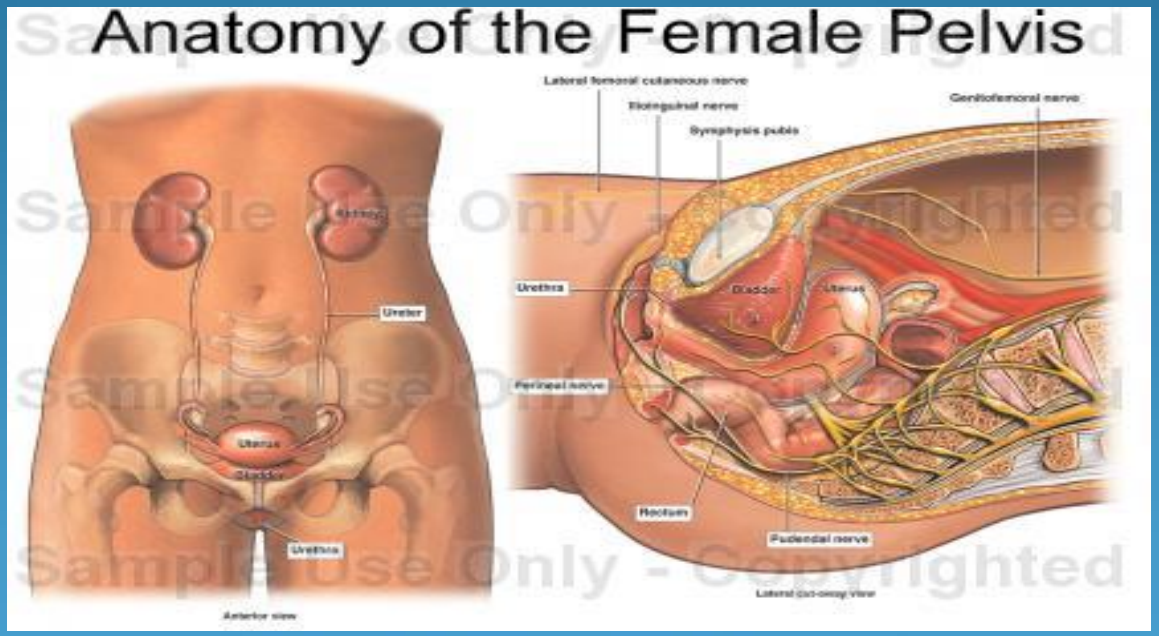
King Saud University Medical City

Department of Obstetrics & Gynecology

Course 482

Anatomy of the Female Pelvic Organs



Adapted from:
http://www.doereport.com/generateexhibit.php?ID=4935&ExhibitKeywordsRaw=&TL=&A=

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 & Delivery.

Objectives

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

- Describe anatomy of female bonny pelvis&Diameters.
- Discuss the important landmarks in the female pelvis.
- To know the types of pelvis.
- Comprehend the normal organs with their blood, venous, lymphatic drainage and innervation.
- Explain the relationship between pelvic organs.
- Understand the relationship between the female pelvis (Bones& Soft Tissue) and fetal skull, in order to understand the mechanism of labour

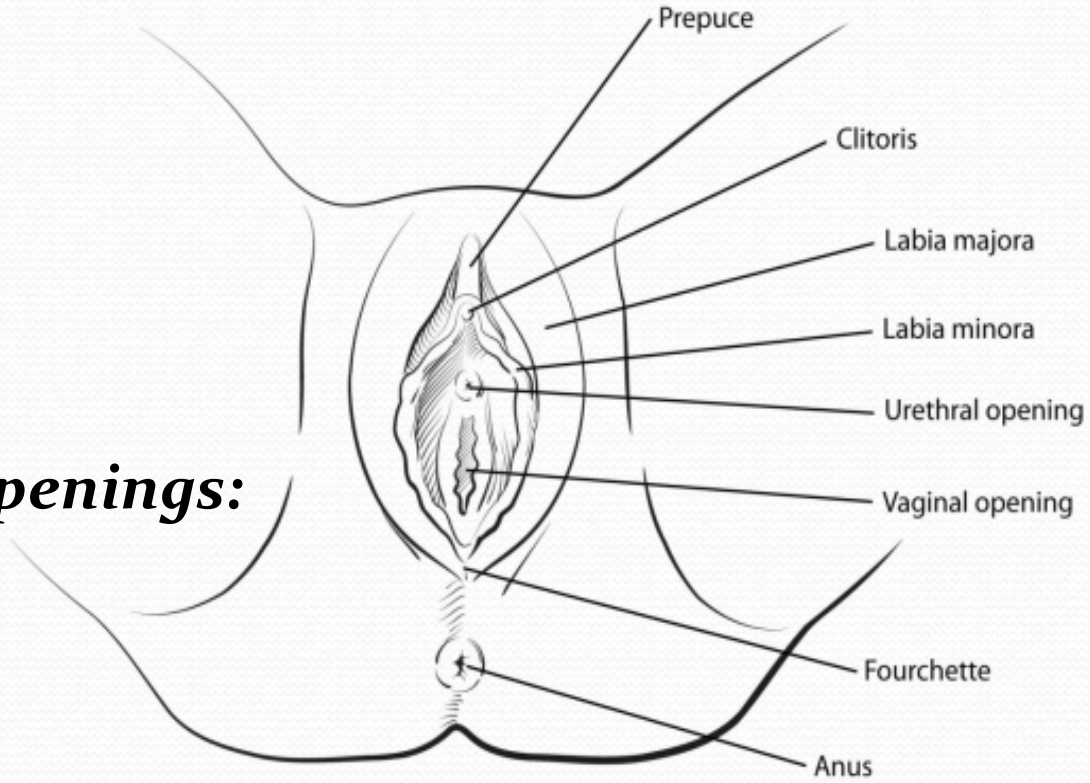
The Vulva
external organs of the female

Include: -

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

The intriotus has six openings:

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



Adapted from:
https://www.cancer.org/cancer/vulvar-cancer/about/what-is-vulvar-cancer.html

The Vulva

Bartholin glands - lies on each side of the vagina, in the posterior lower third 1/3 of the interiotus.

- 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 (T12 L1-2, S2-4)

- **In labour:** Catheterization, Episiotomy, Anaesthetic infiltration

The vagina

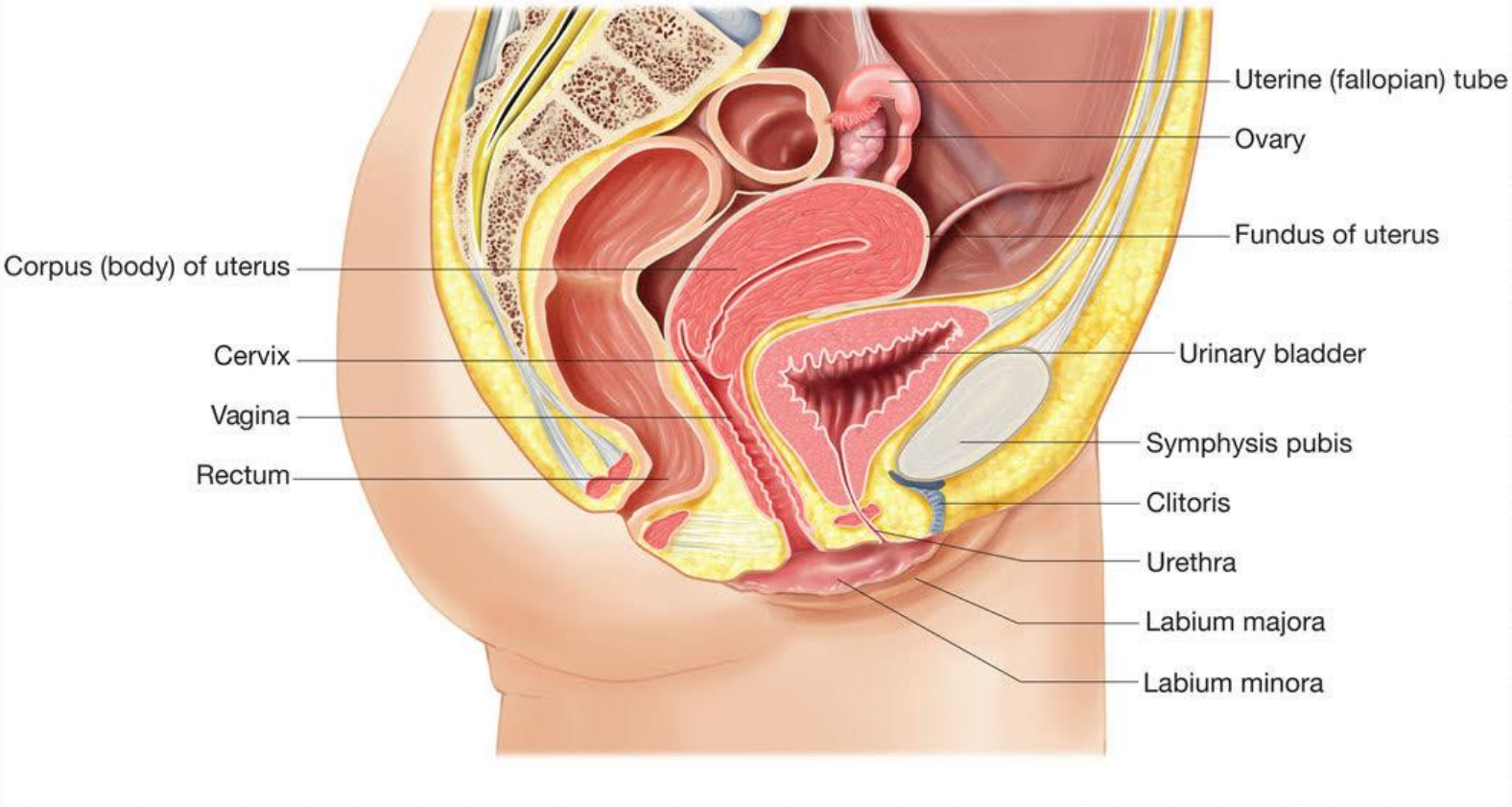
A Canal/tube extend from the vulva to the uterus

- 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.
- Fornices = four

  Anterior, posterior and Two laterals



Adapted from:
https://www.anatomynote.com/human-anatomy/reproductive-system-anatomy/female-reproductive-system-and-urinary-system-lateral-sectional-view/

The Vagina

Blood supply

- Vaginal aa, uterine aa, middle haemorridal, inferior vesical, pudendal branches of the internal iliac aa.
- **Venous** drainage to corresponding veins.
- **Lymph:** inguinal, internal iliac, sacral glands
- **Nerves**: symphatetic and parasymphatetic
- **Relations:**

Anterior : base of the bladder on upper ½ of vagina.
cystocele

Posterior: upper ½ ???*Pouch of Douglas* in the lower ½
Rectocele

Rectum centrally

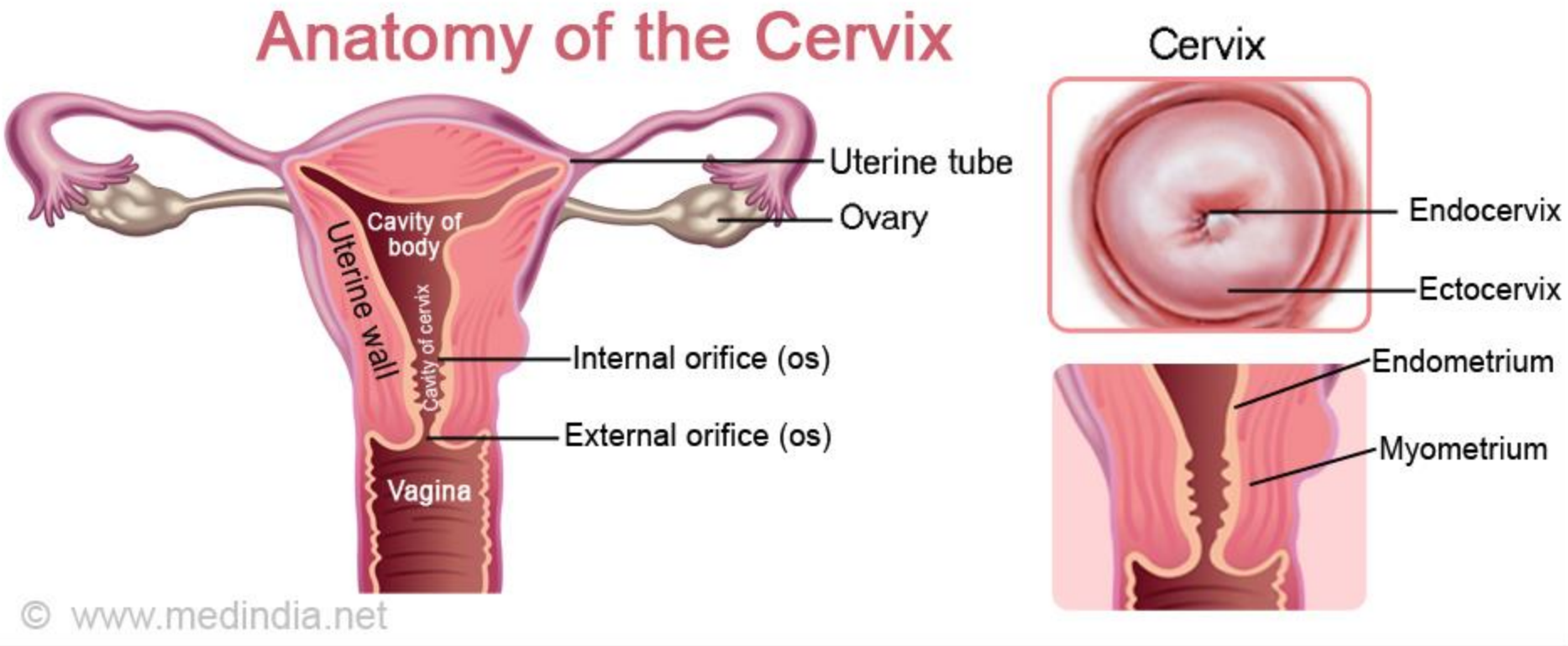
Perineal body inferiorly

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:
  - Supr avaginal
  - Intra vaginal
- **Cervical os**
  - Internal os
  - *External os*; shape differ in nulliparous and multiparous
- Cervical canal between the internal os and the external os
- Cervical canal is covered by columnar epithelium
- ***Transformation zone; squamous-columnar junction***.
- Cervical **Ectropion**



