

# Anatomy of the Female Pelvic Organs

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# Aims

- To fully understand the anatomy of the female pelvis in terms of bones and tissues, and fetal skull, this would help in explaining the mechanism of Labour
- To predict and thus prevent postpartum haemorrhage related to the placenta
- To understand the major events in fetal circulation; during pregnancy and after birth

# Objectives

- ❖ **Student at the end of session should be able to:**
  - Explain the relationship between pelvic organs
  - Comprehend the normal organs
  - Understand the relationship between the female pelvis (Bones & Soft Tissue) and fetal skull, in order to understand the mechanism of labour

# Objectives

## **Student at the end of session should be able to:**

- Understand the major variant in the fetal circulation than that of the adult
- Know the significance of ductus venosus ductus arteriosus and the first breath.
- Explain the changes that occur after birth.
- Familiarize yourself with the placental structure.
- Know the significance of placental and umbilical cord inspection after birth
- Differentiate between the different types of placental abnormalities and their significance

# The Vulva

## external organs of the female

***Include:*** -

- ✓ Mons veneris
- ✓ Labia majora
- ✓ Labia minora
- ✓ The clitoris
- ✓ The vestibule

***The vestibule has six openings:***

- Urethral meatus
- Two skene's ducts
- Vaginal orifice
- Two Bartholin ducts.

# The Vulva

- Bartholin glands*** - lies on each side of the vagina, in the posterior lower third 1/3 of the interiorus.
- Secrete mucus – alkaline
  - **Blood supply:** Pudendal artery from the femoral **aa**  
Venous drainage in the corresponding vein.
  - **Lymphytic**  
inguinal glands  
External iliac glands
  - **Nerves:** Branches of the pudendal nerve, perineal nerve (T<sub>12</sub> L<sub>1-2</sub>, S<sub>2-4</sub>)
  - **In labour:** Catheterization, Episiotomy, Anaesthetic infiltration

# The vagina

A Canal/tube extend from the vulva to the uterus

- Runs upwards and backwards
- Walls lie in close contact, easily separated.

## *Speculum examination*

- The posterior vaginal wall is longer than the anterior 11.5 cm (4.5 in) vs 7.5 cm
- Cervix enters the vagina at a right angle.
- Tornices = four

Anterior, posterior, lateral

# The Vagina

## Blood supply

- Vaginal aa, uterine aa, middle haemorrhoidal, inferior vesical, pudendal branch of the internal iliac aa.
- **Venous** drainage to corresponding veins.
- **Lymph:** inguinal, internal iliac, sacral glands
- **Nerves:** sympathetic and parasympathetic
- **Relations:**

*Anterior* : base of the bladder on upper  $\frac{1}{2}$  of vagina.

*Posterior:* Pouch of Douglas in the lower  $\frac{1}{2}$

Rectum centrally

Perineal body inferiorly

Laterally:



# The Cervix

Forms the lower 1/3 of the uterus

- Enter the vagina at a right angle
- Barrel shape
- 2.5 cm (1 in) long
- Two parts:
  - Supra vaginal
  - Intra vaginal
- **Cervical os**
  - Internal os
  - External os
- Cervical canal between the internal os and the external os
- Transformation zone; squamous-columnar junction.

**Blood supply:**

Uterine artery

**Lymphatic drainage**

Internal iliac, sacral

glands

# The Cervix

## Supports:

- Cardinal ligaments
- Pubocervical ligaments
- Utero sacral ligaments

## In pregnancy:

- Rich blood supply – bluish coloration
- Soft
- Cervical glands – mucus plug “operculum”

**Late in pregnancy** – softer and starts to dilate.

## In labor:

- The longitudinal fibres of the uterus contract and retract pulling upward thus reducing the length of the cervix.
- The cervix is made up of fibrous and elastic tissue
- *Full dilatation marks the end of the first stage of labour.*

# The Uterus

The uterus lies in the true pelvis.

Anteverted (A/V) and anteflexed (A/F) in position.

The body of the uterus lies above the bladder.

- **Size:** 7.5 cm length
- 5 cm wide
- 2.5 cm thick
- 50 -75 gm weight

## Gross structure:

- The cervix lower 1/3
- The isthmus
- The cavity
- The corpus
- The cornua.
- The fundus

## **Layers:**

Endometrium

Myometrium

Perimetrium - peritoneum

Adherent, where???

Loose,???

## **Blood supply:**

Arteries: fundus – ovarian artery (aa)

Body - uterine aa , directly from internal iliac

aa

## **The relationship between the ureter and uterine aa**

- ❖ Uterine artery runs behind the peritoneum, cross transeverse cervical ligament (Cardinal ligament) then it pass anterior to and above the uerter 1.5cm from lateral vaginal wall fornix

**Venous:** Right ovarian vein - inferior vena cava

Left ovarian vein – renal vein

**Lymph** internal and external iliac gland

inguinal /Sacral gland

# THE FALLOPIAN TUBES

- Extend from the cornua of the uterus, travels towards the sidewalls of the pelvis. Then turns downwards and backwards.
- The tube lies in the upper margin of the broad ligaments
- **Communicate**; superiorly with the uterine cavity, Inferiorly with the perineal cavity
- Length 10 cm (4cm) : 3 mm thick
- **4 PARTS**
  - ✓ Interstitial
  - ✓ Ampula
  - ✓ Infundebulum
  - ✓ Fimbrial
- **BLOOD SUPPLY**
  - ovarian artery
  - Uterine artery
  - Venous drainage by corresponding veins

# THE OVARIES

- Lie in the posterior wall of the broad ligament at the fibrial end of the fallopian tubes at the level of the pelvic brim.
- Size: almond like = 3 x 2 x 1 cm  
Dull white colour, Corrugated surface
- Structure varies with woman's age.



# The Ovaries

- **Blood supply** – ovarian artery
- Ovarian vein
- **Lymphatic**                      lumbar glands
- **Nerves**                              ovarian plexus
- **SUPPORTS**

They lie in a fossa

- Attached to broad ligament – meso ovarian
- The meso salpinx is the broad ligament that extend between the fallopian tube and the ovary.

