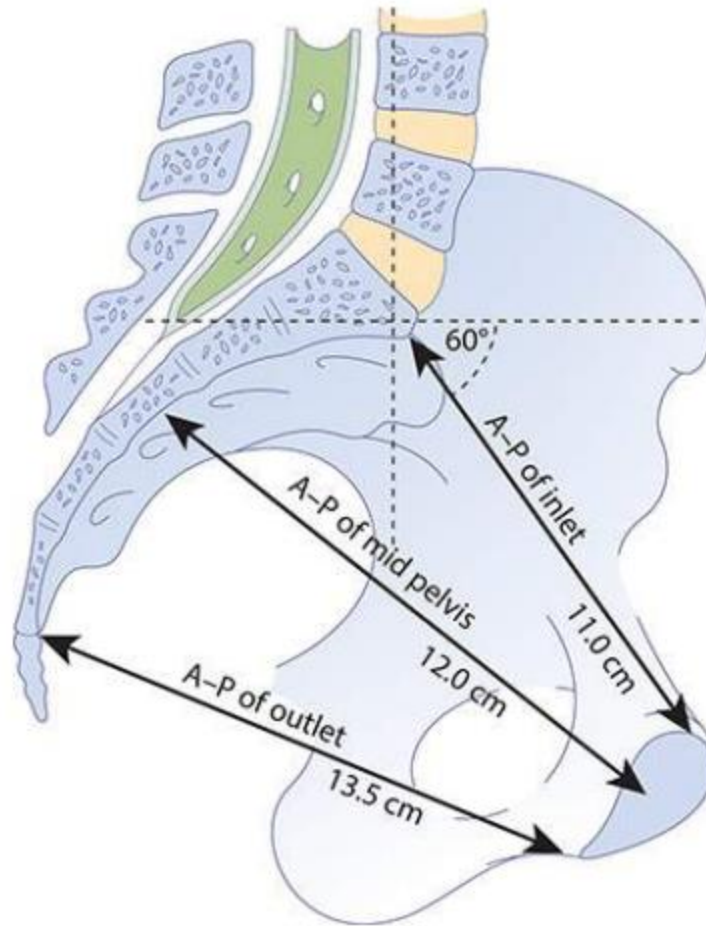
The Pelvic Inlet (Brim)



The Pelvic Inlet (Brim)



Sagittal section of the pelvis demonstrating the anterior–posterior (A–P) diameters of the inlet and outlet.



The Midpelvis (Midcavity)

- An area bounded anteriorly by the middle of the symphysis pubis, laterally by the pubic bones, the obturator fascia and the inner aspect of the ischial bone and spines, and posteriorly by the junction of the second and third sections of the sacrum.
- The midpelvis is almost round, as the transverse and anterior diameters are similar at 12 cm.

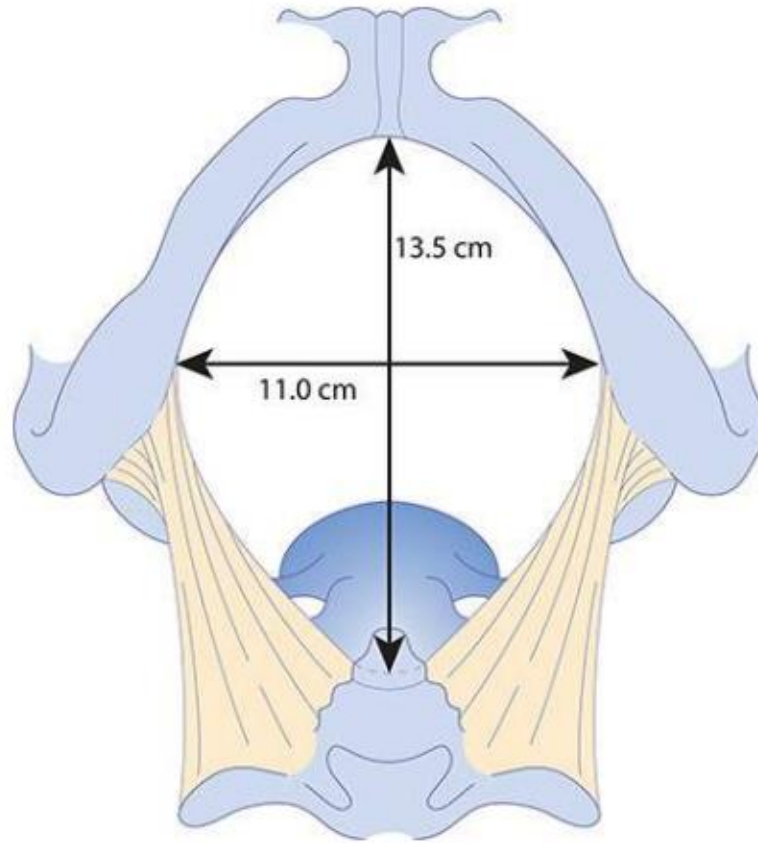
The ischial spines

- **The ischial spines are palpable vaginally and are used as important landmarks for two purposes:**
- 1- To assess the descent of the presenting part on vaginal examination (e.g. station zero is at the level of the ischial spines, -1 is 1 cm above the spines and +1 is 1 cm below the spines).
- 2- To provide a local anesthetic pudendal nerve block.
- The pudendal nerve passes behind and below the ischial spine on each side.

The Pelvic Outlet

- The pelvic outlet The pelvic outlet is bounded anteriorly by the lower margin of the symphysis pubis, laterally by the descending ramus of the pubic bone, the ischial tuberosity and the sacrotuberous ligament, and posteriorly by the last piece of the sacrum.
-
- The AP diameter of the pelvic outlet is 13.5 cm and the transverse diameter is 11 cm

The pelvic outlet



NOTES

- The pelvic inlet is wider in the transverse than in the AP diameter.
- The pelvic outlet is wider in the AP than in the transverse diameter.
- The ischial spines are located in the midpelvis and denote station zero.
- The fetal head enters the pelvis in a transverse position, rotates in the midpelvis and delivers in an AP position.
- Pelvic dimensions may increase during labour due to pelvic ligament laxity. The shape of the pelvis and pelvic floor muscles aid flexion and rotation of the fetal head.
- The sutures and fontanelles of the fetal skull are used to assess the position and attitude of the fetal head.
- Moulding of the skull bones during labour reduces the measurements of the fetal head