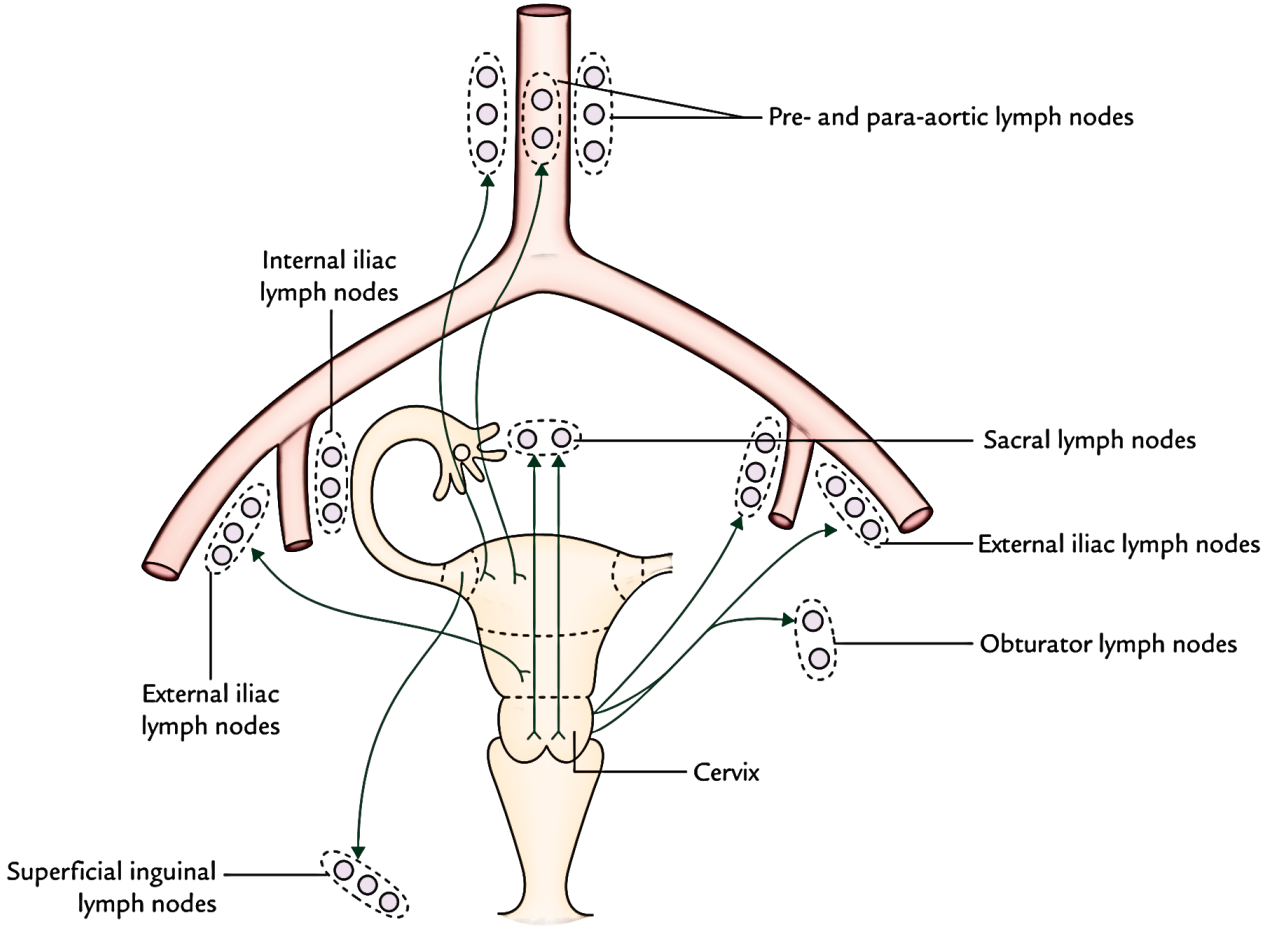
Adapted from:
http://www.medindia.net/images/common/patientinfo/950_400/anatomy-of-the-cervix.jpg

Blood supply

Uterine aa

Lymphatic drainage

Internal iliac, sacral glands



Adapted from :
https://www.earthslab.com/anatomy/uterus/

The Cervix

Supports:

- Cardinal ligaments/Transverse Cervical
- Pubocervical ligaments
- Uterosacral ligaments

All 3 ligaments insert into supra-vaginal cervix &upper vagina

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 *smooth muscle* fibres of the uterus contract and retract pulling upward thus reducing the length of the cervix. Cervical Bishop Score
- 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.

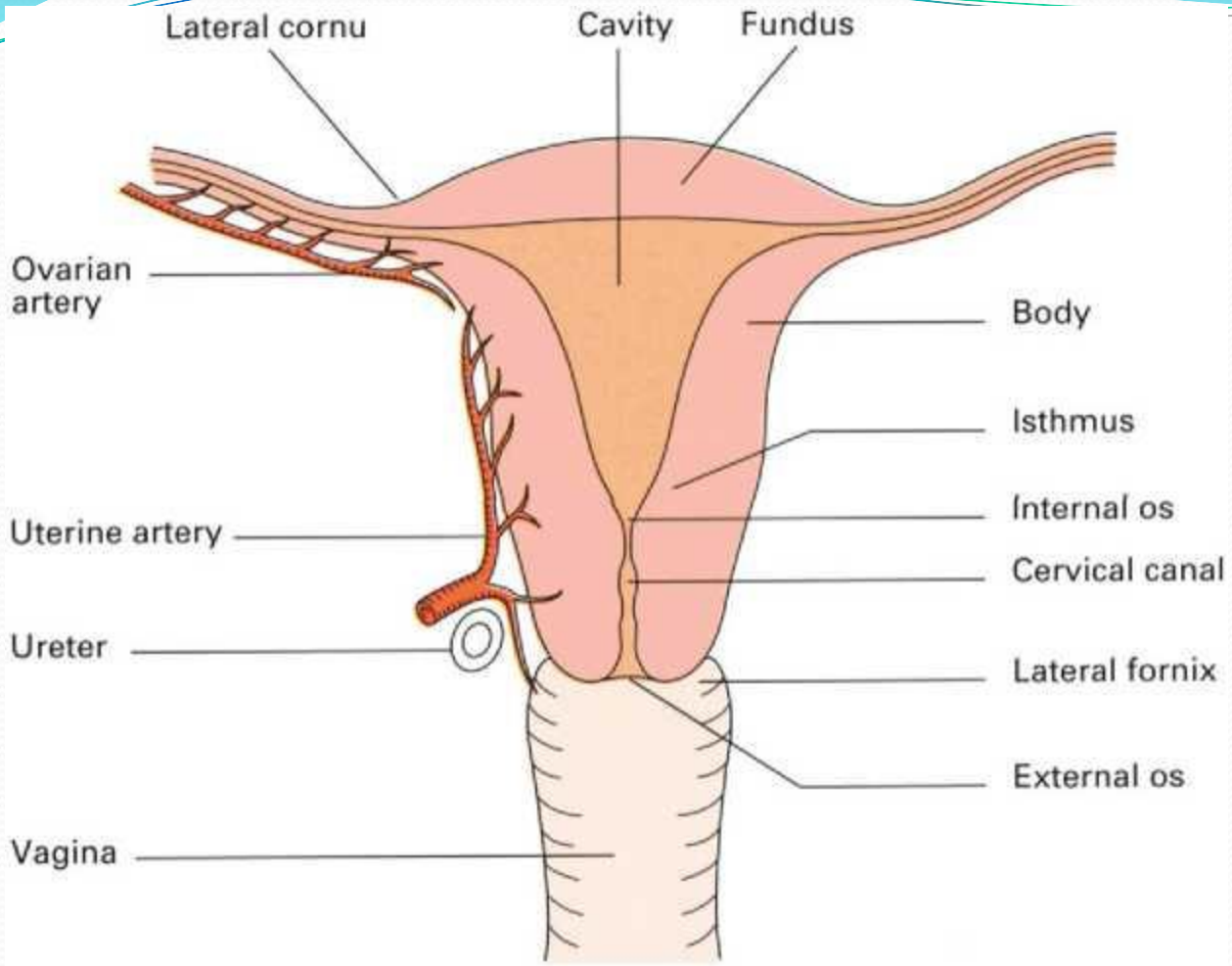
Anteverted (A/V)and anteflexed (A/F)in position.

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, in pregnancy **1** Kg ????
- Position/site:

Gross structure:

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



Adapted from: http://aibolita.com/uploads/posts/2015-03/44qv-132.jpg

Layers: Endometrium

Myometrium

Perimetrium - peritoneum

Adherent, where???

Loose,???

Blood supply:

Arteries: fundus – ovarian artery (aa)

Body-uterine aa , directly from internal iliac aa

Venous: Rt Ovarian???? Left Ovarian???

The relationship between the ureter and uterine aa

- Uterine aa runs behind the peritonieum, cross transeverse cervical ligament (Cardinal ligament) then the aa passes anterior to and above the Ureter 1.5cm from lateral vaginal wall fornix. *Water under the bridge, Important landmark*

Venous: Right ovarian vein - inferior vena cava

Left ovarian vein – renal vein

Lymph Internal and external iliac glands

Inguinal /Sacral glands

Nerves: Sympathatic and Parasympathetic

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. *Tubal patency checked by different means*
- Length **10** cm : **3** mm thick
- **4 PARTS**

✓ Interstitial
✓ Ampula
✓ Infundebulum
✓ Fimbrial

- **BLOOD SUPPLY** - ovarian aa
  Uterine aa
  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 1.5 cm

  Dull white colour, Corrugated surface

- Structure varies with woman's age.

The Ovaries

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

They lie in a fossa, posterior leafof broad ligament

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

❑ ***The Fallopian tubes, ovaries and broad ligaments are called Adenxa*** **Bimanual examination**

Adapted from:
https://download.e-bookshelf.de/download/0000/5952/91/L-X-0000595291-0001346903.XHTML/images/c01f004.jpg