□ *The Fallopion tubes, ovaries and broad ligments are called Adenxa*

# Ligaments:

- **Round ligaments**

Maintains uterus in A/V + A/F

From the cornua of the uterus – pass downwards and insert in the tissue of the labia majora.

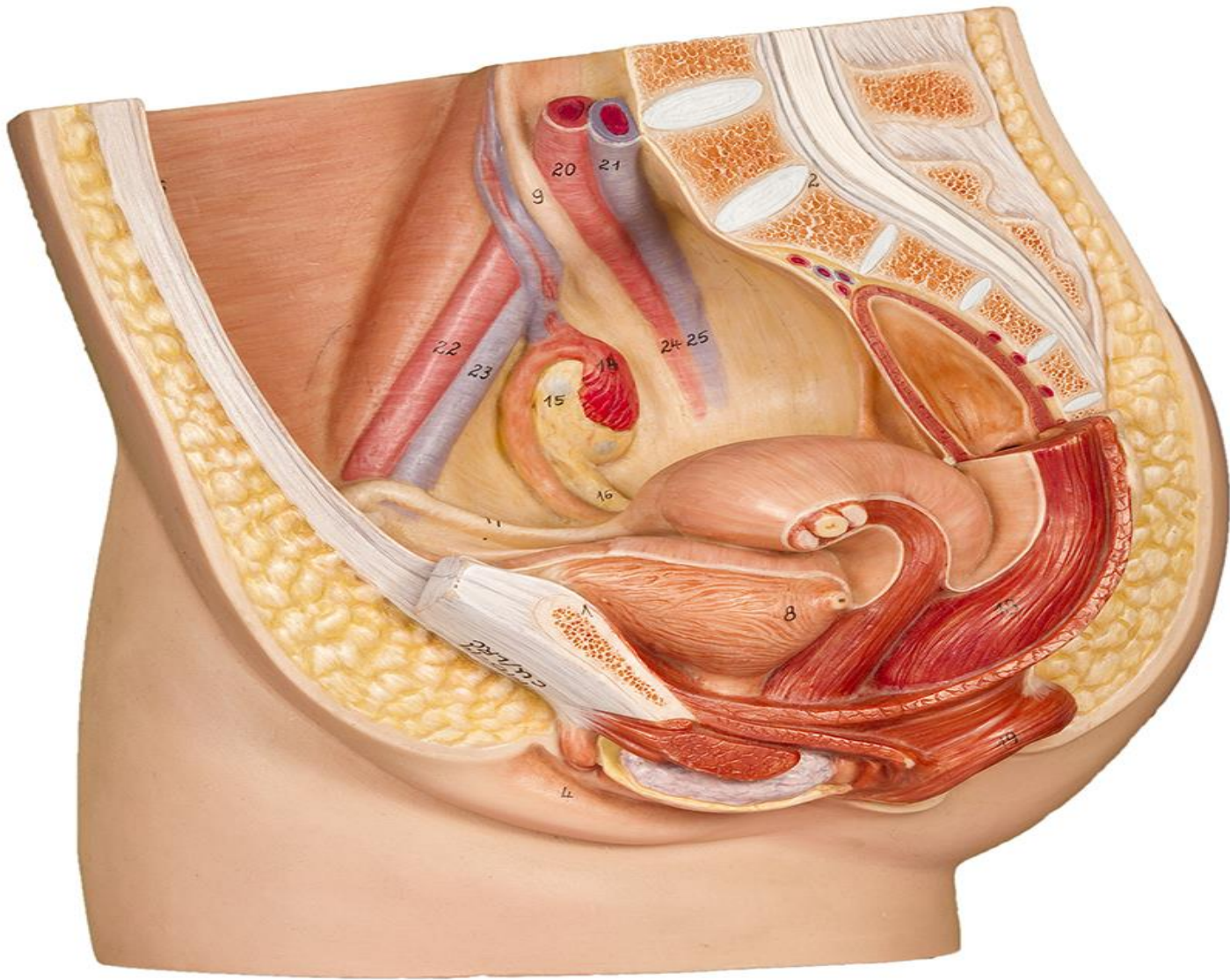
- **Broad ligaments**

Not true ligament

Folds of peritoneum extend laterally from the uterus to the pelvic side walls.

- **Cardinal ligaments (transverse cervical ligament)**

- Pubocervical
- Uterosacral



# THE NORMAL FEMALE PELVIS

The pelvis articulate with the fifth lumbar vertebra above and with the head of each femur in the right and left acetabulum.

- The weight of the trunk is transmitted through the pelvis into the legs.
- Gives protection to the pelvic organs
- The pelvis is the largest bone in the body.

**Gross structure: Consists of:**

- 5 fused sacral vertebrae and coccyx
- left & right innominate bones
- 4 pairs of holes (nerves, blood vessels/lymph)



# The Sacrum

A triangular shape;