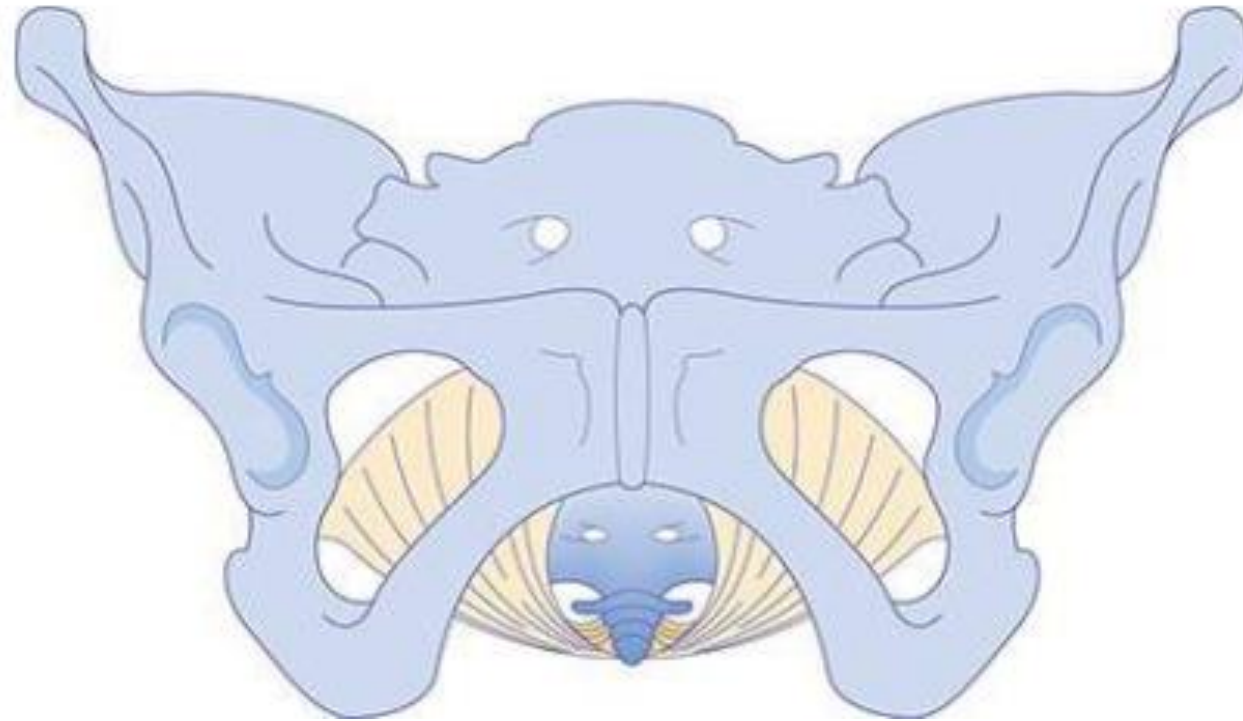
NOTES

- The transverse is the widest diameter at the inlet, but at the outlet it is the AP diameter, and the fetal head must rotate from a transverse to an AP position as it passes through the pelvis.
- Typically, this happens in the midpelvis where the transverse and AP diameters are similar.
- In addition, the pelvic axis describes an imaginary curved line, a path that the centre of the fetal head must take during its passage through the pelvis, from entry at the inlet, descent and rotation in the midpelvis and exit at the outlet.

The Pelvic Floor

- The pelvic floor This is formed by the two levator ani muscles which, with their fascia, form a musculofascial gutter during the second stage of labour.
- The configuration of the bony pelvis together with the gutter-shaped pelvic floor muscles encourage the fetal head to flex and rotate as it descends through the midpelvis towards the pelvic outlet.

The Musculofascial Gutter of the Levator sling



The Perineum

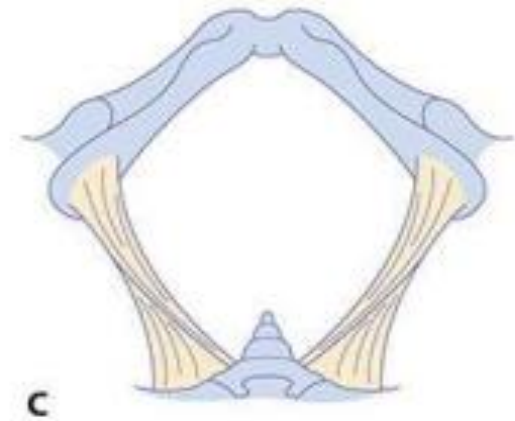
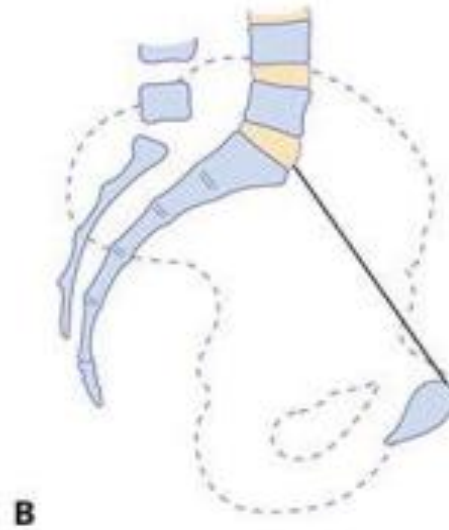
- The final obstacle to be overcome by the fetus during labour is the perineum.
- **The perineal body** is a condensation of fibrous and muscular tissue lying between the vagina and the anus.
- It receives attachments of the posterior ends of the bulbo-cavernosus muscles, the medial ends of the superficial and deep transverse perineal muscles and the anterior fibres of the external anal sphincter.
- The perineum is taut and relatively resistant in the nulliparous woman, and pushing can be prolonged. Vaginal birth may result in tearing of the perineum and pelvic floor muscles or an episiotomy (surgical cut) may be required.
- The perineum is stretchy and less resistant in multiparous women, resulting in faster labor and a higher probability of delivering with an intact perineum.

Shapes of the pelvis

- **The gynaecoid pelvis** is the most common & most favourable for labor.
- **The android pelvis** is said to predispose to failure of rotation and deep transverse arrest.
- **The anthropoid** shape encourages an occipito-posterior (OP) position.
- **The platypelloid pelvis** is also associated with an increased risk of obstructed labor due to failure of the head to engage, rotate or descend.

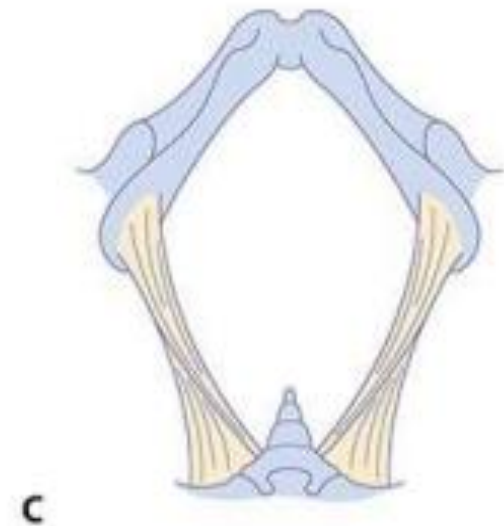
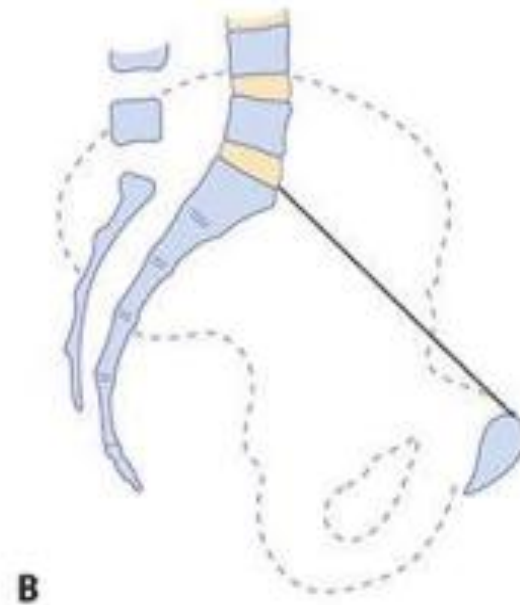
The Gynaecoid pelvis