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 a true ligament

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

- **Cardinal ligaments**
  - Pubocervical
  - Uterosacral

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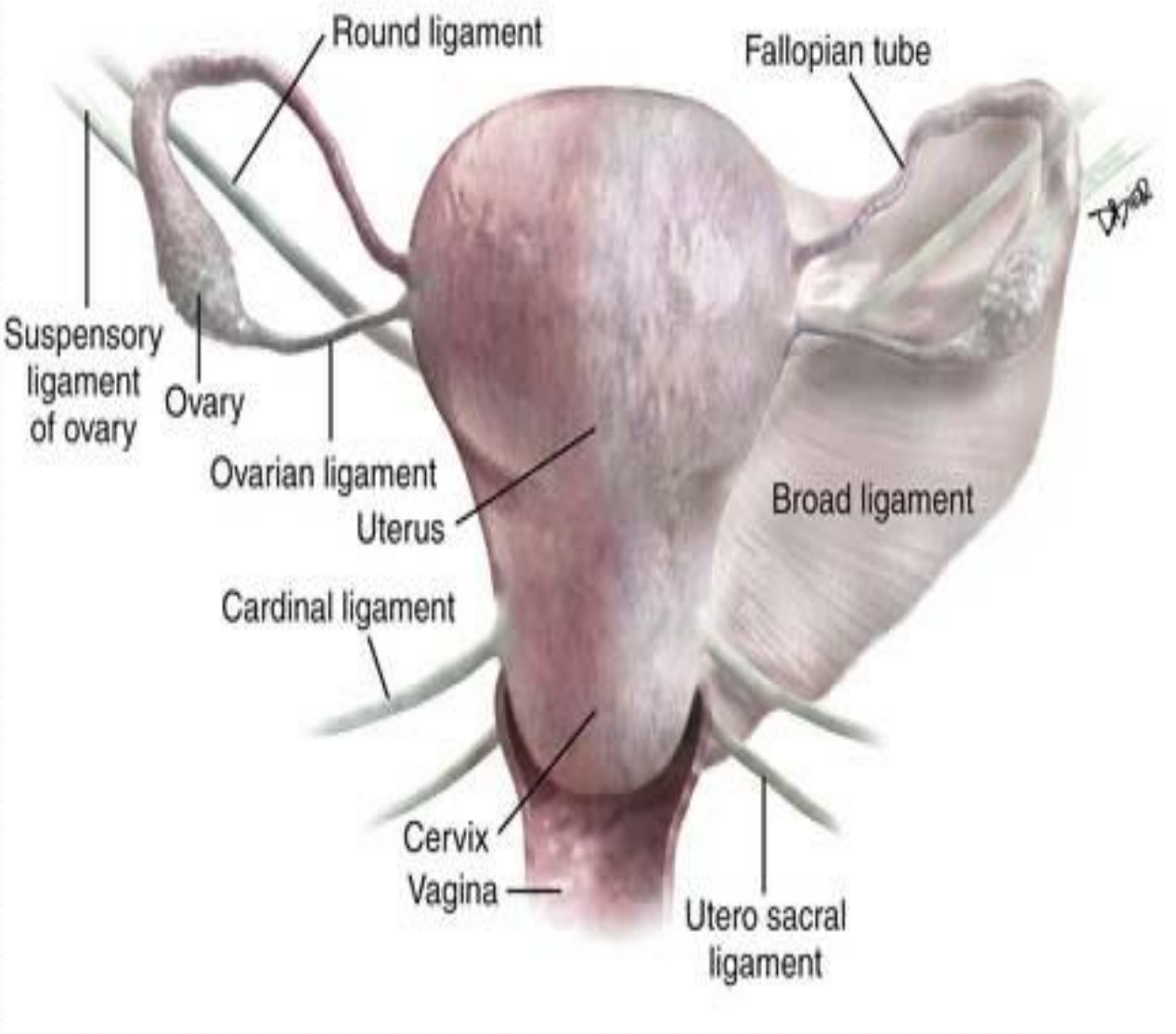
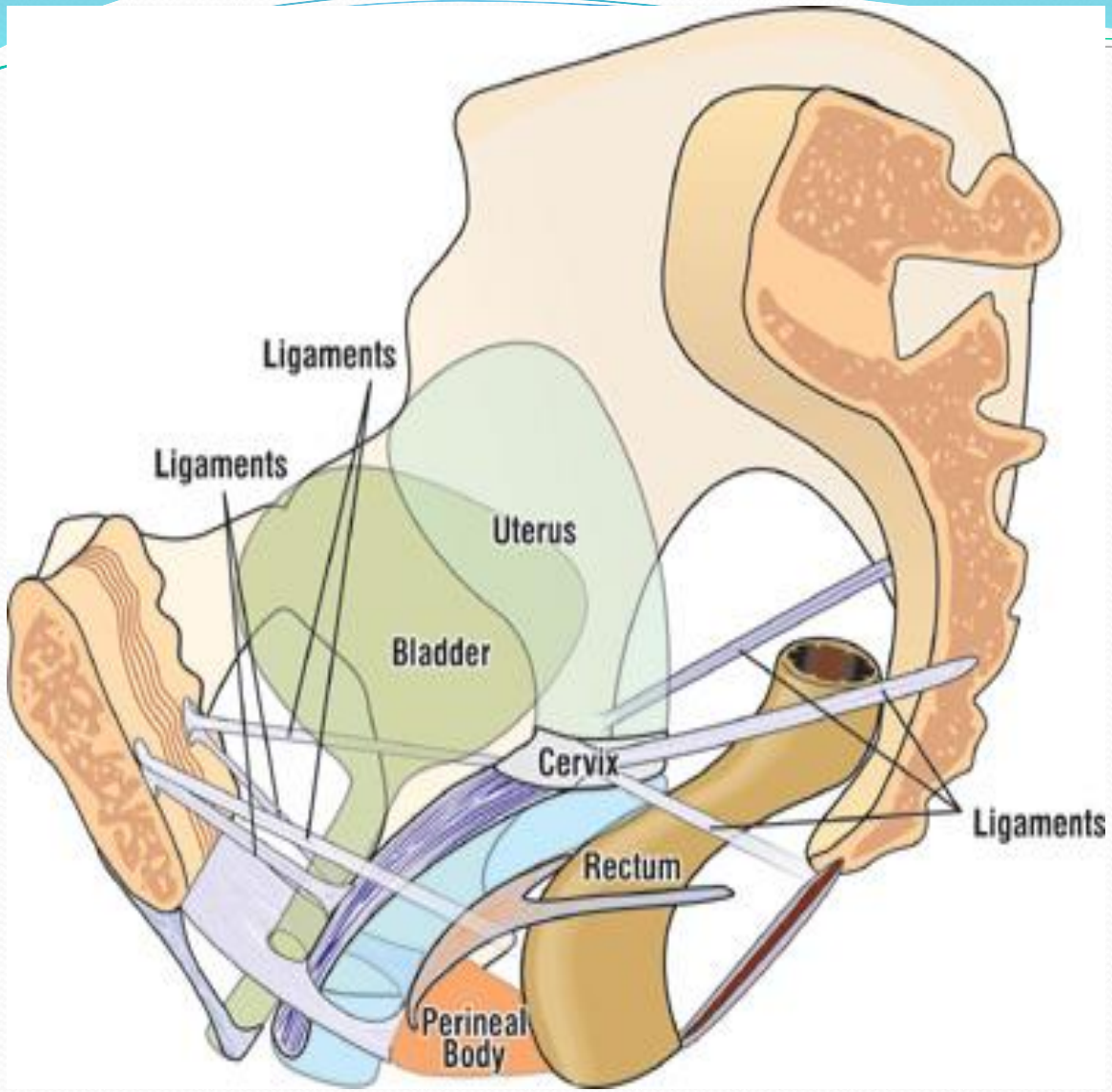
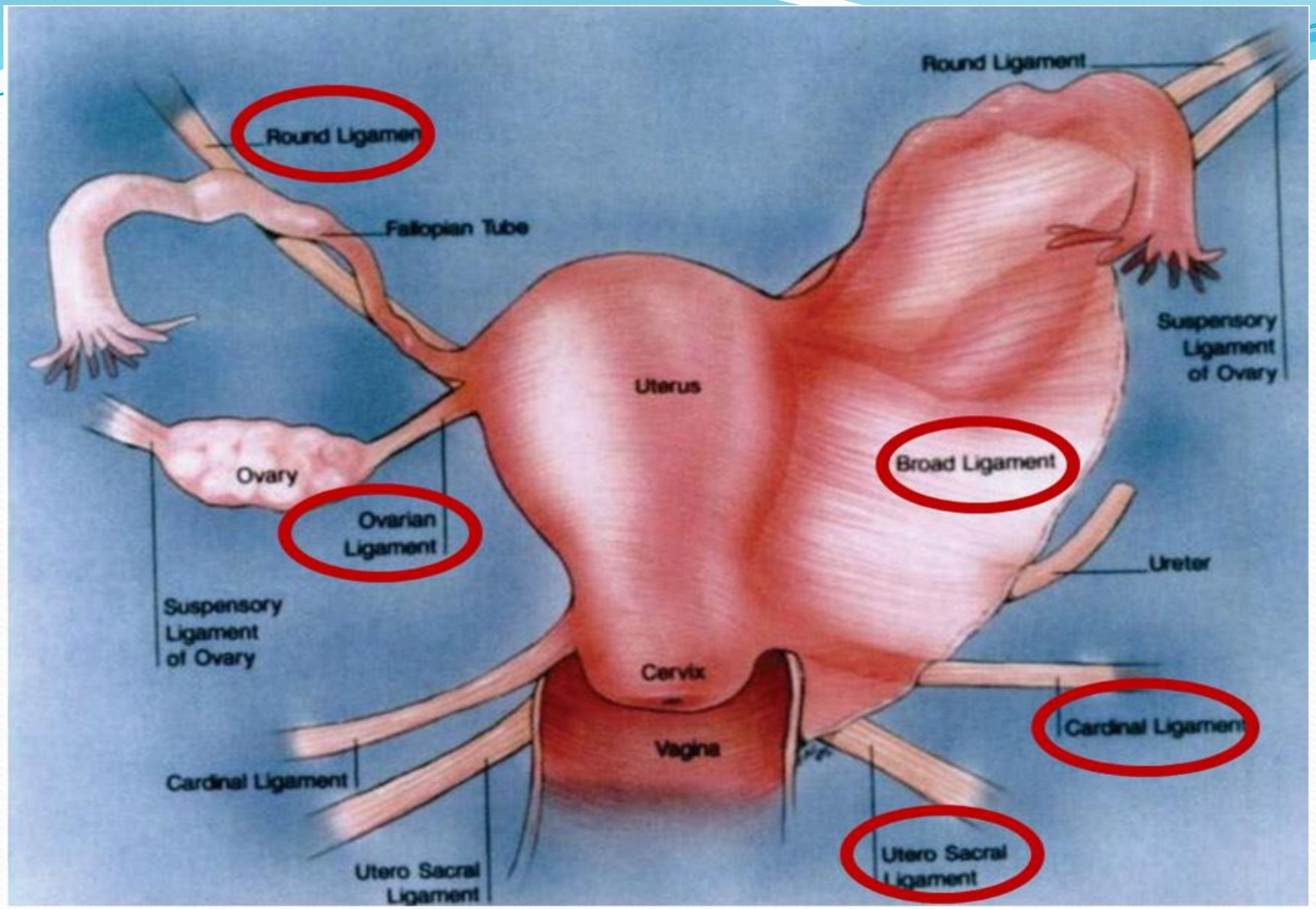


- Adapted from:
- https://radiologykey.com/cervical-cancer



Adapted from:
http://www.integraltheory.org/diagrams/5.jpg



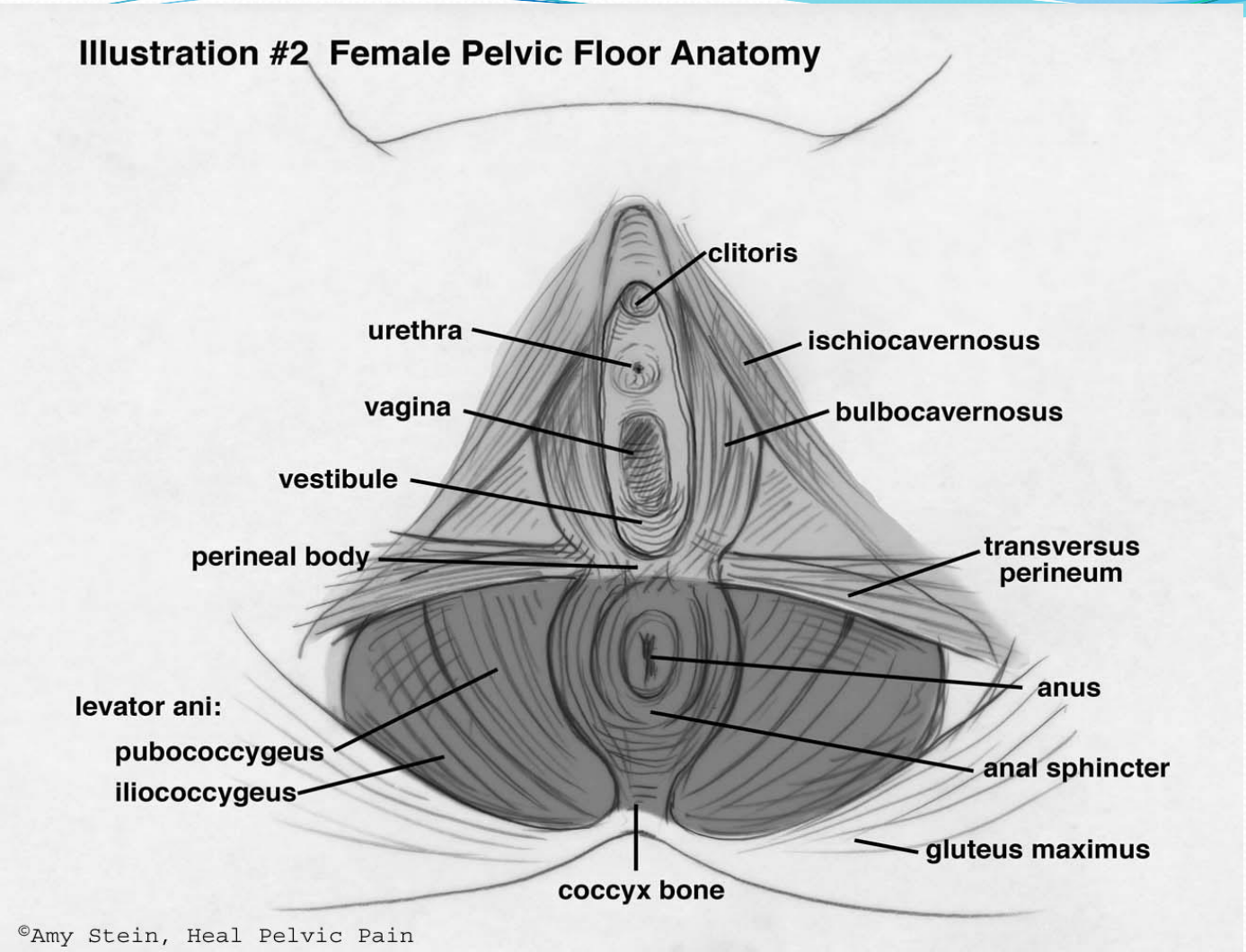
Adapted from:
https://epos.myesr.org/poster/esr/ecr2019/C-3224/findings%20and%20procedure%20details

THE PELVIC FLOOR

- The outlet of the pelvis is filled with soft tissue that supports the pelvic and abdominal organs.
- It forms as a gutter-shaped structure higher anteriorly than posteriorly.