The hollow of the sacrum – smooth and concave

The alae of the sacrum - give the appearance of wings

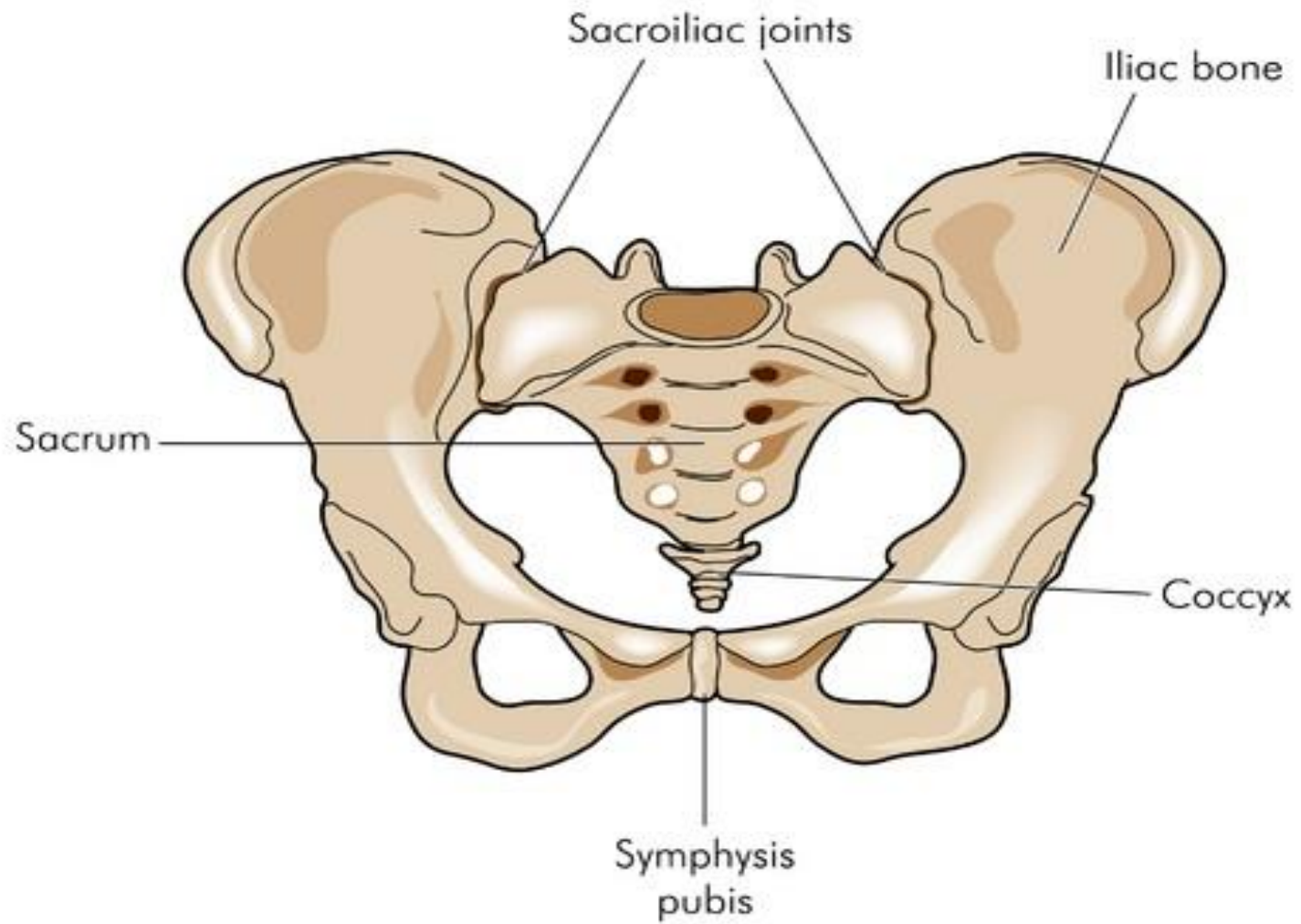
- **The sacral promontory**

is the centre point of the upper border of the first sacral vertebrae.

- The sacral canal opens at the level of 5<sup>th</sup> sacral vertebra, a passage for spinal cord.
- At the level of the 2<sup>nd</sup> and 3<sup>rd</sup> sacral vertebrae, the nerves spread out to form the **cauda equina**.
- **Anaesthesia in labour**

# THE COCCYX

- 4 Fused coccygeal vertebrae
- Triangular shape
- Articulate with the sacrum
- Muscles are attached to its tip.





# Right & Left In-nominate Bones

## ❑ Each made of 3 separate parts meet in the acetabulum.

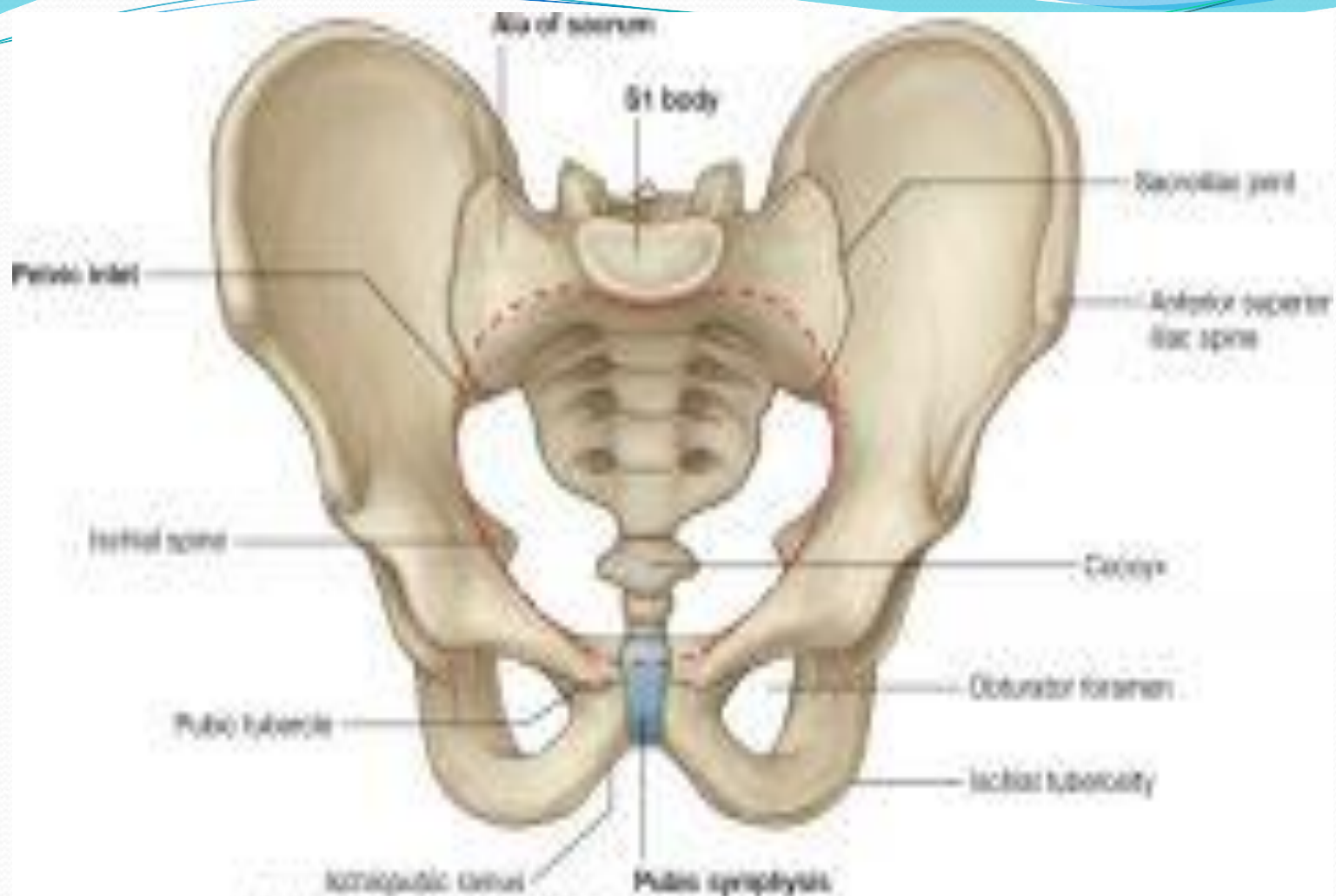
- **Ilium** upper part is iliac crest (anterior and posterior, superior iliac crest)
- **Ischium** ischial tuberosity , 2 cm above is the ischial spines.
- **Pubis** both meet the pubic body fused by cartilage “symphysis pubis”