(A) BRIM ; (B) LATERAL VIEW ; (C) OUTLET



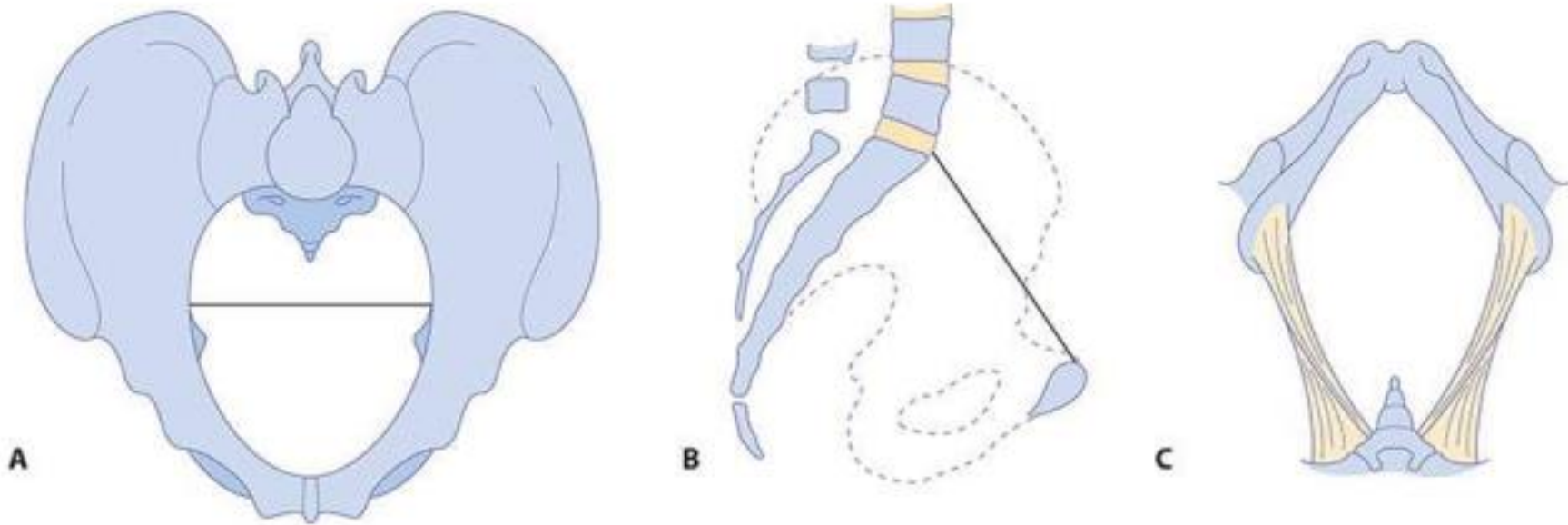
The android pelvis

(A) brim; (B) lateral view; (C) outlet.

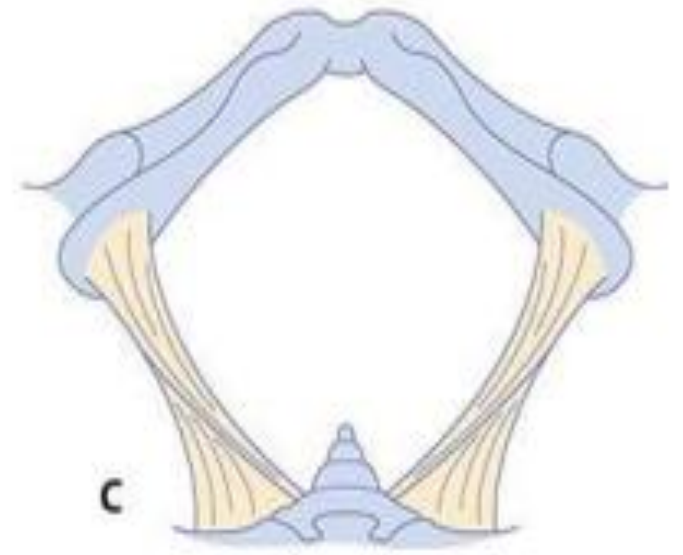
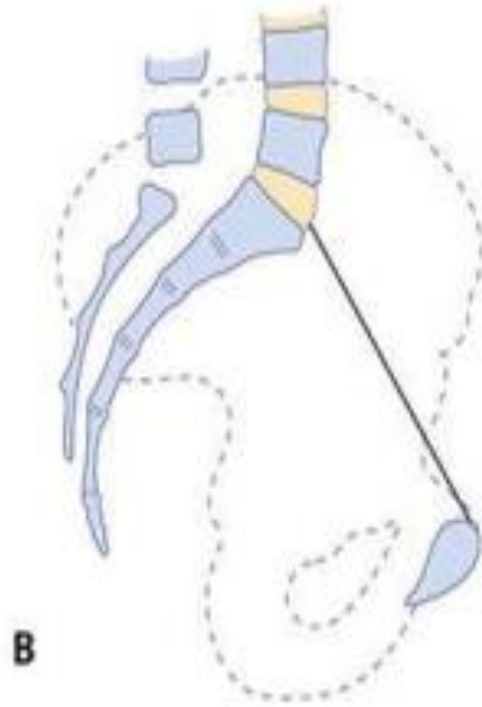
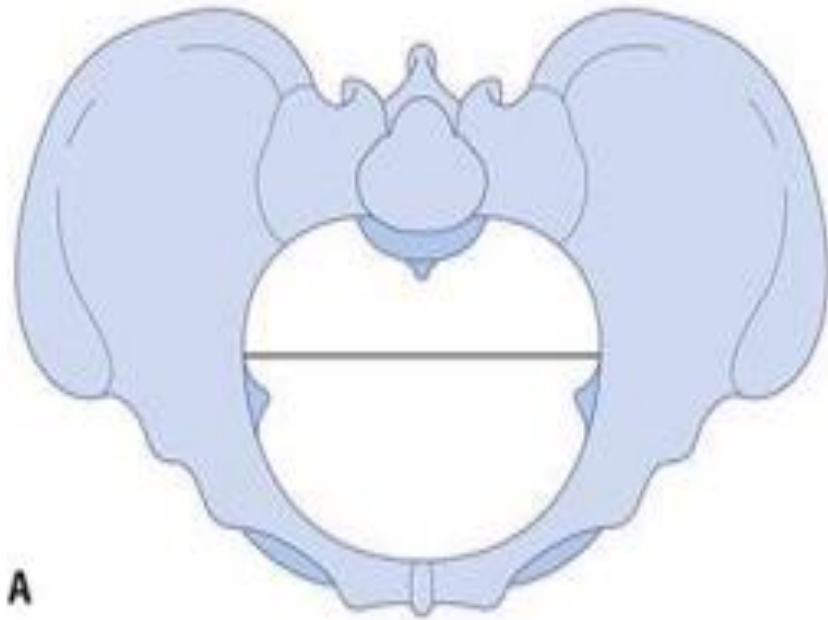


The anthropoid pelvis

(A) brim; (B) lateral view; (C) outlet.