- Three canals, each with an external orifices, run through the tissue are the:

1. Urethra
2. Vagina
3. Rectum



Adapted from:
https://www.nva.org/learnpatient/gynecological-anatomy/vulvovaginal_health_5-new/

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 Pelvic Floor muscles:**

1) One muscle Transverse perinei
2) Two muscles Bulbo-cavernosus
3) One muscle Ischio-cavernosus

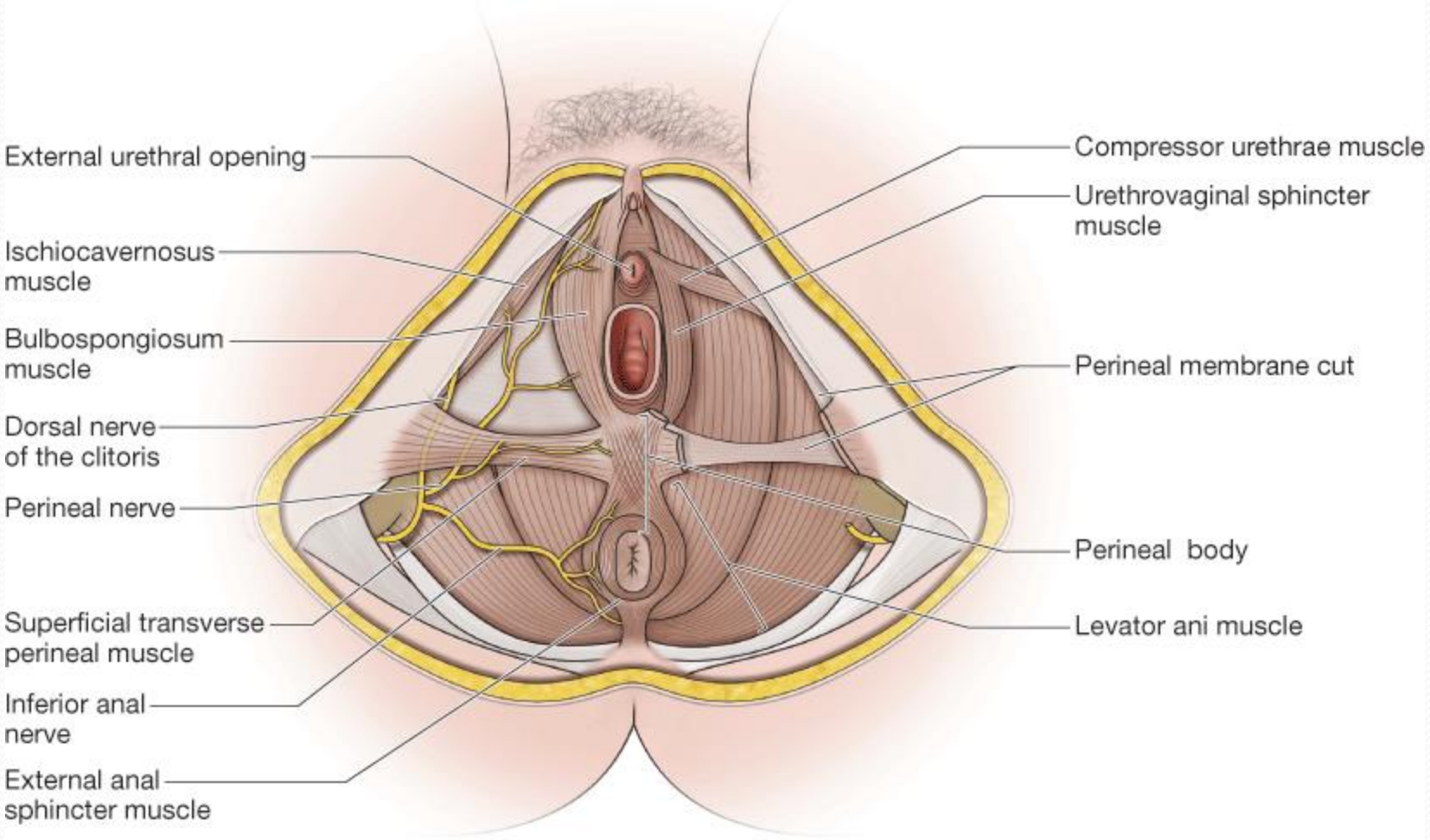
The membranous Sphincter of the urethhra and the rectal sphincter

- **Deep Pelvic Floor muscles**

Three pairs of muscles all have their insertion around the coccyx, sometimes called cocygeous muscles.

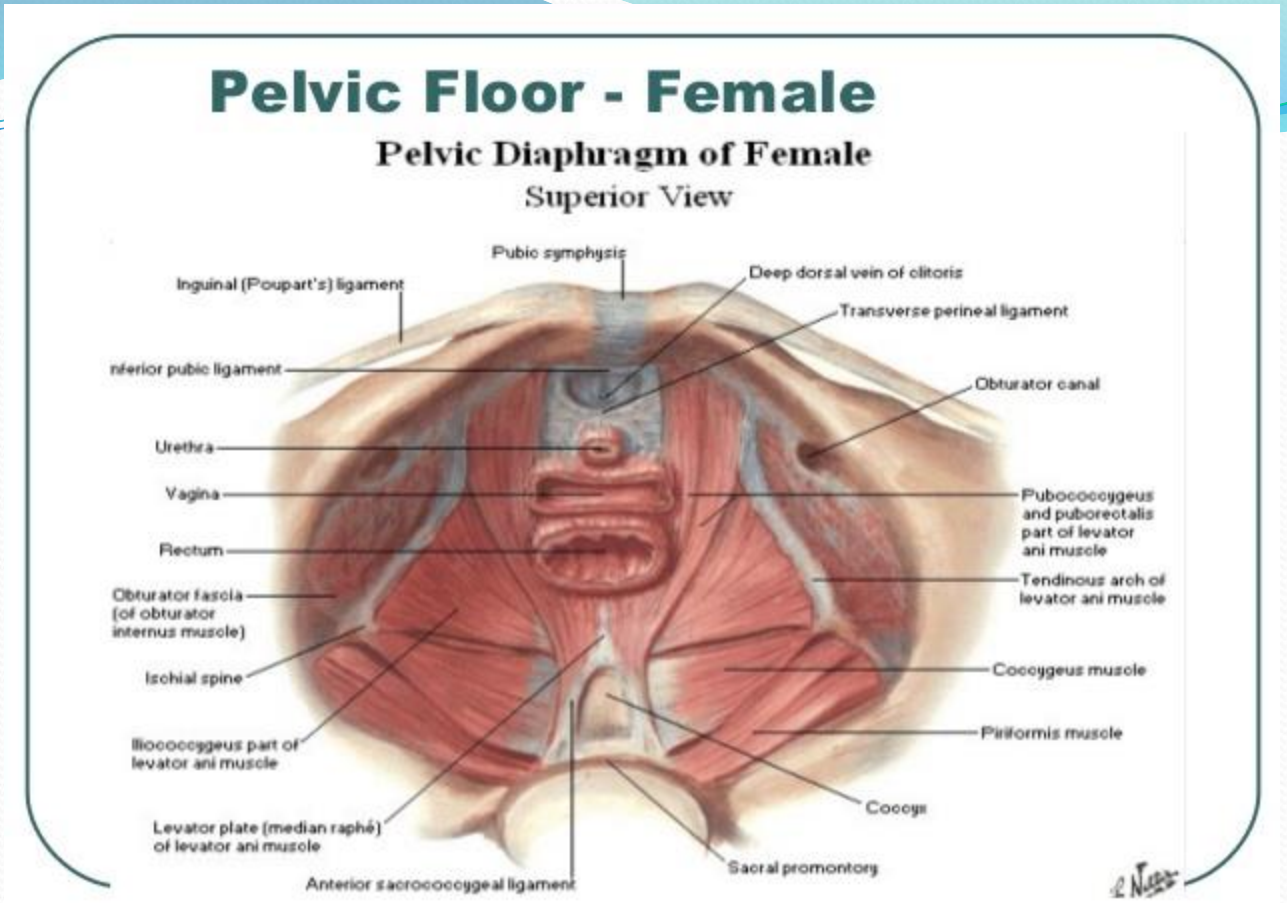
Their anatomical name is "levator ani" muscles, 5 mm thick

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



Source: Rebecca G. Rogers, Vivian W. Sung, Cheryl B. Iglesia, Ranee Thakar: *Female Pelvic Medicine and Reconstructive Surgery: Clinical Practice and Surgical Atlas*: www.obgyn.mhmedical.com

Adapted from: http://obgyn.mhmedical.com/data/books/1307/rog001_fig_02-05.png



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The perinuem

- Bounded by Levator ani above and the anus below
- Divided into: urogenital triangle anteriorly and anal sphincter posteriorly
- Covered by superficial and deep fascia

perineal body

- Fibromuscular mass
- 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
     - bubo-cavernous muscle
     - Ischio-cavernouses muscle
     - transverse perinei muscle
  3. deep pelvic floor muscle.

  Episiotomy, types, indications,

THE NORMAL FEMALE PELVIS

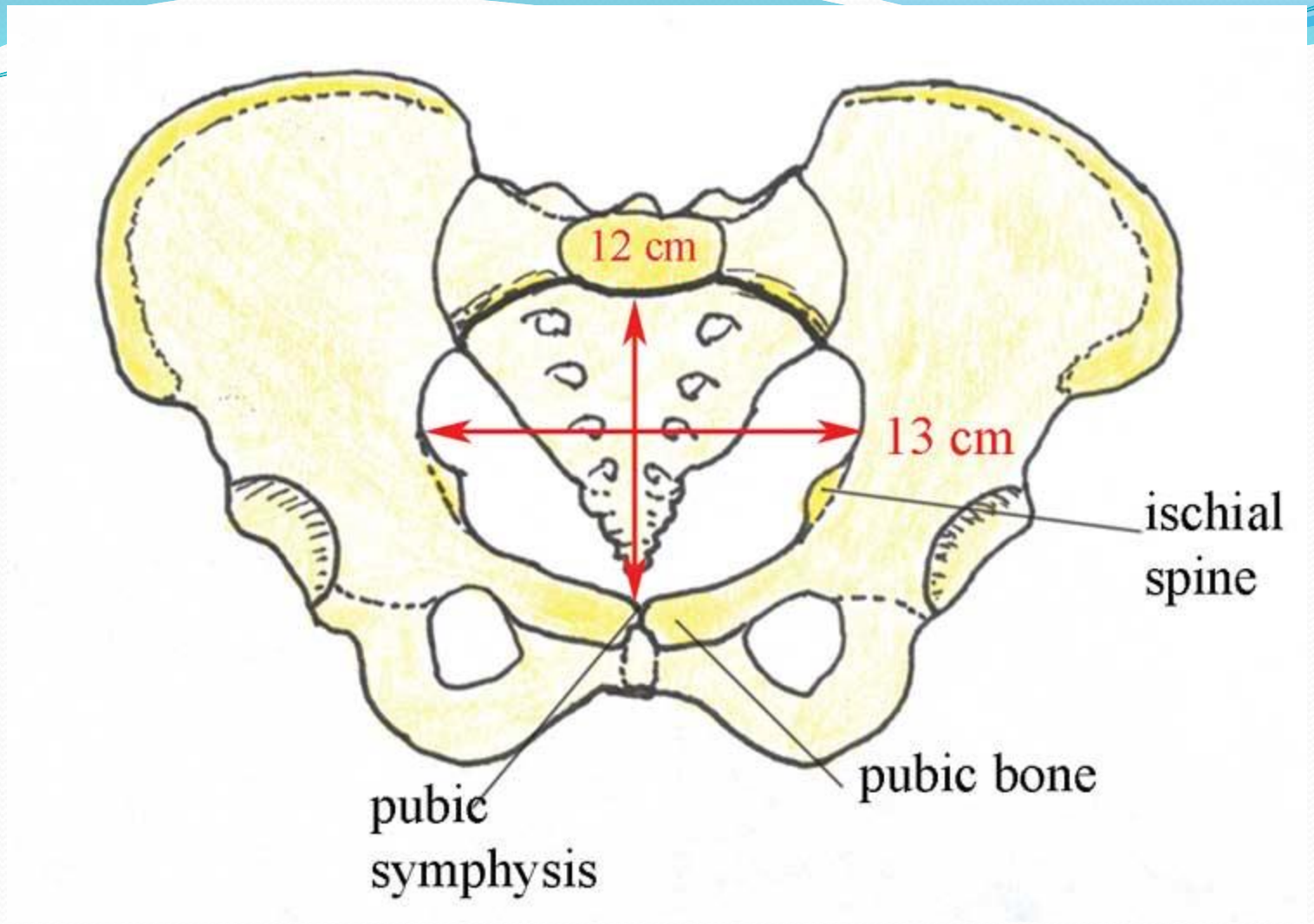
The pelvis articulate with the fifth lumbar vertebra above and with the head of each femur in the right and left acetabulum.