## ❑ PELVIC JOINTS

- The two sacroiliac joints
- The symphysis pubis
- The sacrococcygeal joints

## ❑ THE PELVIC LIGAMENTS

- Sacroiliac ligament = strongest in the body
- Sacro tuberos
- Sacro spinous
- Inguinal ligament



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# DIVISIONS OF THE PELVIS

*The brim divides the pelvis into the parts:*

- ❖ **The false:** lies above the pelvic brim not important in obstetrics
- ❖ **The true:** what lies below the pelvic brim.

*It has a : cavity, outlet and a brim*

- Forms the curved canal through which the fetus pass during labour.

# The brim or inlet

Round in shape

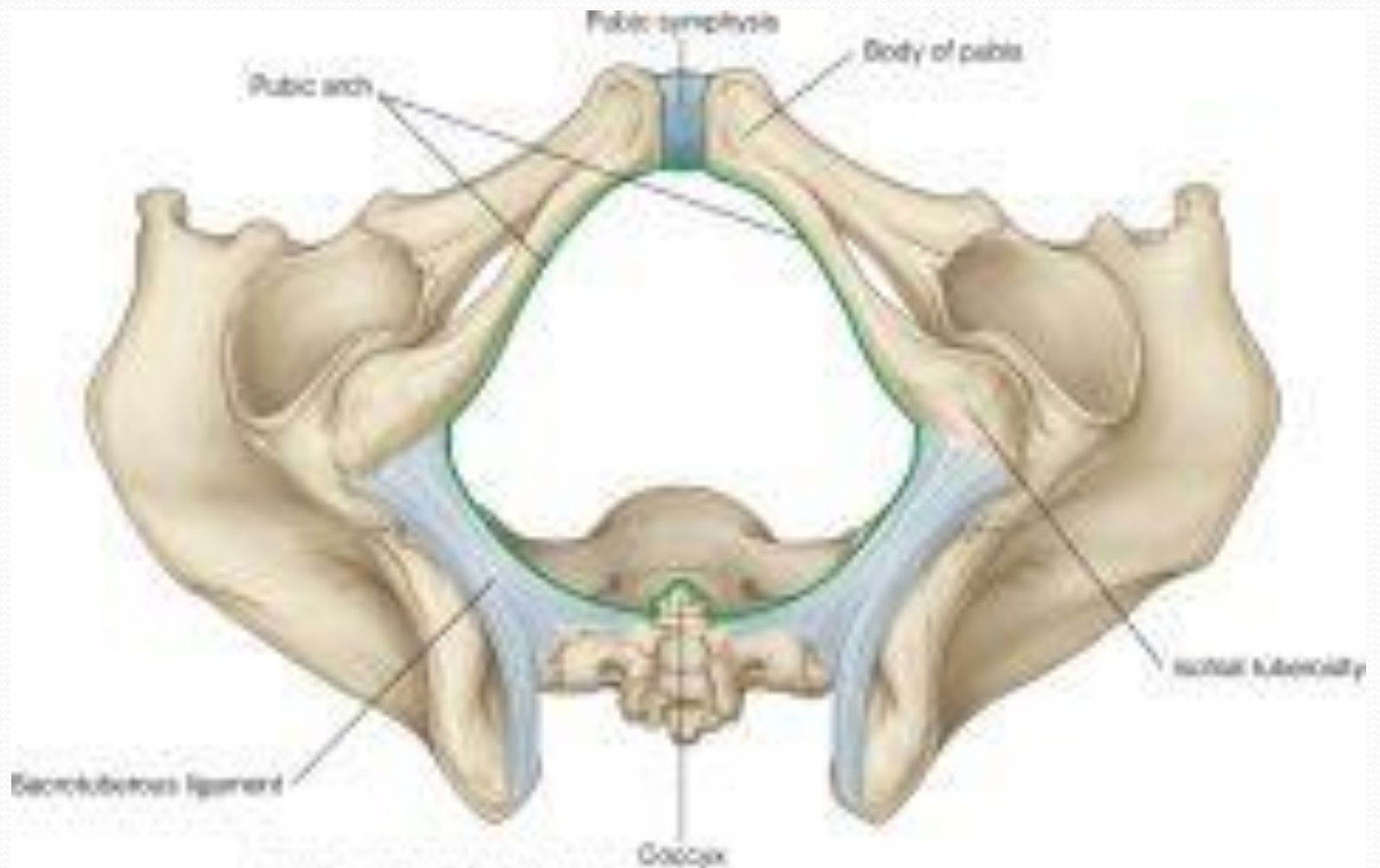
- Has eight points as demonstrated
- Bounded anteriorly by the pubis
- Laterally by iliopectineal lines
- Posteriorly by ale and sacral promontary
- Widest diameter is, Transverse
- **True Conjugate** ( Anteroposterior diameter) from sacral promontary to upper inner border of Symphysis pubis
- **Diagonal Conjugate**