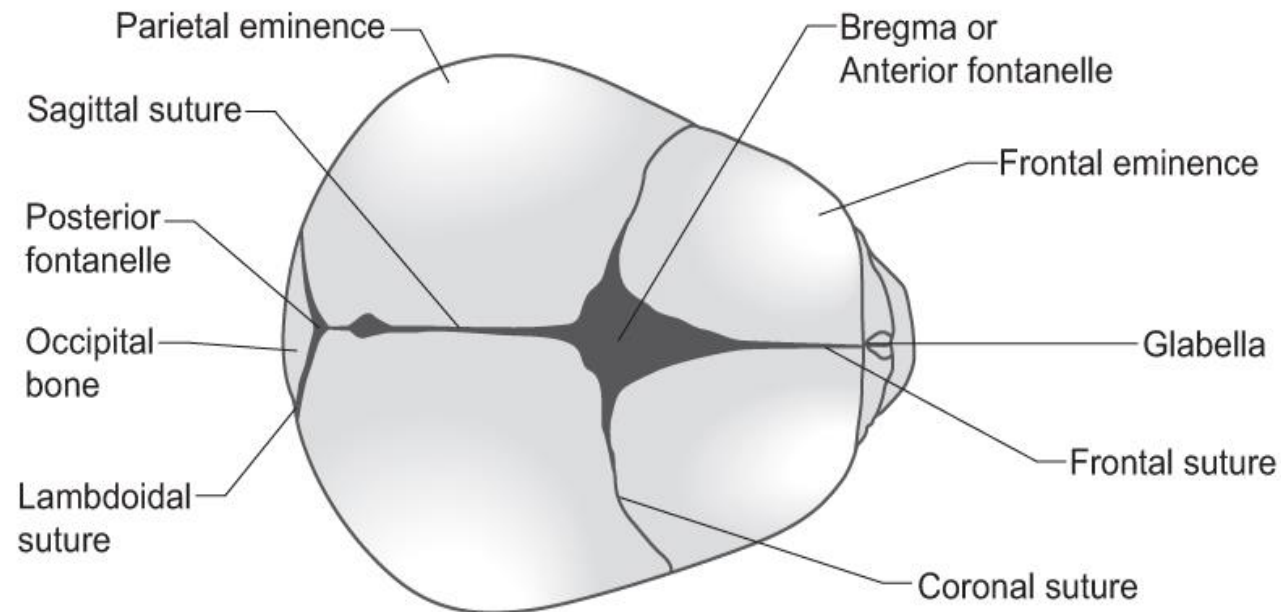


The platypelloid pelvis (A) brim; (B) lateral view; (C) outlet



Anatomy of the fetal skulls

- The **vertex** is the area bounded by the anterior and posterior fontanelle and the parietal eminence



Anterior fontanelle & Posterior fontanelle

- The anterior fontanelle, also known as bregma, is at the junction of the sagittal, frontal and coronal sutures, and is diamond shaped.
- The posterior fontanelle lies at the junction of the sagittal suture and the lambdoidal sutures between the two parietal bones and the occipital bone, and is smaller and triangular shaped.

The vertex

- The vertex is the area bounded by the anterior and posterior fontanelle and the parietal eminence.
- In normal labor the vertex of the fetal head is the presenting part and the posterior fontanelle (indicating the occiput) is used to define the position of the fetal head in relation to the pubic symphysis.

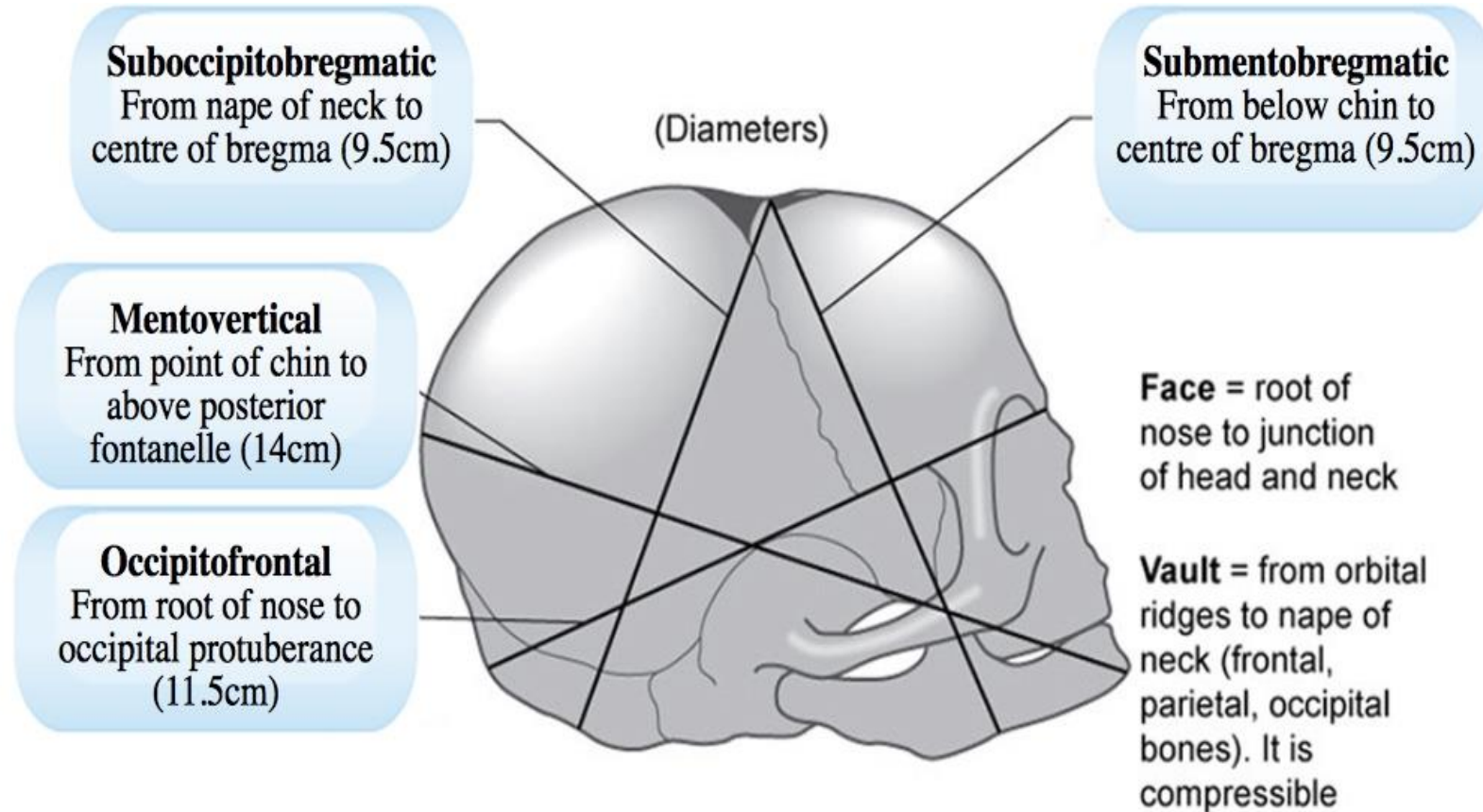
Molding

- The parietal bones usually slide over the frontal and occipital bones. Furthermore, the bones themselves are compressible.
- These characteristics of the fetal skull allow a process called 'molding' to occur, which reduces the diameters of the fetal head and encourages progress through the bony pelvis, while still protecting the underlying brain.
- Severe moulding, or moulding early in labour, can be a sign of obstructed labor due to a fetal malposition (failure of the head to rotate) or cephalopelvic disproportion (a mismatch between the size of the fetal head and maternal pelvis).