- 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 4 bones:**

- 5 fused sacral vertebrae and coccyx
- left & right innominate bones

- Adapted from:
https://radiopaedia.org/cases/normal-pelvic-radiograph-



Adapted from:
https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=36&printable=1

The Sacrum

A triangular shape; 5 fused vertebrae and 4 pairs of holes (nerves, blood vessels/lymph)

The hollow of the sacrum – smooth and concave

The alae of the sacrum - give the appearance of wings

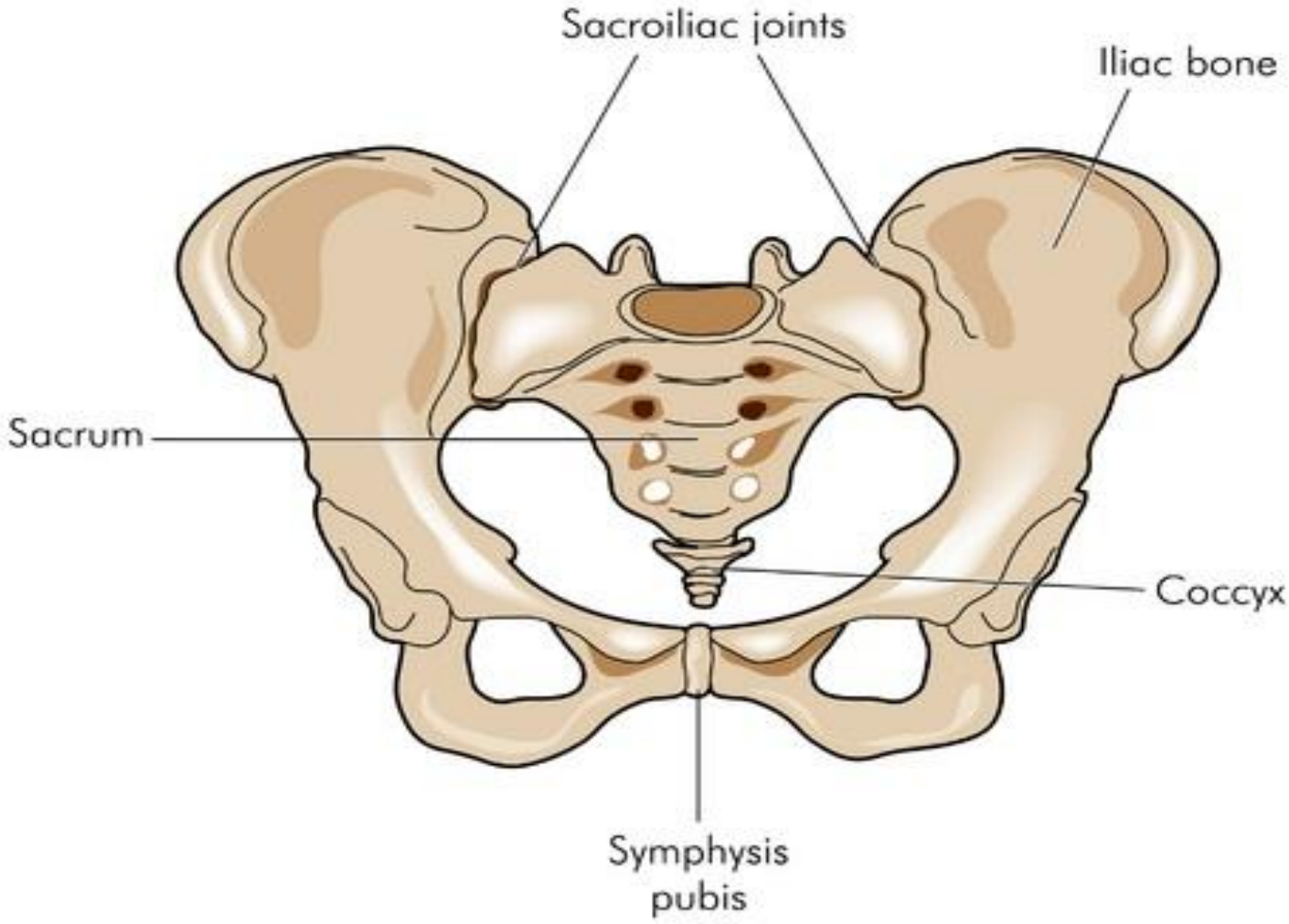
- **The sacral promontary**

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

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

THE COCCYX

- 4 Fusesd coccygeal vertebrae
- Triangular shape
- Articulate with the sacrum
- Muscles are attached to its tip.
- Easley in labour



Adapted from:
https://www.orthoillinois.com/blog/posterior-pelvic-ring-fractures-of-the-si-joint-and-the-sacrum/

Right &Left In-nominate Bones

Each made of 3 separate parts that meet in the acetabulum.

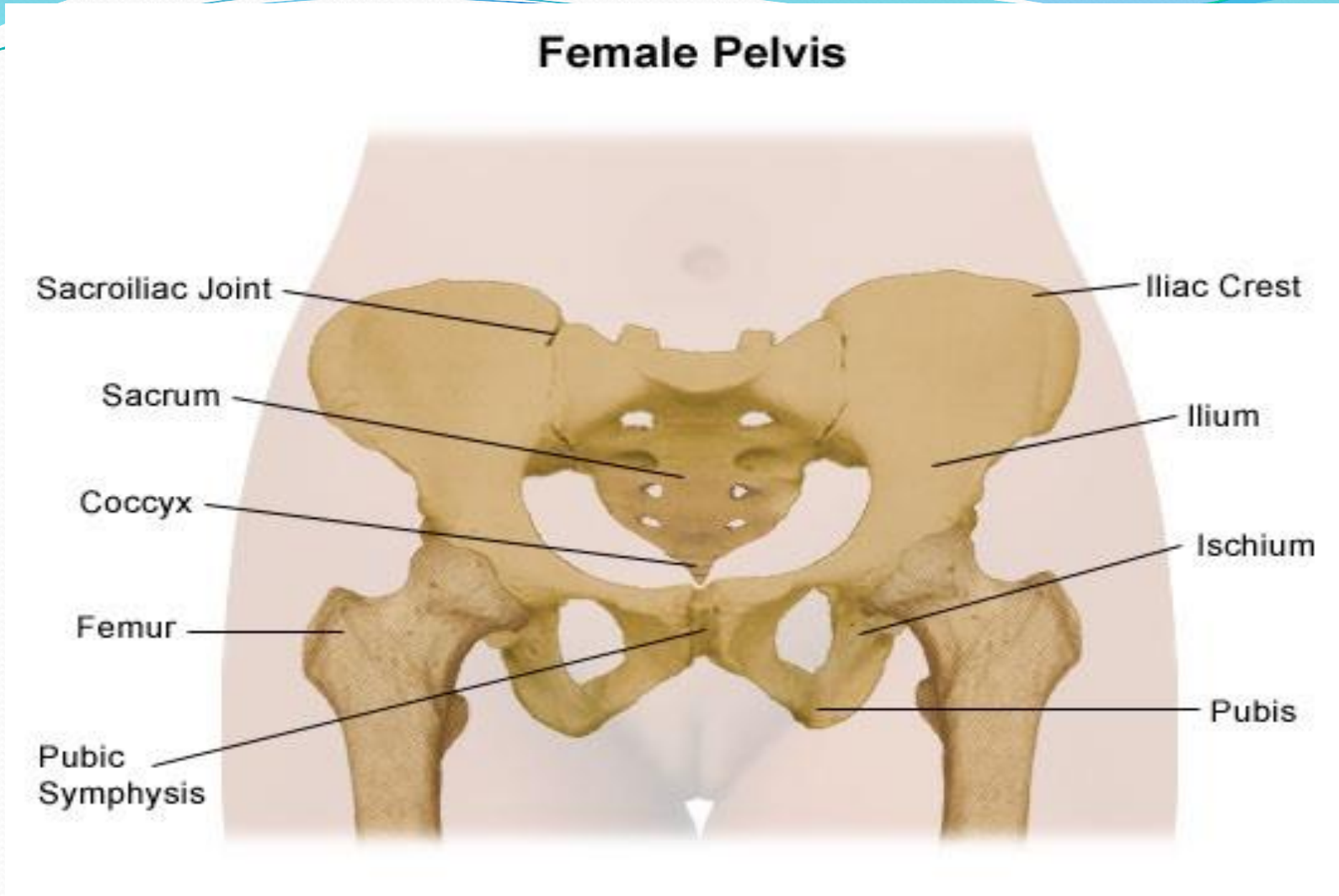
- **Ilium** upper part is iliac crest (anterior and posterior, superior iliac crest
- **Ischium** ischial tuberosity , 2 cm above is the ischial spines.
- **Pubis** both meet the pubic body fused by cartilage "symphysis pubis"

❑ **PELVIC JOINTS**

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

❑ **THE PELVIC LIGAMENTS**

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



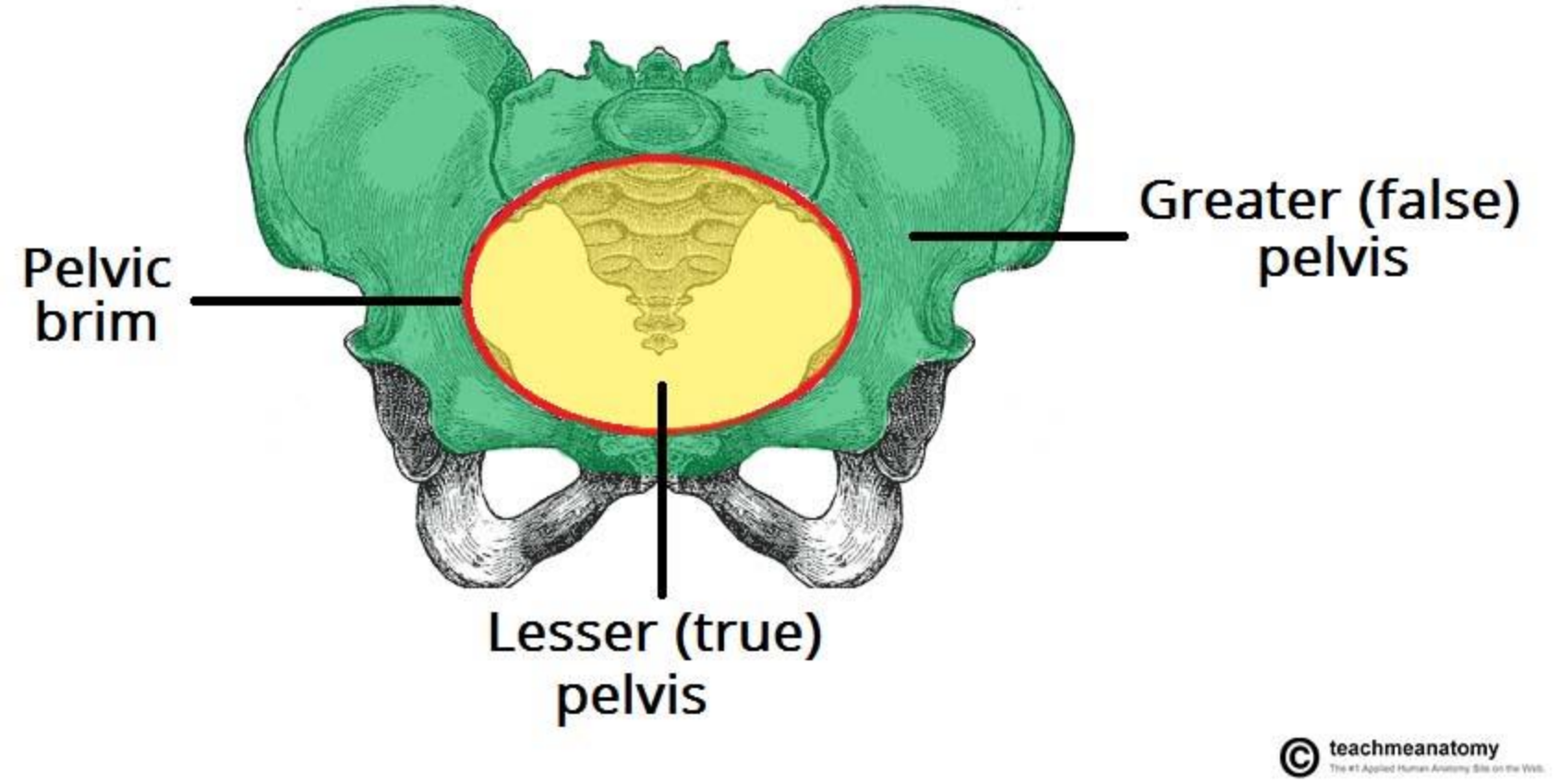
Adapted from:
https://www.google.com/amp/s/www.hopkinsmedicine.org/health/conditions-and-diseases/pelvis-problems%3famp=true

DIVISIONS OF THE PELVIS

The brim divides the pelvis into two parts:

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

It has a : brim , cavity and an outlet Forms the curved canal through which the fetus pass during labour.