# The Pelvic cavity

- Extend from the brim above to the pelvic outlet below
- The posterior wall 11 cm formed by hollow of the sacrum
- The anterior wall is formed by the symphysis pubis and obturator foramen 3.8 cm
- The lateral walls sacrosciatic ligament and ischial spines
- Interspines Diameter

# The pelvic outlet

- *Anatomical outlet*
- *Obstetrical outlet*
- **The anatomical outlet** is formed by fixed points useful landmarks for taking pelvic measurement.
- Bounded anteriorly by pubic Arch
- Laterally by sacrosciatic lig&Ischial Tuberosity
- Posteriorly by tip of Coccyx
- **The obstetrical outlet**  
The landmarks are:
  - The lower border of the symphysis pubis
  - The ischial spines
  - The sacro-spinous ligament
  - The lower border of the sacrum.



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# Average measurements of pelvis

- ***Brim***

Antero-posterior = 11.5 cm

Transverse = 13.0 cm

- ***Cavity***

Antero-posterior = 12.0 cm

Transverse (I/S) = 10.5 cm

## ***Outlet***

Antero-posterior = 12.5 cm

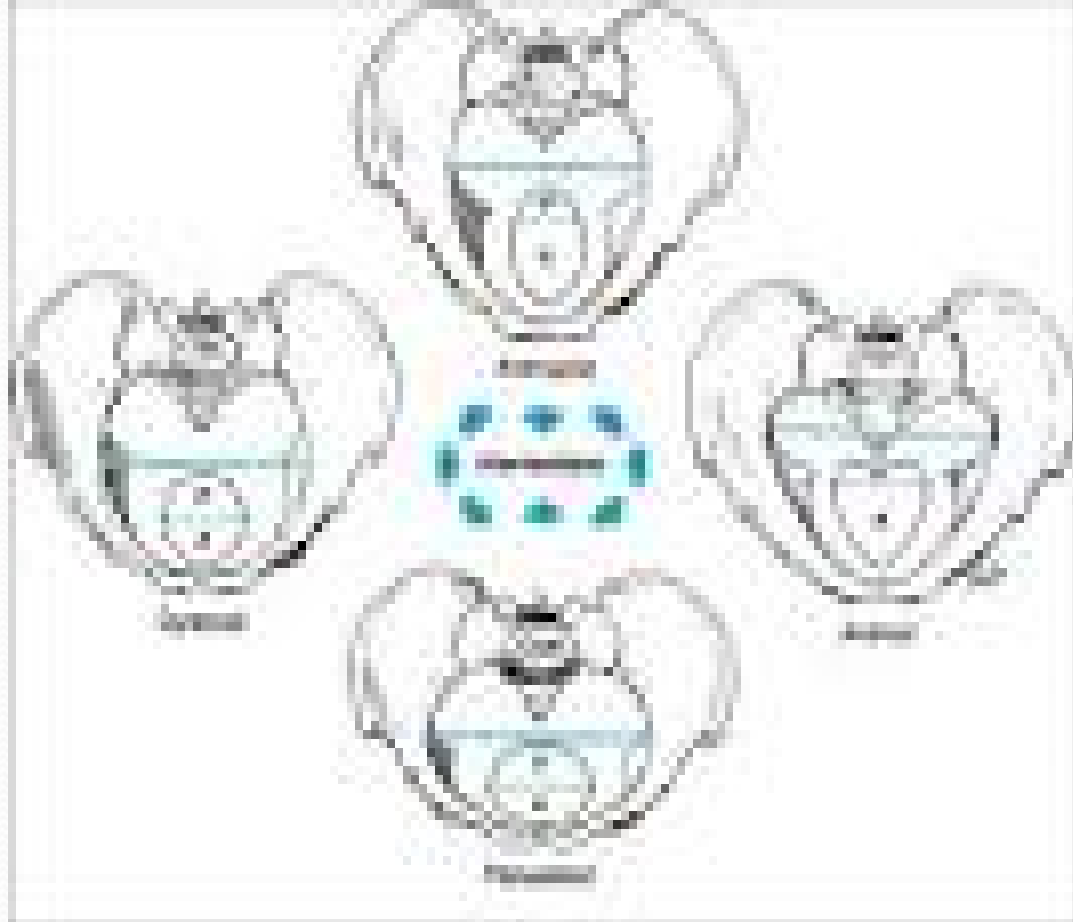
Transverse = 11.0 cm

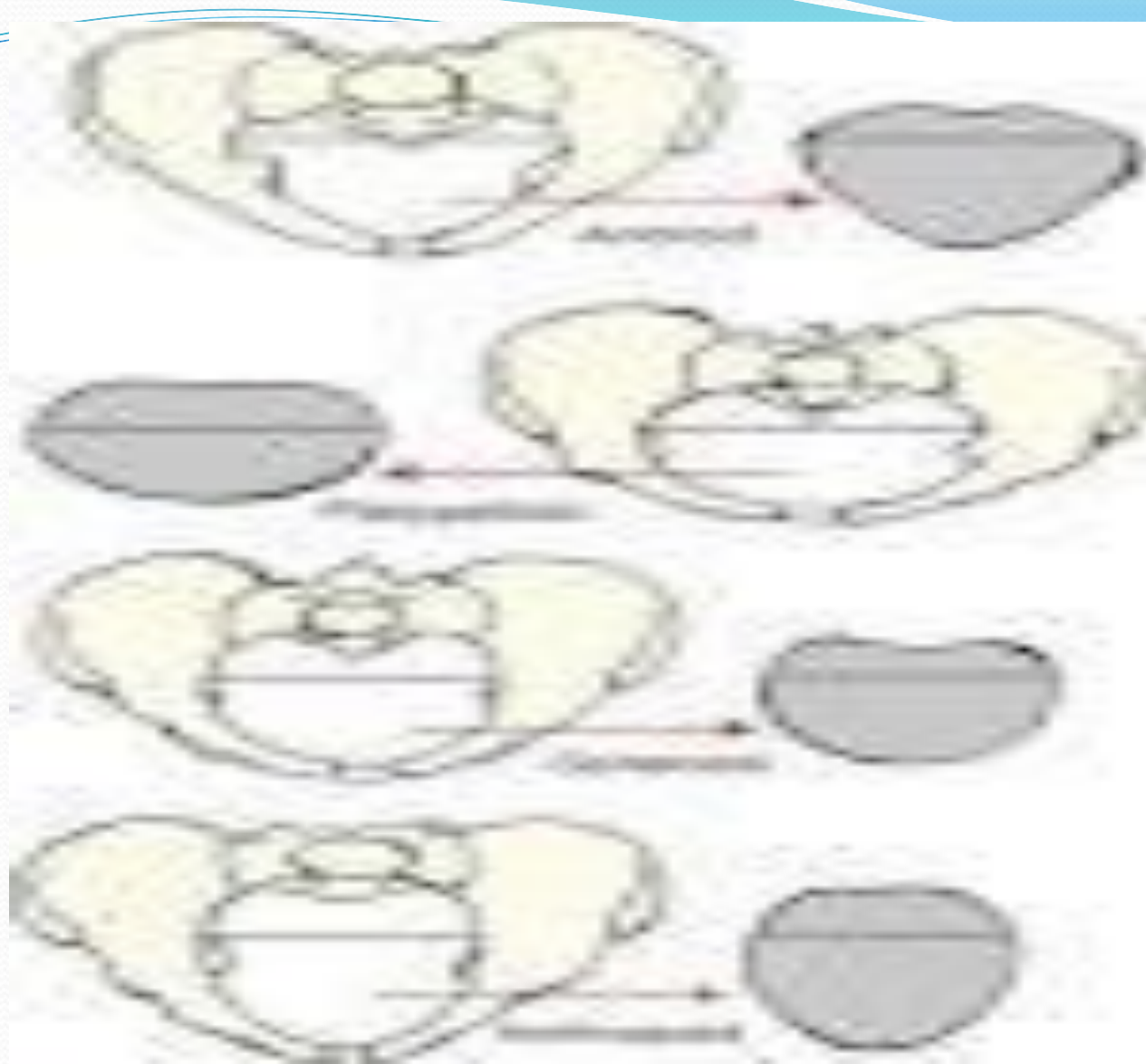


# Abnormal Pelvis

## Four Types

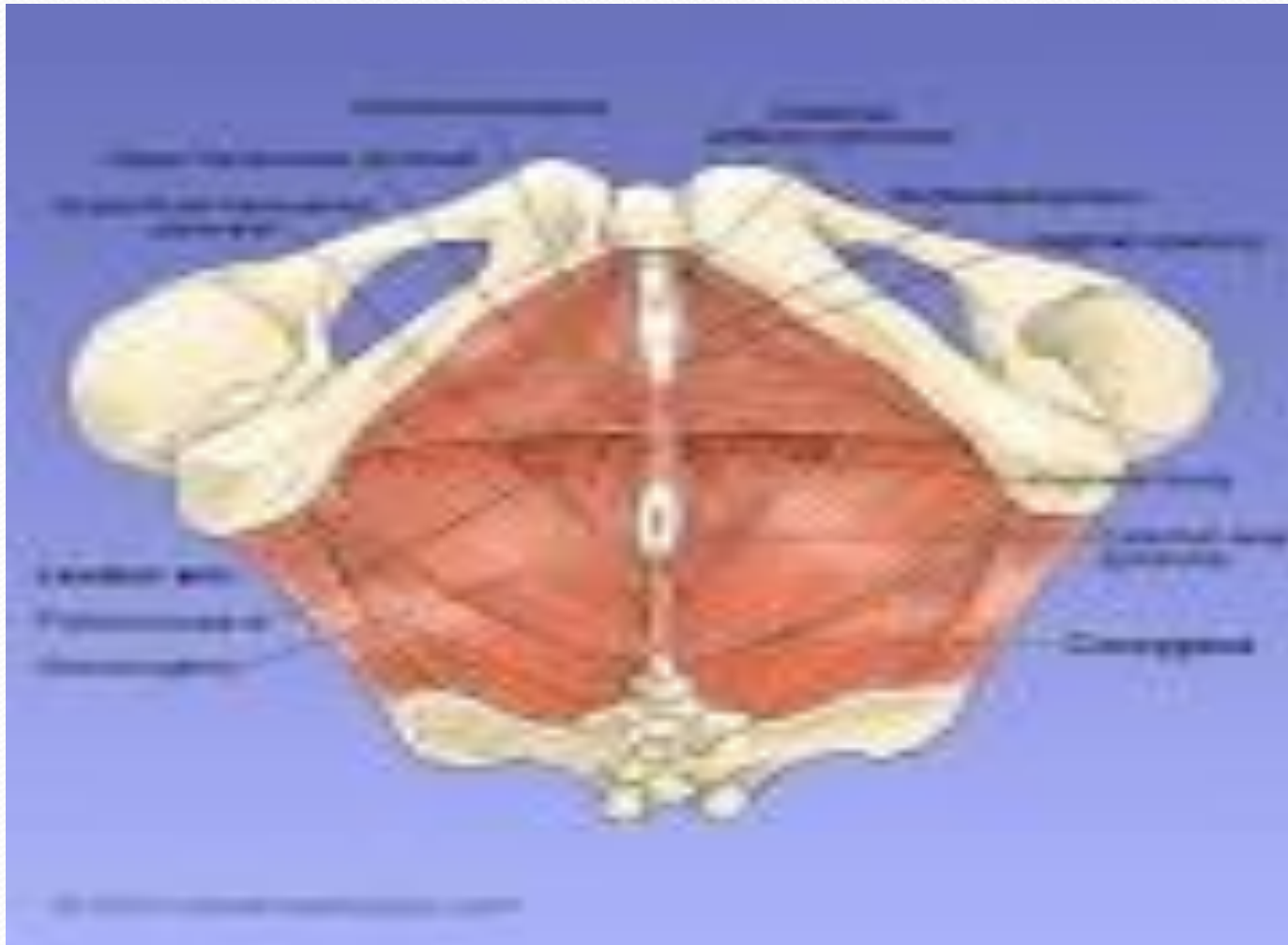
1. Gynecoid Pelvis 50%
2. Anthropoid 25%
3. Android Pelvis 20%
4. Platypelloid (flat) 5%