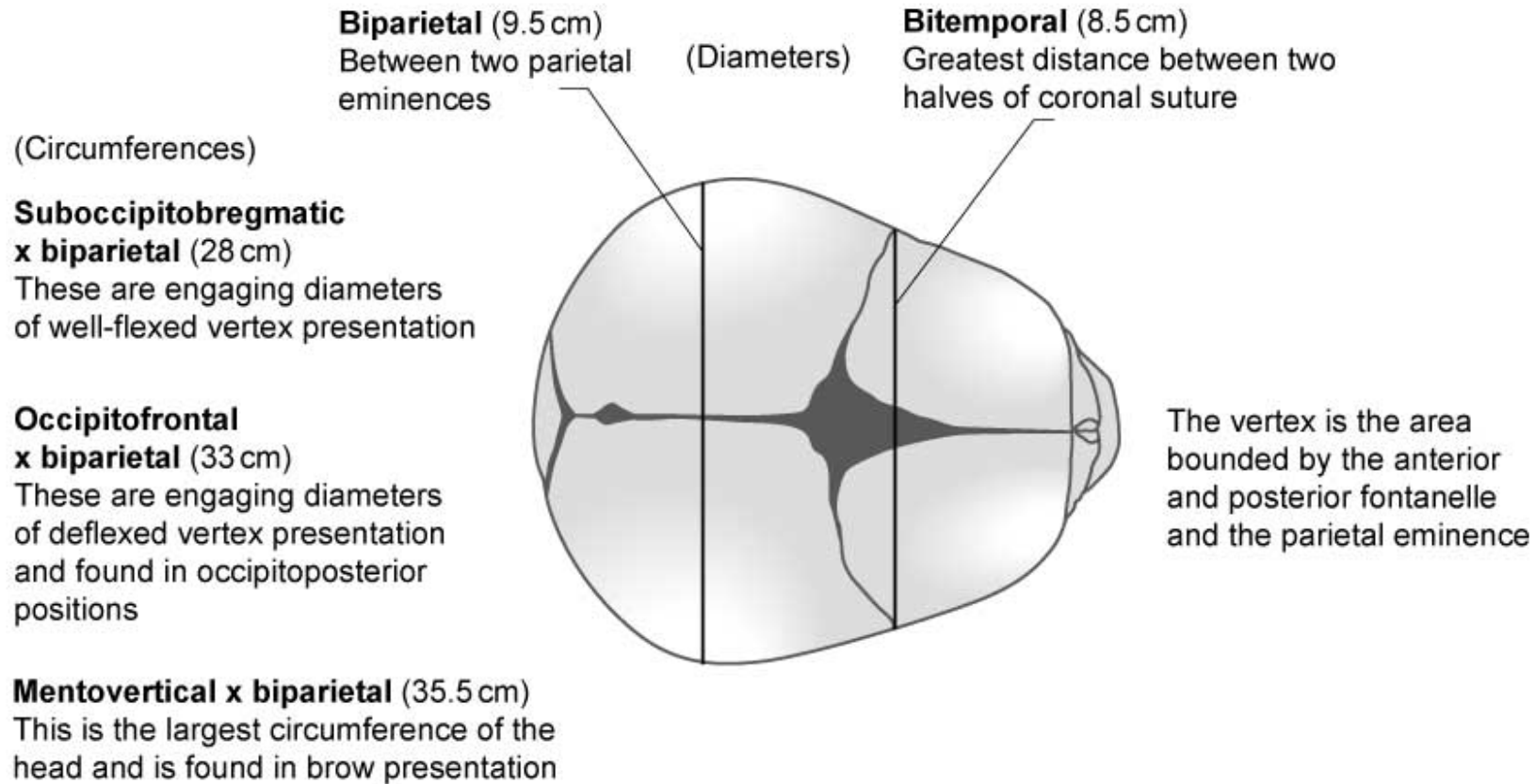
Cephalopelvic Disproportion

- Cephalopelvic disproportion: (a mismatch between the size of the fetal head and maternal pelvis).
 - Macrosomic fetus
 - Contracted Pelvis

Anatomy of the fetal skulls



Anatomy of the fetal skulls



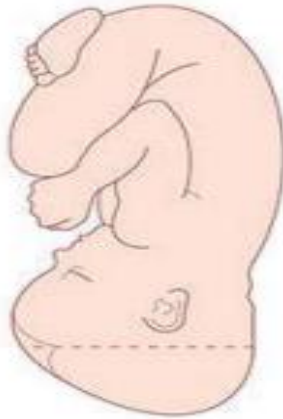



Summary of Presenting diameters

Vertex	Suboccipito–bregmatic	9.5 cm
Deflexed OP	Occipito–frontal	11.5 cm
Brow	Mento–vertico	13.0 cm
Face	Submento–bregmatic	9.5 cm

Fetal Skull Diameters

- Smallest diameter of fetal skull is the Suboccipito-bregmatic – 9.5cm (vertex)
- All non vertex presentations likely to contribute to **cephalo-pelvic disproportion**

The effect of fetal attitude

	Flexed	→			Extended
Attitude	Well flexed	Less well flexed (partially extended) or deflexed	Extended 'brow presentation'	Hyperextended 'face presentation'	
Diameter	Suboccipito-bregmatic	Occipito-frontal	Occipito-mental	Submento-bregmatic	
Measurement	9.5 cm	11.5 cm	13.0 cm	9.5 cm	
					

Fetal Lie

- Fetal lie refers to the relationship between the longitudinal axis of the baby with respect to the longitudinal axis of the mother.
 - Longitudinal lie
 - Transverse lie
 - Oblique lie

Presentation

- Presentation: that part of the fetus entering the pelvis first, e.g. vertex of head, face, brow or breech.

Position

- Position: orientation of the presenting part in relation to the maternal pubic symphysis, e.g. occipito-anterior, occipito-posterior, occipito-transverse.
- The occipito-anterior (OA) position is the most favourable for a spontaneous vaginal birth.
- The occipito-transverse (OT) position or (OP) position is a malposition and may result in prolonged labour, instrumental delivery or caesarean section.

Three Ps

- POWER//PASSAGES//PASSENGER
- Abnormalities of the uterine contractions (the 'powers'), the pelvis and lower genital tract (the 'passages') and the fetus (the 'passenger') can cause abnormal labour, resulting in the need for intervention and with that, an increased risk of morbidity or mortality.
- When the 3Ps are favourable, normal labour is likely to ensue, resulting in an unassisted or spontaneous vaginal birth.

Labor

- Labor is defined as regular, rhythmic and painful uterine contractions that cause progressive ripening, effacement (thinning and shortening) and dilatation of the cervix and subsequent expulsion of the fetus.

Bishop score

To assess cervical condition

Parameter	0	1	2	3
Dilatation	<1 cm	1–2 cm	2–4 cm	>4 cm
Length	>4 cm	2–4 cm	1–2 cm	<1 cm
Consistency	Firm	Average	Soft	
Position	Posterior	Mid	Anterior	
Station	–3	–2	–1, 0	+1, +2

Cervical Ripening

- Definition: the increased softening, effacement and dilatation of the cervix, prelude to the onset of labor.
- These changes are due to alterations in the biomechanical properties of cervical tissue, including a reduction in collagen concentration, an increase in water content and a change in proteoglycan/glycosaminoglycan composition
- One important change involved is a rearrangement and realignment of collagen

Factors possibly linked to controlling cervical ripening including

- Prostaglandins
- Estrogens
- Progesterone and Antiprogesterones
- Relaxin
- Inflammatory mediators
- Nitric oxide
- Apoptosis

Methods commonly employed to encourage cervical ripening in clinical practice

Pharmacological	Mechanical
Misoprostol - Prostaglandin E1	Foleys Catheter
Dinopostone – Prostaglandin E2	Single / Double Balloon catheter

Normal Birth

❖ **The World Health Organization (WHO) defines normal birth as follows:**

- The birth is spontaneous in onset and low risk at the start of labor and remains so throughout labor and delivery.
- The infant is born spontaneously in the vertex position between 37 and 42 weeks of pregnancy.
- After birth, mother and infant are in good condition

Stages of Labor

- The First stage of Labor
- 1- Latent
- 2-Active (Established)
- The Second stage of labor
- The Third stage of labor
- The Fourth stage of labor

The First stage of Labor

- ❖ The first stage of labor is divided into two phases:
 - The Latent phase
 - The active phase
- ❖ This describes the time from the diagnosis of labor to full dilatation of the cervix (10 cm).

The Latent Phase of 1st Stage of Labor

- **Latent phase:**
- Irregular contractions become progressively coordinated, discomfort is minimal, and the cervix effaces and dilates to 4 cm.
- Latent first stage of labor is the presence of uterine contractions and cervical dilation and effacement up to 4 cm.
- The latent phase is difficult to time precisely, and duration varies, averaging 8 hours in nulliparas and 5 hours in multiparas; duration is considered abnormal if it lasts > 20 hours in nulliparas or > 12 hours in multiparas.