Adapted from: http://teachmeanatomy.info/wp-content/uploads/Greater-and-Lesser-Pelvis-Divided-by-the-Pelvic-Brim.jpg

The brim or inlet

Round in shape; partly bone & partly ligaments

- Has eight points as demonstrated
- Bounded anteriorly by the pubis
- Laterally by illiopectineal lines
- Posteriorly by ale and sacral promontory
- Widest diameter is, Transverse

- **True Conjugate** (Anteroposterior diameter)

from sacral promontory to upper inner border of Symphysis pubis, *Measured by erect lateral pelvimetry an X-Ray*

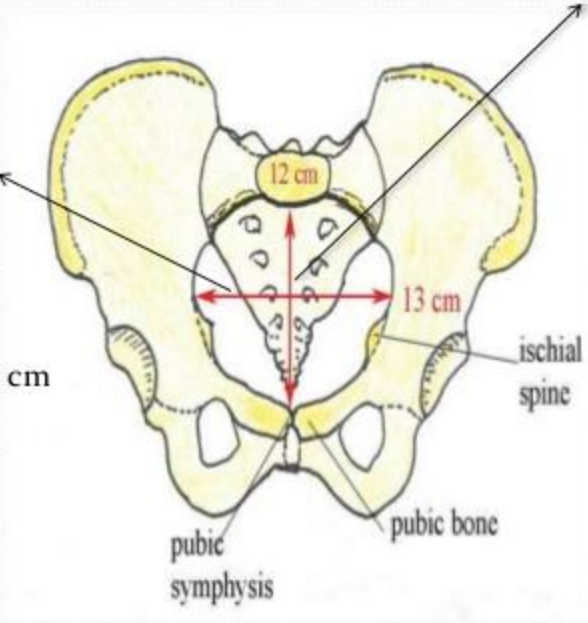
- **Obstetric Conjugate** From the inner surface of symphysis pubis to the sacral promontory
- **Diagonal Conjugate,**

from the sacral promontory to ?

Pelvic inlet:

Anteroposterior diameter (true conjugate)=12 cm,from upper border of pubic symphysis to sacral promontory

Transverse diameter: Between the farthest two points on iliopectineal line,largest=13 cm



Obstetric conjugate Shortest AP diameter=11.5 cm,from posterior surface of pubic symphysis to sacral promontory

Diagonal conjugate Measured from the lower border of pubic symphysis to sacral promontary=12.5 cm

Adapted from: https://image.slidesharecdn.com/normallabour-140428082740-phpapp02/95/normal-labour-7-638.jpg?cb=1398675297

The Pelvic cavity

- Extends 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 ligamnet and ischial spines
- Interspines Diameter

The pelvic outlet

- ***Anatomical outlet***
- ***Obstetrical outlet***

➢ **The anatomical outlet** is formed by fixed pointes useful landmarks for taking pelvic measurement.

➢ Bounded anteriorly by pubic Arch

➢ Laterally by sacrosciatic lig&Ischail Tuberosity

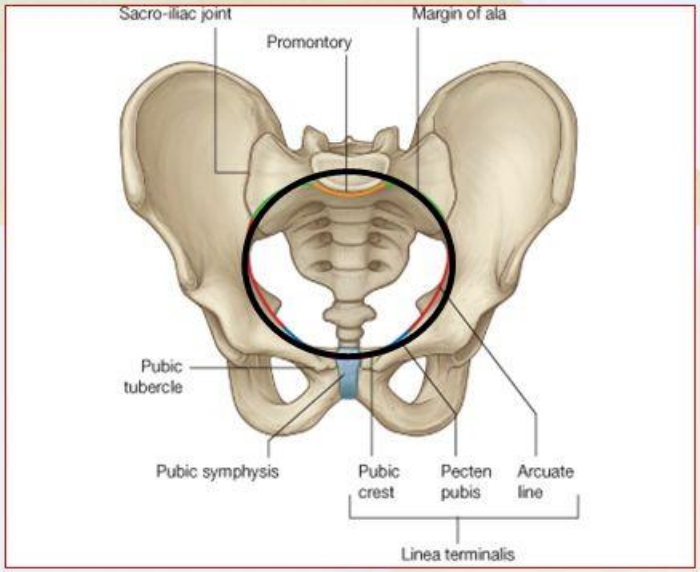
➢ Posteriorly by tip of Coccyx

➢ **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.

PELVIC INLET

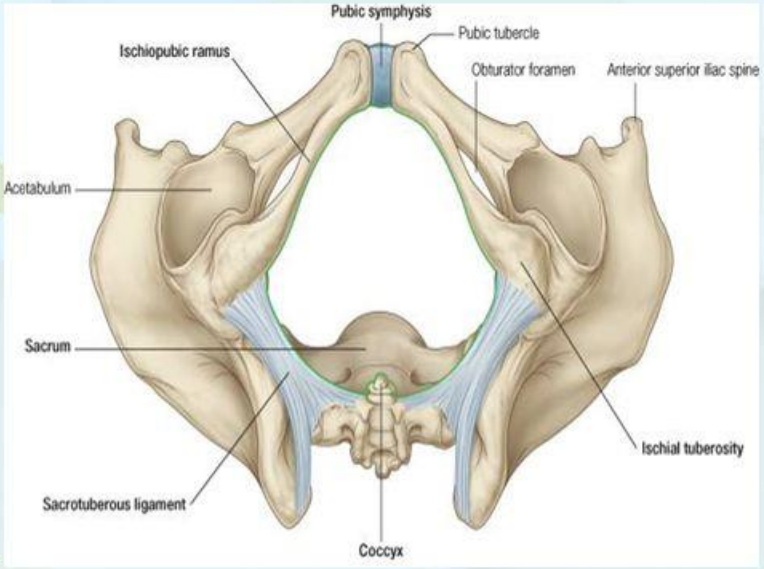


Anteriorly: Symphysis pubis.

Posteriorly: Promontory of sacrum, ala of sacrum.

Laterally: Ileopectineal (arcuate) lines.

PELVIC OUTLET



Anteriorly: Symphysis pubis.

Posteriorly : **Coccyx,**

Anterolaterally: **ischiopubic ramus**

Posterolaterally: Sacrotuberous ligament

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Adapted from:
http://slideplayer.com/slide/2790499/10/images/7/PELVIC+INLET+PELVIC+OUTLET.jpg

Average measurements of pelvis

- ***Brim***

Antero-posterior = 11.5 cm

Transverse = 13.0 cm

- ***Cavity***

Antero-posterior = 12.0 cm

Transverse (I/S) = 12.0 cm

Outlet

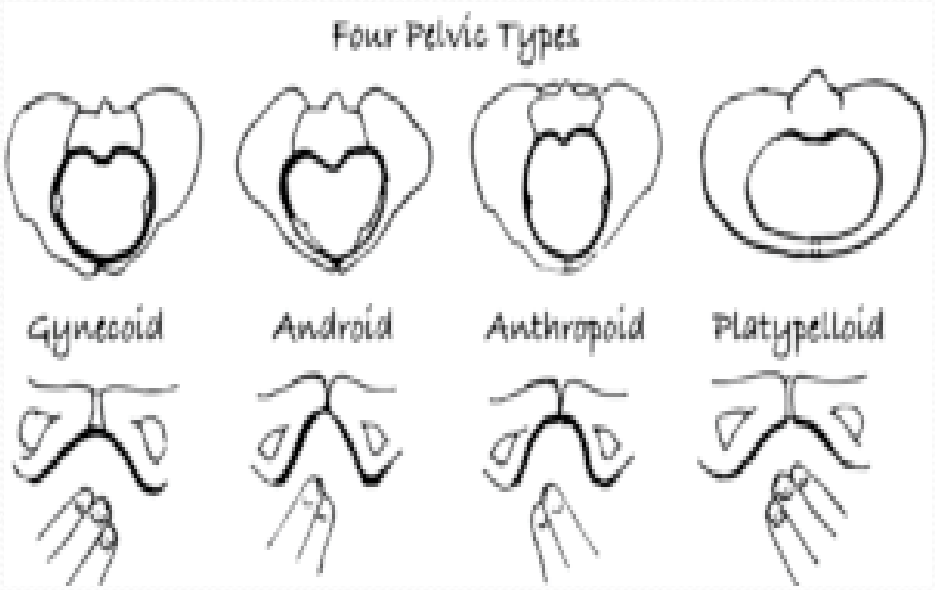
Antero-posterior = 12.5 cm

Transverse = 11.0 cm

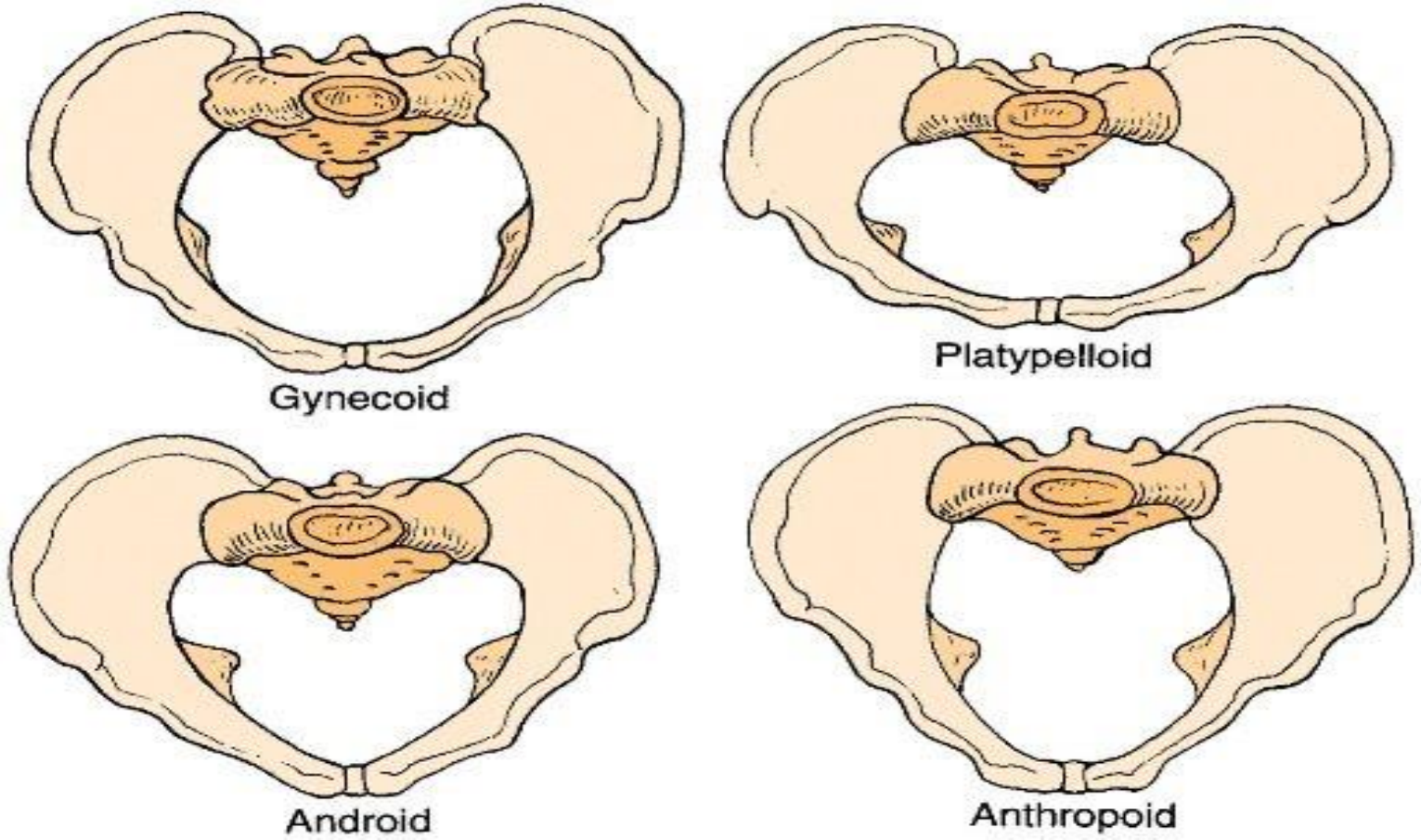
Abnormal Pelvis

Four Types

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



Adapted from:
https://spinningbabies.com/learn-more/birth-anatomy/



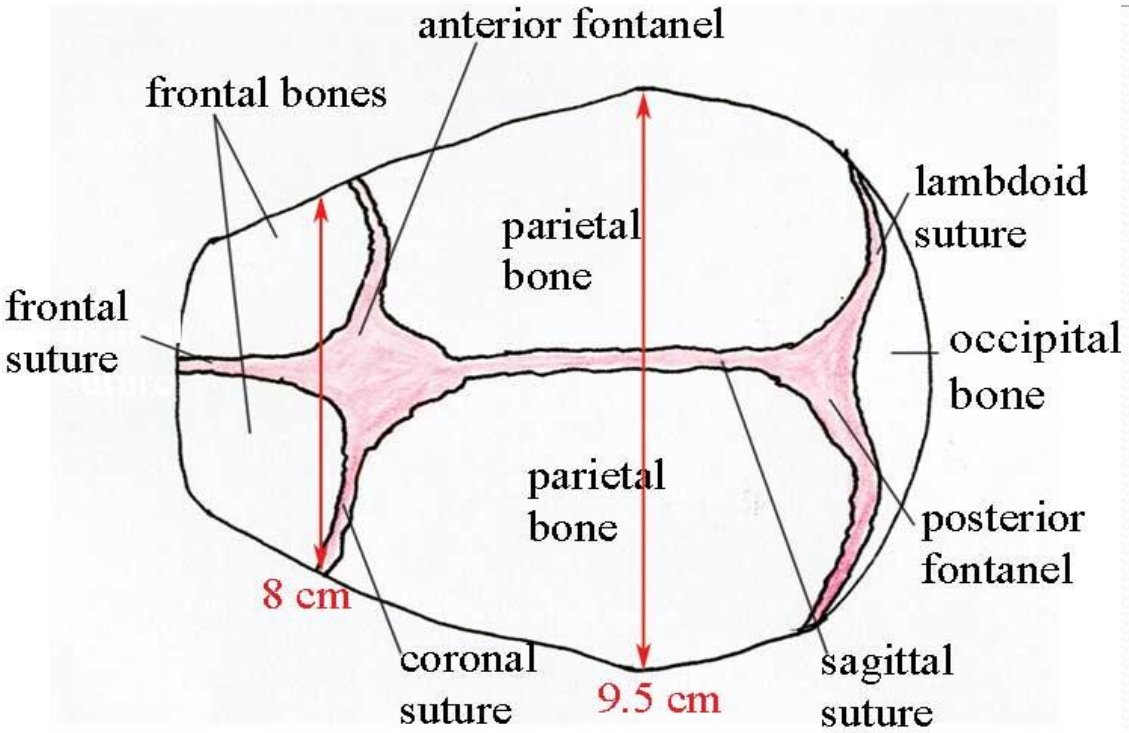
Adapted from:
https://www.pinterest.com/pin/505388389410117004/

FETAL SKULL

- Vault of fetal skull – formed from membranes 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. From orbital ridges to the nape of neck
  - The face. From orbital ridges to junction of chin&neck
  - The base
- **Bones:**

Bones are separated by??