# THE PELVIC FLOOR

- The outlet of the pelvis is filled with a soft tissue that supports the pelvic and abdominal organs.
- It forms as a gutter-shaped structure highest anteriorly than posteriorly.
- Three canals with external orifices run through the tissue
  1. The urethra
  2. The vagina
  3. The rectum



# Pelvic Floor

- **There are six layers of tissue.**
  1. An outer covering of skin
  2. Subcutaneous fat
  3. Superficial muscles enclosed in fascia
  4. Deep muscles enclosed in fascia
  5. Pelvic fascia, thickened to form pelvic ligaments
  6. Peritoneum

# Pelvic Floor

- **Superficial muscles:**

- 1) Transverse perinei
- 2) Bulbo-cavernosus
- 3) Ischio-cavernosus

- **Deep muscles**

*Three pairs of muscles all have their insertion around the coccyx*

Their anatomical name is levator ani muscles, 5 mm thick

1. Ilio coccygeus
2. ischio coccygeus
3. pubo- coccygeus

# perineal body

- Lies between the vaginal and rectal canals
  - Is triangular, the base is the skin and the apex pointing upward each side is 3.8 cm in length
  - **Three layers of tissue**
    1. outer covering of skin
    2. superficial pelvic floor
      - bulbo-cavernosus
      - transverse perinei
    3. deep pelvic floor muscle.
- Episiotomy, types, indications,**

# FETAL SKULL

- Vault of fetal skull – formed from membrane and not cartilage
- There are 5 points – ossification centres
- Calcification begins as early as 5 weeks after conception
- Premature baby is born, intracranial damage!!!!
- Skull is divided into **regions**
  - ❖ The vault.
  - ❖ The face.
  - ❖ The base
- **Bones:**
  - Two frontal bones
  - Two parietal bones
  - One occipital bone

*Bones are separated by??*



Suture, an area of membrane which has not ossified

- Lambdoidal suture
- Sagittal suture
- Coronal suture
- Frontal suture
- **Fontanelles very important landmarks**

Areas where two or more sutures meet.

- **Anterior fontanelle**, diamond in shape where sagittal and frontal sutures meet
- **Posterior fontanelle**, where lambdoidal and sagittal sutures meet.

# AREAS OF THE SKULL

1. Glabella: the bridge of the nose
2. Sinciput : the forehead
3. Bregma: the anterior fontanelle
4. **Vertex**
5. Lambda: the posterior fontenlle
6. Occiput
7. Suboccipital area
8. Mentum: the chin

*Malposition*

*Malpresentation*

# CIRCUMFERENCES OF THE FETAL SKULL

- The engaging Diameter in a well flexed head:  
***suboccipito-bregmatic+ Biparietal***  
***In Vertex presentation***
- The engaging Diameter in a Deflexed head (partly extended)

***OccipitoFrontal+Biparietal***  
***In Occipito posterior Position***

# DIAMETERS OF FETAL SKULL

- Bipareital
- Suboccipital-bregmatic
- Occipito frontal
- Mentovertical
- Submento-bregmatic

# Effect of Labour and delivery

- Moulding
- Caput succedaneum
- Cephalhaematoma, Effect of ???????

# The placenta

- *Structure of the mature placenta*
- **Maternal surface** lies next to the uterus on inspection, chorionic villi are arranged in lobes/cotyledons – 20 in number – 200 lobules.
- The groove separating the lobes are sulci
- dark – red color, rough surface
- **Fetal surface**, faces the baby. Bluish gray colour, smooth, shiny surface.
- **Umbilical cord** inserted in the fetal surface usually in the centre
- Blood vessels seen radiating from the cord
- The amniotic membranes covers the fetal surface.



# *Structure of the mature placenta*

- Flat, Roughly circular
- 22 cm in Diameter
- 2cm thick in the centre
- Weight:  $\frac{1}{6}$  of the baby's weight



# Abnormalities of placental development.

- Placenta succenturiata
- Placenta bipartita
- Placenta circumvallata
- Placenta velamentosa



- Placenta succenturiata/ Placenta velamentosa  
*and Vasa previa*

# Umbilical cord:

- At full term: 40-50 cm long  
1.5 cm in diameter
  - Twisted in appearance
  - Two umbilical arteries
  - One umbilical vein
  - Wharton jelly
- 
- Abnormal insertion of the cord
    - Battledore insertion
    - Velamentous insertion