The active phase of 1st Stage of Labor

- **Active Phase:**
- A woman is considered to be in active or established labor when there is regular contractions and progressive dilation beyond 4cm.
- Cervical dilatation during the active phase occurs typically at 1 cm/hour or more in a normal labor, but is only considered abnormal if it occurs at less than 1 cm in 2 hour.
- It is also variable in length, usually lasting between 2 and 8 hours, shorter in multiparous women.

Rupture of the fetal membranes

- Rupture of the fetal membranes is a vital part of normal labor.
- During spontaneous labor at term, the membranes remain intact until after the onset of labor in 90% of women.
- In only 10% of women do they rupture prior to the onset of labour (prelabour or premature rupture of the membranes, PROM).
- If managed conservatively, 70% of mothers will establish in labor spontaneously within 24 hours, and 90% will establish by 48 hours.
- As the interval between rupture of the fetal membranes at term and birth increases, so may the risk of fetal and maternal infection

Methods of Augmentation of Labor

- Artificial Rupture of Membranes (Amniotomy)
- Adding Oxytocin

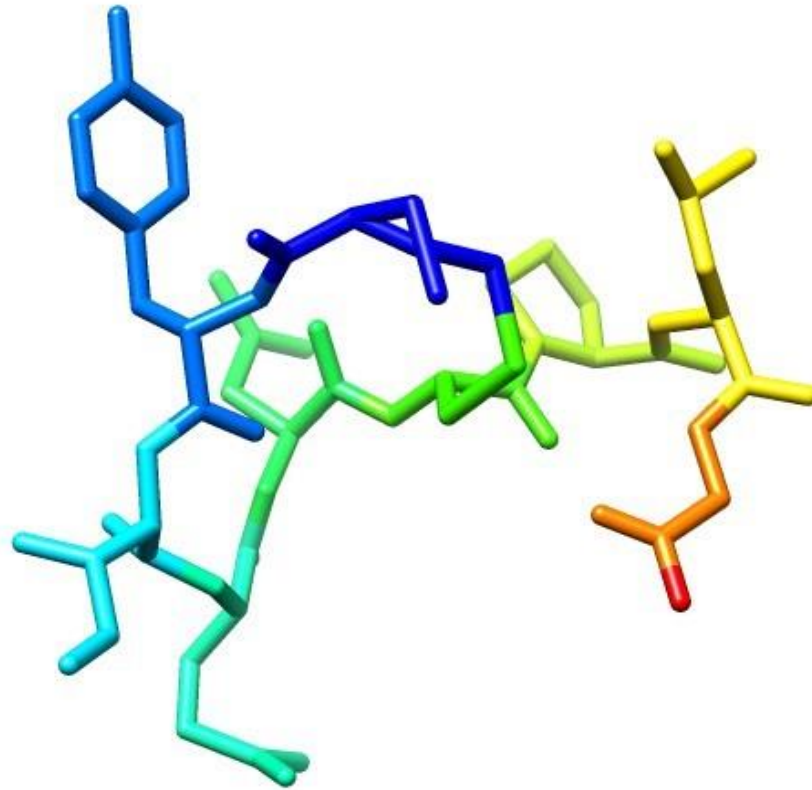
Artificial Rupture of Membranes (Amniotomy)

- ✓ Done in the active phase of the first stage of labor.
- ✓ It is a method of augmentation (Prostaglandin Release, as a result, labor may progress more rapidly)
- ✓ The status of amniotic fluid is detected (e.g Meconium stained liquor)
- ✓ Amniotomy during this stage may be necessary for specific indications, such as facilitating internal fetal monitoring & fetal scalp PH Sampling (FPS) to confirm fetal well-being.
- ✓ Amniotomy should be avoided in women with HIV infection or hepatitis B or C, so that the fetus not exposed to these organism.

Oxytocin

- **Oxytocin** (Oxt or OT) is a neuropeptide hormone normally produced in the hypothalamus and released by the posterior pituitary.
- **Oxytocin** is a natural hormone that stimulates uterine contractions in childbirth and lactation after childbirth. It also affects aspects of human behavior and the male and female reproductive systems.
- In the mid-1950s, **synthetic oxytocin** was successfully synthesized by a biochemist named Vincent du Vigneaud; he was later recognized with a Nobel prize for his work.

Oxytocin is composed of nine amino acids with a disulfide bridge between the Cys 1 and 6 residues



Oxytocin

- **Uses:**

- ✓ Augmentation of labor

- ✓ Management of post partum hemorrhage

- **Side Effects:** nausea, vomiting, hypotension, hyponatremia, water retention & overstimulation of the uterus.

- Augmentation of labor with an oxytocin infusion will often correct inefficient uterine contractions and may help correct a fetal malposition.

- Augmentation of labor with oxytocin can be dangerous in multiparous women with a uterine scar, a malpresentation and where there are concerns about fetal wellbeing.

The Second Stage of Labor

- **This describes the time from full dilatation of the cervix to delivery of the fetus or fetuses.**
- **The second stage of labor may also be subdivided into two phases:**
 - 1-The 'passive phase' describes the time between full dilatation and the onset of involuntary expulsive contractions.
 - There is no maternal urge to push and the fetal head is still relatively high in the pelvis.
 - 2- The 'active second stage'.
 - There is a maternal urge to push because the fetal head is low (often visible), causing a reflex need to 'bear down'.

The Second Stage of Labor

- Conventionally, a normal active second stage should last no longer than 2 hours in a nulliparous woman and 1 hour in women who delivered vaginally before.
- Use of epidural anesthesia will influence the length and management of the second stage of labor (3hrs in primigravida, 2hrs in multigravida).
- There is evidence that a second stage of labor lasting more than 3 hours is associated with increased maternal and fetal morbidity.

Third Stage of Labor

- The third stage is the interval between delivery of the baby and the complete expulsion of the placenta and membranes.
- This normally takes between 5 and 10 minutes and is considered prolonged after 30 minutes.

Signs of Placental Separation

- ✓ Apparent lengthening of the cord
- ✓ A small gush of blood from the placental bed
- ✓ Rising of the uterine fundus to above the umbilicus
- ✓ Uterine contraction resulting in firm globular feel on palpation

Active management of the third stage

- ✓ Intramuscular injection of 10 IU oxytocin, given as the anterior shoulder of the baby is delivered, or immediately after delivery of the baby.
- ✓ Early clamping and cutting of the umbilical cord.
- ✓ Controlled cord traction.

Modified approach to active management of the third stage

- It is now recognized that a modified approach to active management of the third stage may be preferable with delayed cord clamping for between 1 and 3 minutes.
- This approach allows autotransfusion of placental blood to the neonate while maintaining the benefit of a reduced risk of PPH.
- It is of particular importance in preterm birth.

Prolonged Labor & Precipitous Labor

- It is difficult to define **prolonged labor**, but it would be reasonable to suggest that labor lasting longer than 12 hours in nulliparous women and 8 hours in multiparous women should be regarded as prolonged.
- **Precipitous labor** is defined as expulsion of the fetus within less than 3 hours of the onset of regular contractions.