- Two frontal bones
- Two parietal bones
- One occipital bone



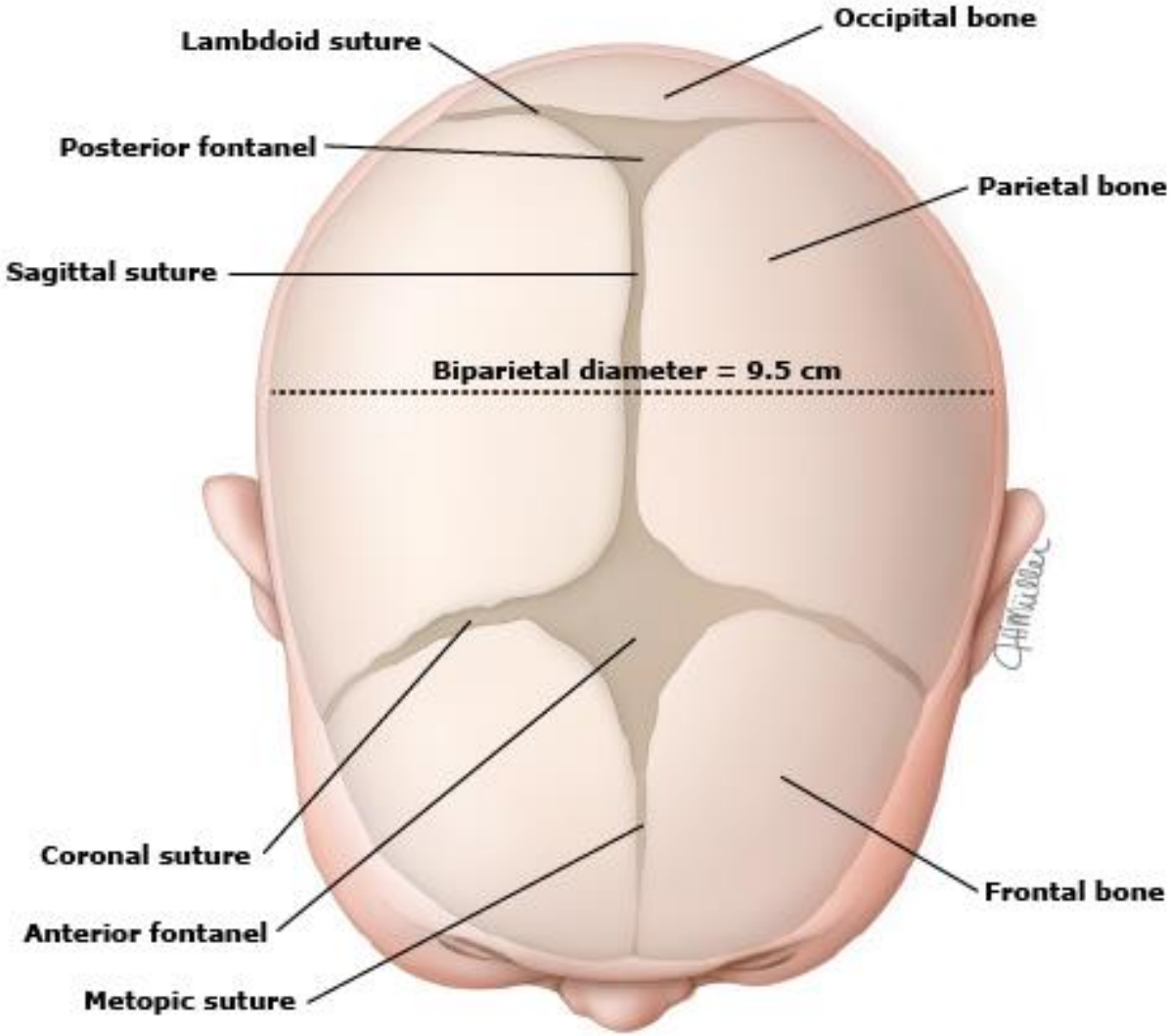
Adapted from:
http://www.open.edu/openlearncreate/pluginfile.php/4415/mod_oucontent/oucontent/14/none/none/fig6.jpg

Suture, an area of membrane which has not ossified

- Lambdoidal suture (*Occipito&Parietal*)
- Sagittal suture (*Two Parietals*)
- Coronal suture (*Frontal&Parietals*)
- Frontal suture (*Two Frontals*)
- Temporal suture (*Temporal&Parietal*)
- **Fontanelles very important landmarks**

Areas where two or more sutures meet.

- **Anterior fontanelle**, diamond in shape where sagittal,coronal and frontal sutures meet (***Bregma***) closes?
- **Posterior fontanelle**, where lambdoidal and sagittal sutures meet (***Lambda***) closes?



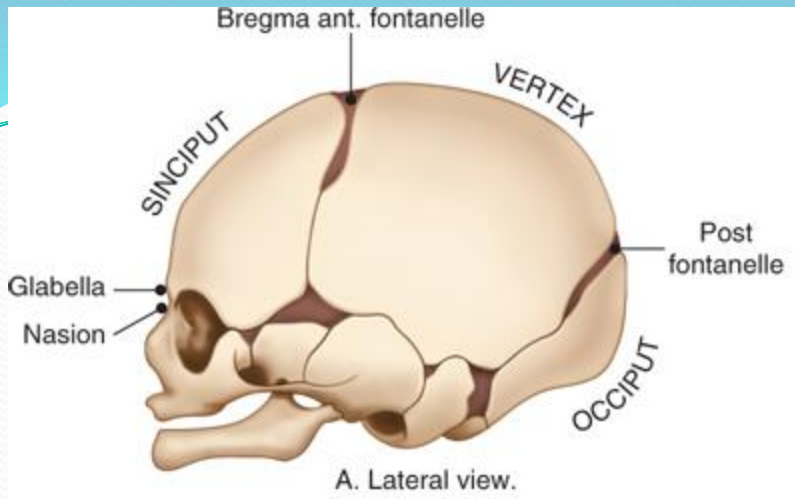
Adapted from: http://s0www.utdlab.com/contents/images/OBGYN/81518/Fontanelles_and_suture_lines.jpg?title=Fontanelles+and+suture+lines

AREAS OF THE SKULL

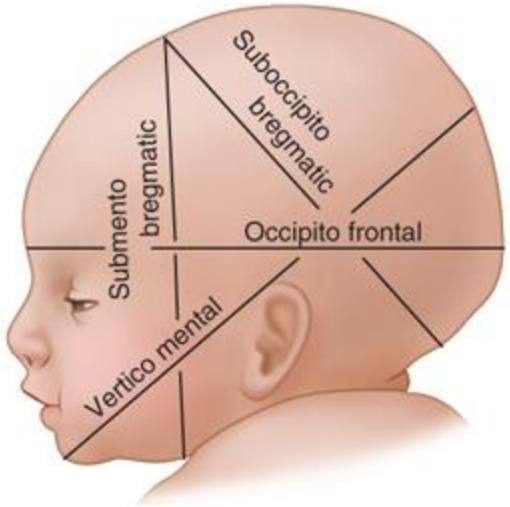
1. Glabella: the bridge of the nose
2. Sinciput : the forehead
3. Bregma: the anterior fontanelle
4. **Vertex:** ***area between Ant &post Fontanelles and the two Parietal eminences***
5. Lambda: the posterior fontanelle
6. Occiput
7. Sub-occipital area
8. Mentum: the chin

Malposition: Abnormal position of fetal head in relation to maternal pelvis

Mal-presentation: Any presentation other than vertex



A. Lateral view.



B. Anteroposterior diameters.

Adapted from:
http://obgyn.mhmedical.com/data/books/1247/pos_ch6_f002.png

CIRCUMFERENCES OF THE FETAL SKULL

The engaging diameters of fetal skull varies with the presenting part

- The engaging Diameters in a well flexed head:

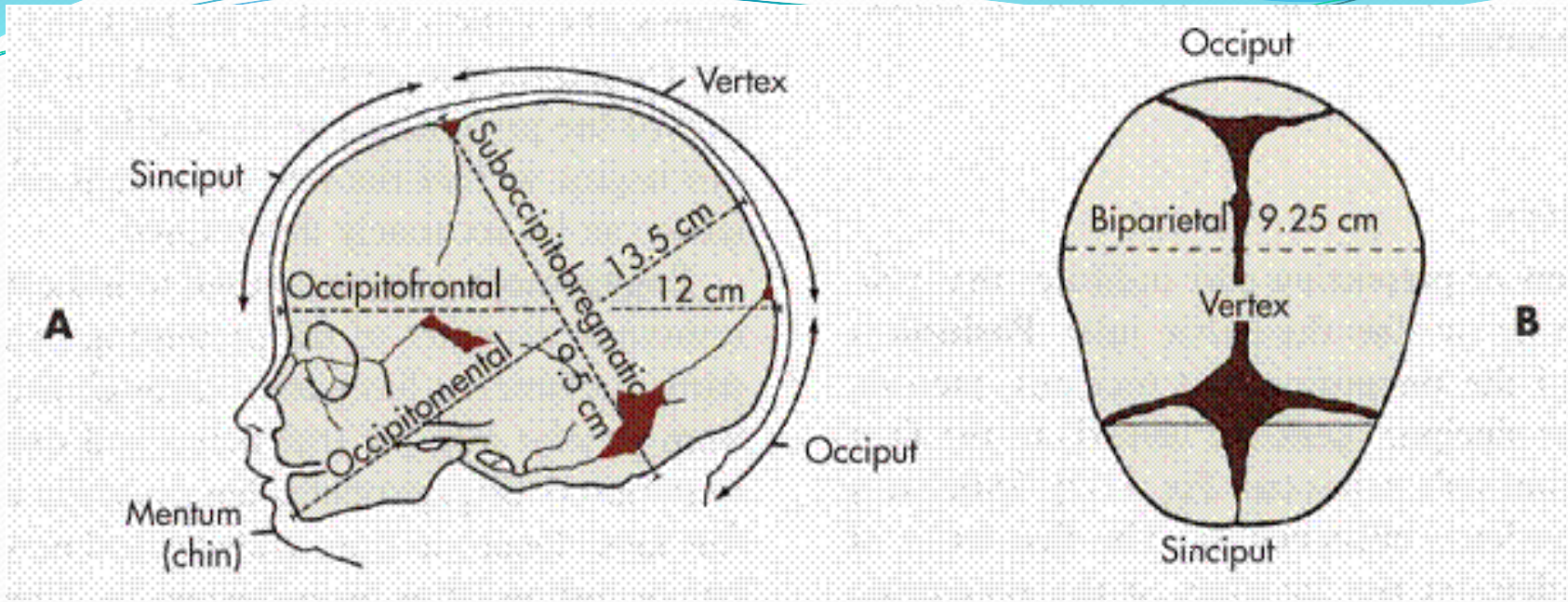
suboccipito-bregmatic+ Biparietal (9.5cm)

In Vertex presentation

- The engaging Diameters in a Deflexed head (partly extended)

OccipitoFrontal+Biparietal (11.5cm)

In Occipito posterior Position



Adapted from:
http://intranet.tdmu.edu.ua/data/kafedra/internal/ginecology2/classes_stud/en/nurse/adn/ptn/2/Nursing%20Care%20of%20Childbearing%20Family/02.%20Unit%20test%20II.files/image004.gif

DIAMETERS OF FETAL SKULL

- Bipareital : Largest transvers head diameter
- Bitemporal
- Suboccipital-bregmatic
- Occipito frontal
- Mento-vertical from point of chin to posterior fontanelle (***Brow Presentation***) 13-14cm
- Submento-bregmatic from root of nose to the junction of head&neck (***Face Presentation)***

Effect of Labour and delivery

- Engagement
- Moulding
- Caput succedaneum
- Cephal-haematoma, Effect of ??????

Useful definitions

- **Lie of the fetus**: the longitudinal axis of the fetus with respect to the longitudinal axis of the mother.
- **Attitude**: position of fetal limb, body and head with respect to each other
- **Denominator**: Occiput in cephalic presentation
- **Presentation**: the part of the fetus nearest to pelvic inlet
- **Malpresentation**: any presentation other than vertex (Brow, face, breech, shoulder) to maternal pelvis
- **Position**: relationship of the denominator tso maternal pelvi

- **Station**: level of descent of the presenting part with respect to the maternal pelvis (reference point; ischial spines ; zero station, above -1 to -3, below zero +1-+3.