# Fetal circulation

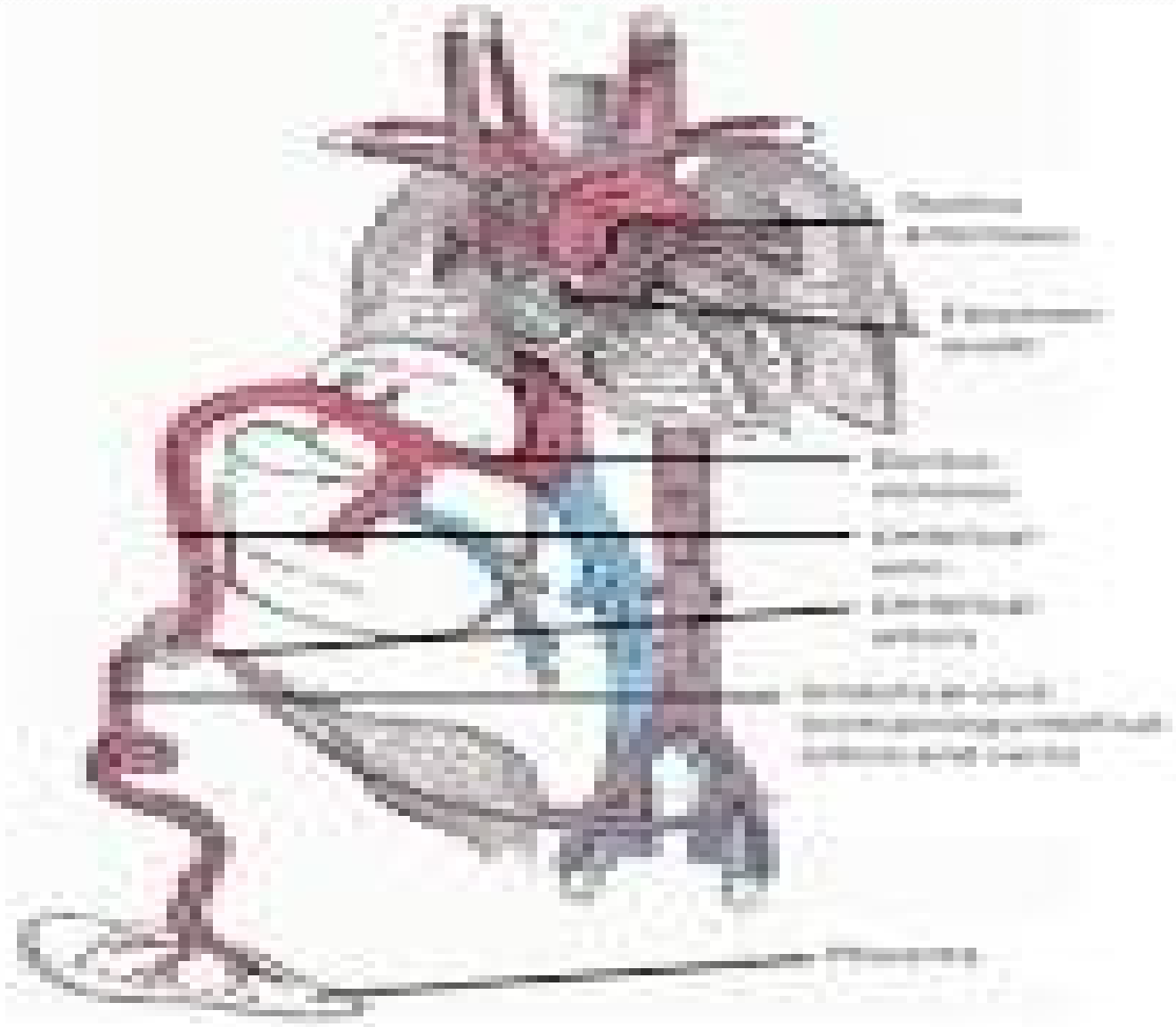
- How does the fetal circulatory system works?
- Two Major Events???????

# Fetal circulation

## Cardiovascular system

*Major variant are explained by:*

- ❑ the presence of umbilical-placental circulation
- and*
- ❑ absence of significant pulmonary circulation.



# Fetal circulation

- The fetal circulatory system uses three shunts???
- Purpose of these shunts???

# Continue

- The respiratory function of the placenta requires that oxygenated blood be returned via the umbilical vein and into the fetal circulation.
- High venous return from the placenta (oxygenated blood O<sub>2</sub> saturation 70-80%) through the umbilical vein.
- This maintains the right-left shunt through the foramen ovale
- Delivers most oxygenated blood to fetal heart and brain.

# Continue

- Placenta -umbilical vein- ductus venosus,
- Most of the blood into the inferior vena cava (IVC), this mixes with returning non oxygenated blood from the lower limbs and kidney, liver. However, only partial mixing of the two streams.
- Most of the oxygenated blood is directed to the crista dividens at the upper end of the inferior vena cava into the right atrium through the foramen ovale

*and* thus into the left atrium and hence to the left ventricles and ascending aorta to be directed to the brain, heart and upper extremities.



- The remainder of the blood from the superior vena cava mixes with that of IVC and passes directly to the right ventricle.
- 10% of it goes through the pulmonary artery to the lung.
- Most of this enters the systemic circulation via the ductus arteriosus and into the descending aorta beyond the vessels supplying the head,
- It supplies the viscera and lower limbs
- It then passes into the umbilical arteries (branches of left and right internal iliac arteries)
- High pulmonary vascular resistance maintains the right-left shunt through the ductus arteriosus.

# At birth

- Blood circulation after birth,  
The closure of the shunts;
  - Ductus arteriosus
  - Foramen ovale
- Completes the transition of fetal circulation to newborn circulation

## ❑ Umbilical vessels contract

- Cessation of umbilical blood flow causes a fall in pressure in the right atrium. The foramen ovale is a valvular opening, the valve functioning from the right to left.
- The left atrial pressure rises and thus closure of the foramen ovula.

## ❑ Breathing

- Ventilation of the lung helps to create a negative thoracic pressure, this opens the pulmonary circulation and thus diverts blood from ductus arteriosus which then gradually closes.

## ❑ What maintains patency of ductus arteriosus in utero?