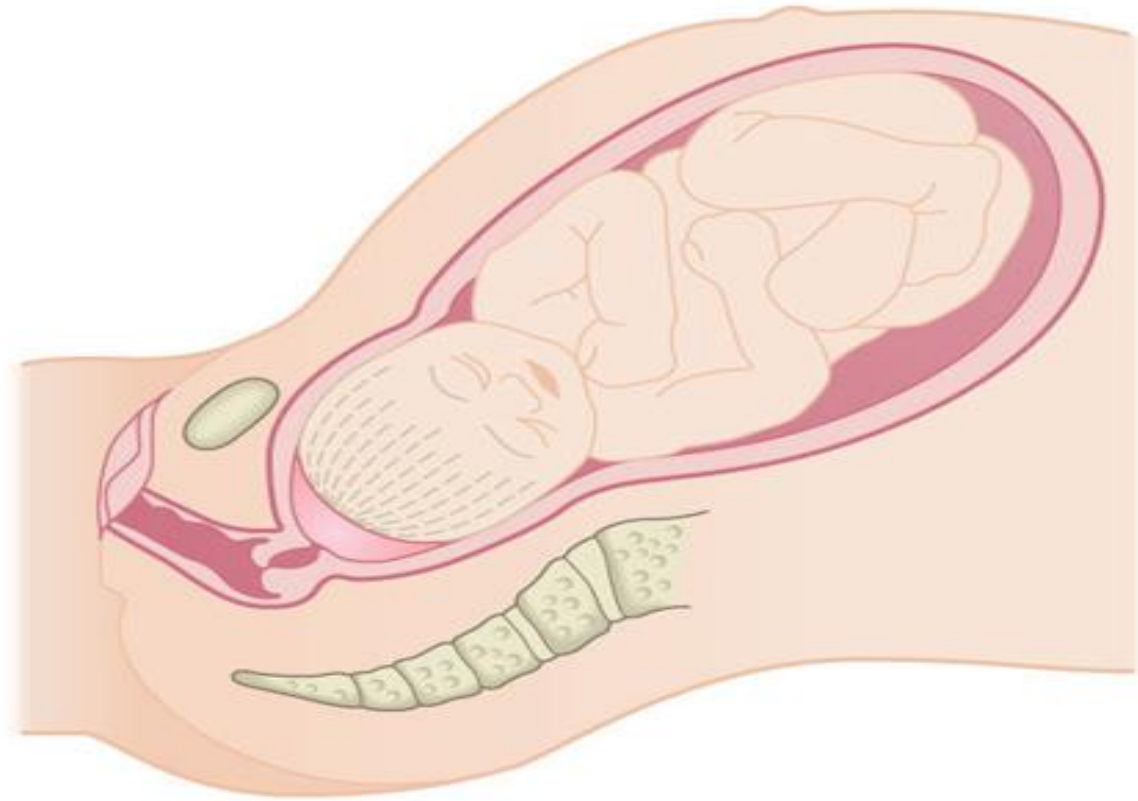
Normal labor

- To be completed successfully, the fetus has to pass through the maternal bony pelvis. The widest points of the fetus are the head (in the antero–posterior plane), and the shoulders (laterally across the shoulder tips).
- Normally, the head enters the pelvic brim in an occipito–lateral position (left or right). With **flexion** of the fetal neck, the presenting diameter is suboccipito–bregmatic (normally about 9.5 cm). With progressive uterine activity, the head **descends** and **engages** in the pelvis.
- Once it reaches the V-shaped pelvic floor, the fetal head **rotates 90°** to an occipito–anterior position. Less commonly, the head rotates to an occipito–posterior position, which may result in a prolonged or obstructed labour.
- The head then continues its descent beyond the ischial spines where it **extends**, distends the vulva and is delivered.

Normal labor

- During this process, the baby's shoulders are entering the pelvic inlet in a transverse position. When they reach the pelvic floor, they also **rotate** to an antero–posterior position. Since the head is by now completely delivered, it rotates back to the transverse position along with the shoulders, a process **called restitution**.
- The **shoulders are then delivered (expulsion)** by applying axial traction to the baby's head along the line of the baby's spine – difficulty delivering the shoulders is called shoulder dystocia and is an obstetric emergency.

Normal labor



Engagement

- The fetal head normally enters the pelvis in the transverse position or some minor variant of this, taking advantage of the widest pelvic diameter.
- **Engagement is said to have occurred when the widest part of the presenting part has passed successfully through the inlet.**
- Engagement has occurred in the vast majority of nulliparous women prior to labor, usually by 37 weeks' gestation, but not so for the majority of multiparous women.
- **The number of fifths of the fetal head palpable abdominally is used to describe whether engagement has taken place. If more than two-fifths of the fetal head is palpable abdominally, the head is not yet engaged.**
- **“0 Station” is an important landmark for engagement, when the presenting part is at the level of the ischial spine.**

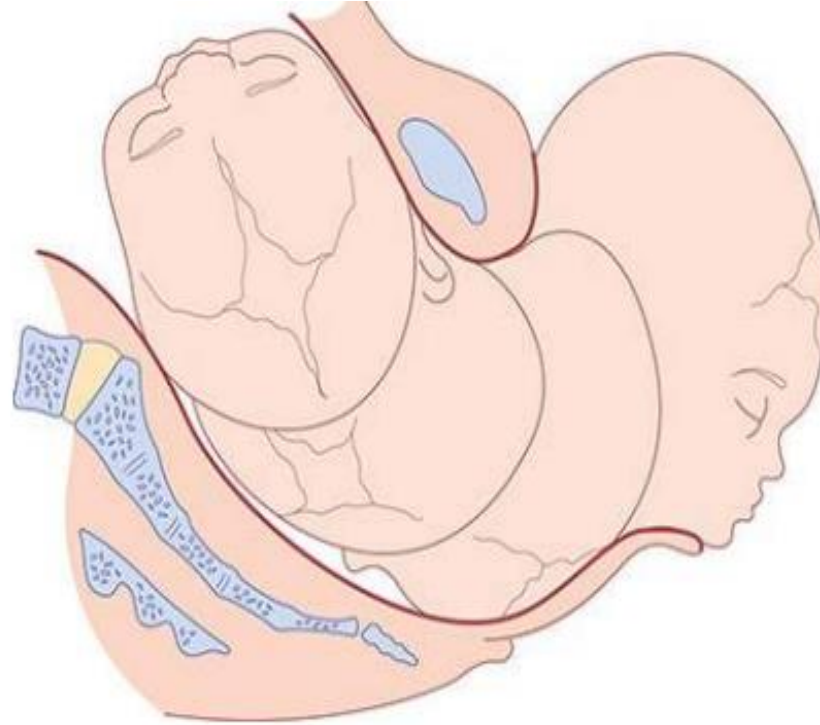
Internal Rotation

- Internal rotation If the head is well flexed, the occiput will be the leading point, and on reaching the sloping gutter of the levator ani muscles it will be encouraged to rotate anteriorly so that the sagittal suture now lies in the AP diameter of the pelvic outlet (i.e. the widest diameter).
- If the fetus has engaged in the OP position, internal rotation can occur from an OP position to an OA position. This long internal rotation may explain the increased duration of labor associated with OP position.
- Alternatively, an OP position may persist, resulting in a 'face to pubes' delivery. Furthermore, the persistent OP position may be associated with extension of the fetal head and a resulting increase in the diameter presented to the pelvic outlet. This may lead to obstructed labor and the need for instrumental delivery or even caesarean section

Extension

- Extension Following completion of internal rotation, the occiput is beneath the symphysis pubis and the bregma is near the lower border of the sacrum.
- The well-flexed head now extends and the occiput escapes from underneath the symphysis pubis and distends the vulva. This is known as 'crowning' of the head.
- The head extends further and the occiput underneath the symphysis pubis acts as a fulcrum point as the bregma, face and chin appear in succession over the posterior vaginal opening and perineal body. This extension process, if controlled, reduces the risk of perineal trauma.

Descent and flexion of the head followed by internal rotation and ending of the head by extension



Restitution

- When the head is delivering, the occiput is directly anterior. As soon as it crosses the perineum, the head aligns itself with the shoulders, which have entered the pelvis in the oblique position. This slight rotation of the occiput through one eighth of the circle is called “restitution”.

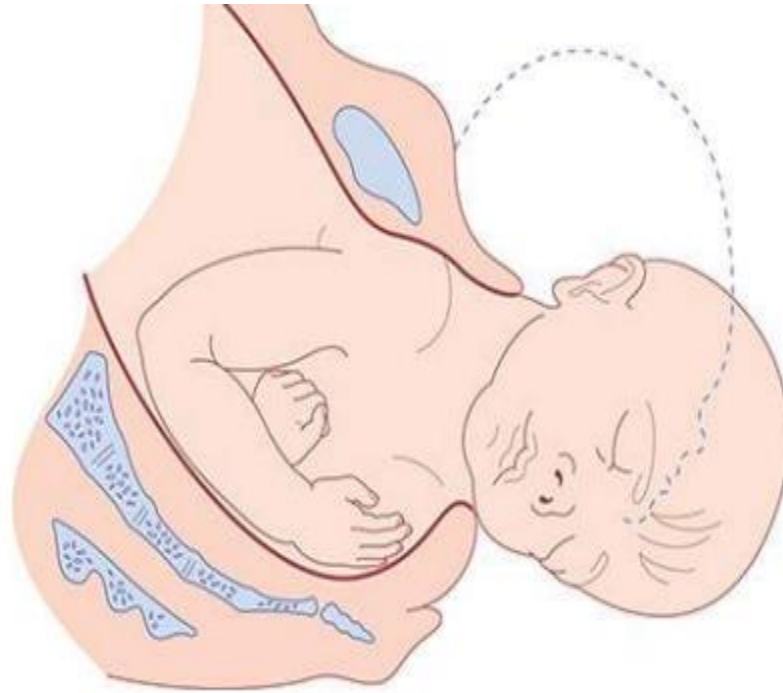
External rotation

- In order to be delivered, the shoulders have to rotate into the direct AP plane (remember, the widest diameter at the outlet).
- When this occurs, the occiput rotates through a further one-eighth of a circle to the transverse position.
- This is called external rotation

Delivery of the shoulders

- Delivery of the shoulders and fetal body When restitution and external rotation have occurred, the shoulders will be in the AP position.
- The anterior shoulder is under the symphysis pubis and delivers first, and the posterior shoulder delivers subsequently.
- Although this process may occur without assistance, traction is often exerted by gently pulling the fetal head in a downward direction along the axis of the pelvis to help release the anterior shoulder from beneath the pubic symphysis.

External rotation of the head after delivery as the anterior shoulder rotates forward to pass under the suprapubic arch



What are the 3 types of delivery?

- Vaginal delivery.
- Assisted vaginal delivery (Vacuum or Forceps).
- C-section (Cesarean birth)

Admission history

- Previous births and size of previous babies. Previous caesarean section.
- Onset, frequency, duration and perception of strength of the contractions.
- Whether membranes have ruptured and, if so, colour and amount of amniotic fluid lost.
- Presence of abnormal vaginal discharge or bleeding.
- Recent activity of the fetus (fetal movement).
- Medical or obstetric issues of note (e.g. diabetes, hypertension, fetal growth restriction [FGR]).
- Any special requirements (e.g. an interpreter or particular emotional/psychological needs).
- Maternal expectations of labor and delivery?

Fetal Assessment in Labor

- Inspection of amniotic fluid – fresh meconium staining, absence of fluid, and heavy blood-stained fluid or bleeding are markers of potential fetal compromise.
- Intermittent auscultation of the fetal heart using a Pinard stethoscope or a handheld Doppler ultrasound.
- Continuous external electronic fetal monitoring (EFM) using CTG.
- Continuous internal electronic fetal monitoring using a fetal scalp electrode (FSE) and CTG
- Fetal scalp blood sampling (FBS).

Management of ladies in their latent phase of the first stage of labor

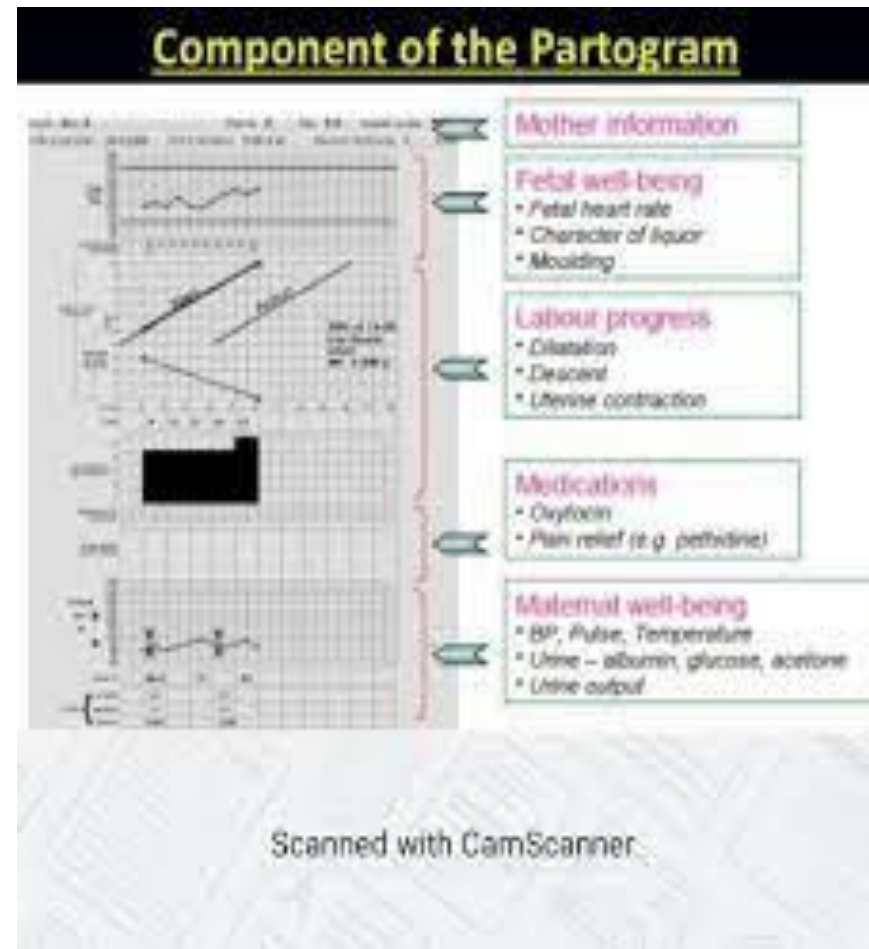
- Women who are in the latent phase of labor should be encouraged to mobilize and should be managed away from the labor suite where possible
- Intervention during this phase is best avoided unless there are identified risk factors
- Simple analgesics are preferred
- There is no reason to restrict eating and drinking, although lighter foods and clear fluids may be better tolerated
- Encouragement and reassurance are extremely important

Management of Ladies in their active phase of the first stage of labor

- First stage of labor is the interval from diagnosis of labor to full dilatation of the cervix.
- One-to-one midwifery care should be provided.
- Additional emotional support from a birth partner should be encouraged.
- Obstetric and anesthetic care should be available as required.
- Maternal and fetal wellbeing should be monitored.
- Vaginal examinations are performed 4 hourly or as clinically indicated. Progress of labor is monitored using a partogram with timely intervention if abnormal.
- Appropriate pain relief should be provided consistent with the woman's wishes.
- Ensure adequate hydration and light diet to prevent ketosis.

The partogram

- The introduction of a graphic record of labour in the form of a partogram has been an important development.



A normal cardiotocograph (CTG), showing a baseline fetal heart rate of approximately 120 bpm, frequent accelerations, baseline variability of 10–15 bpm and no decelerations. The uterus is contracting approximately once every 5 minutes