- **Engagement of the head**: passage of widest diameters of fetal head through the inlet of the pelvis/ brim.
- Palpation of the head (*Cephalic presentation*) by the abdomen, 5/5 palpable to 0/5, When it is **2/5 ????**

Aims

- To predict and thus prevent postpatum haemorrhae 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:

- Understand the major variant in the fetal circulation than that of the adult
- Know the significance of ductus venousus &ductus anteriousus 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

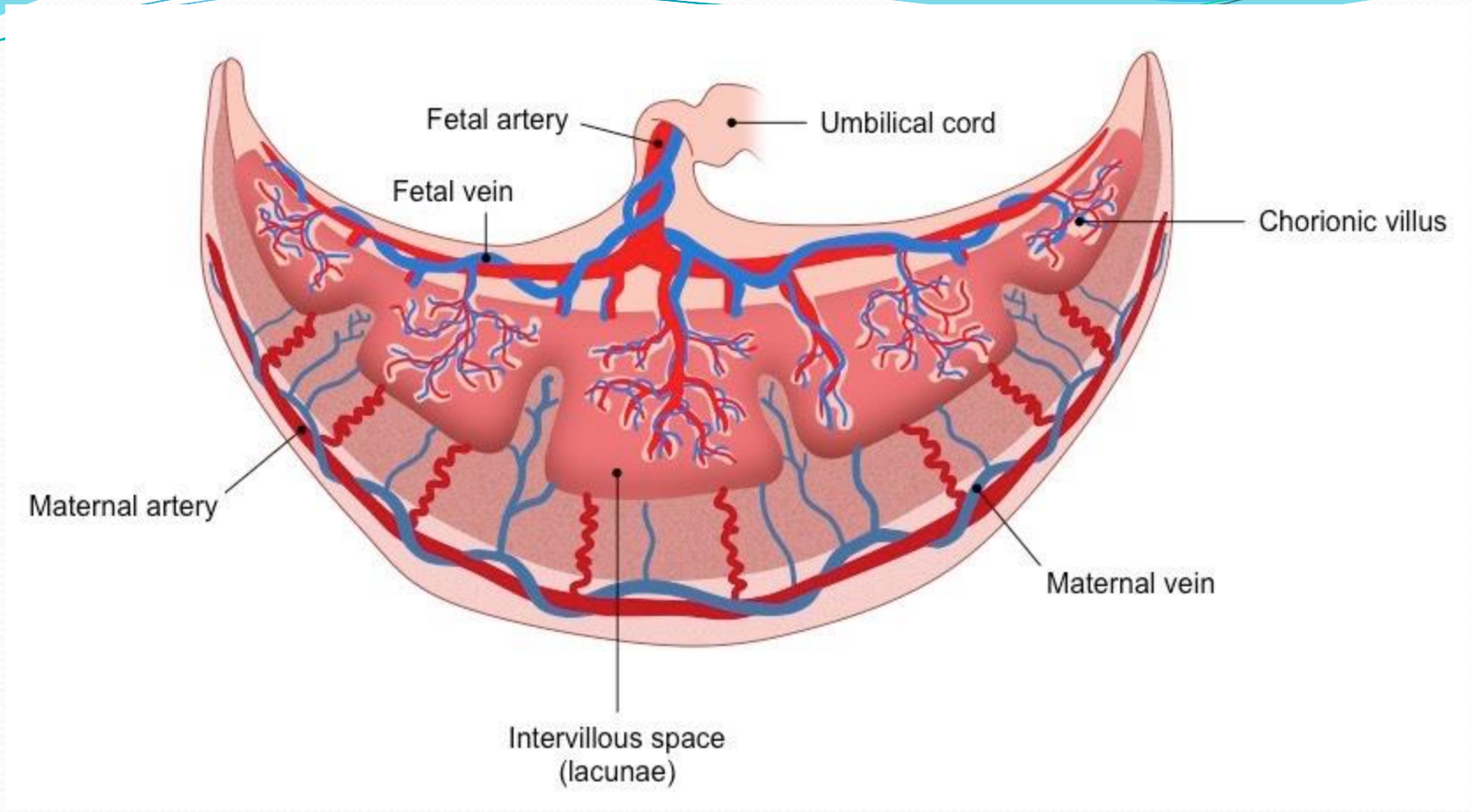
The placenta

- ***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.

Adapted from:
http://kundalinihouse.com.au/wp-content/uploads/2013/11/placenta1.jpg

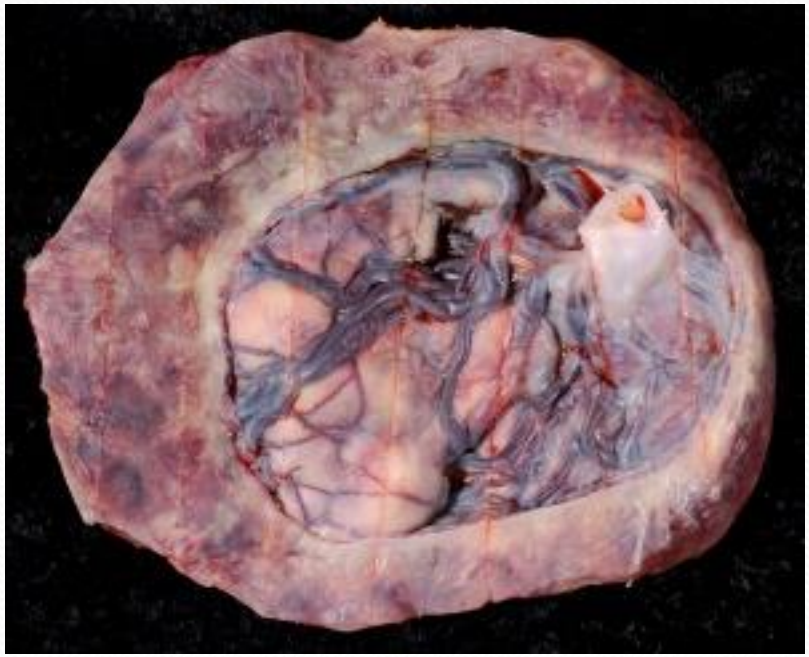
Structure of the mature placenta

- Flat, Roughly circular
- 22 cm in Diameter
- 2cm thick in the centre
- Weight: 1/6 of the baby's weight



Adapted from:
http://ib.bioninja.com.au/_Media/placenta-structure_med.jpeg

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

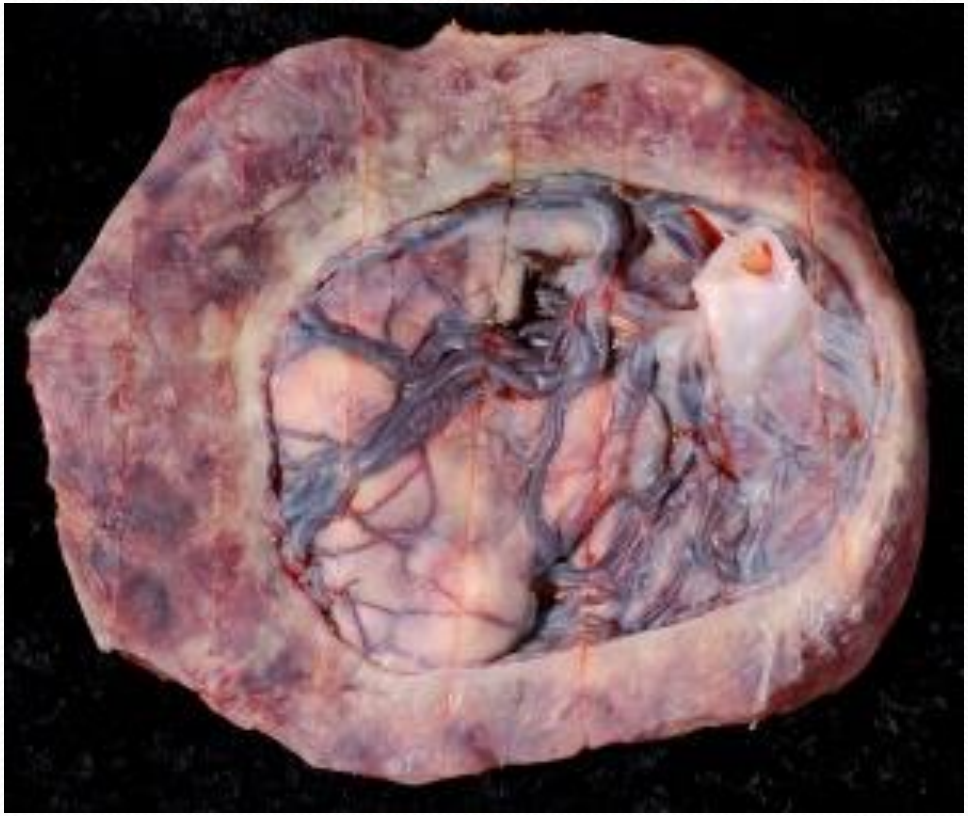


- Placenta succenturiata/ Placenta velamentosa

and **Vasa previa:** ***Antepartum Haemohrrage***

Abnormalities of placental development.

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



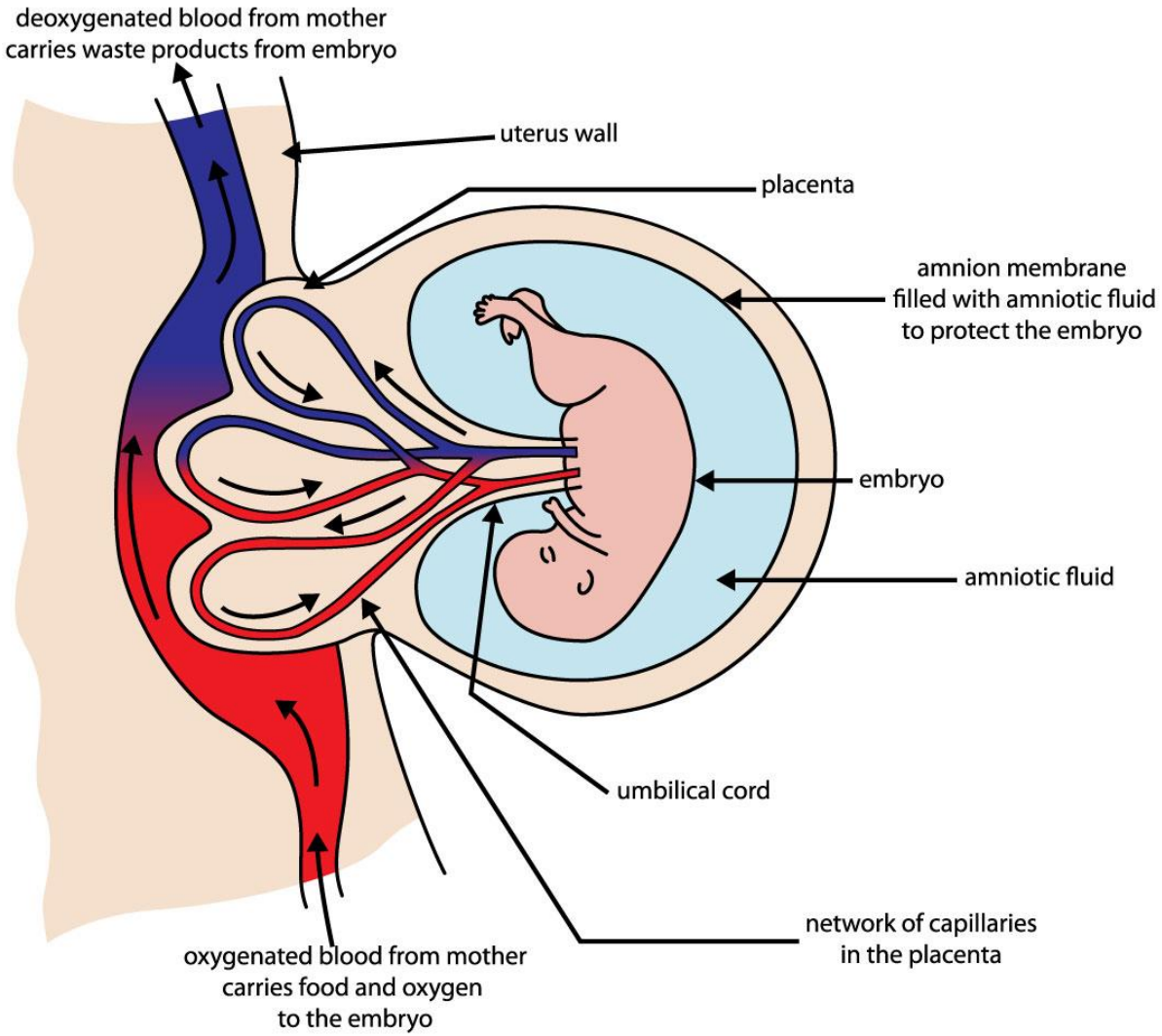
Adapted from
https://embryology.med.unsw.edu.au/embryology/index.php?title=File:Circumvallate_placenta_01.jpg&mobileaction=toggle_view_mobile

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

The developing embryo in the uterus



Adapted from: https://blog.pregistry.com/wp-content/uploads/2016/07/AdobeStock_93761692-1-Converted.jpg

Fetal circulation

- How does the fetal circulatory system works?

- Two Major Events???????

Fetal circulation

Cardiovascular system

Major variant are explained by:

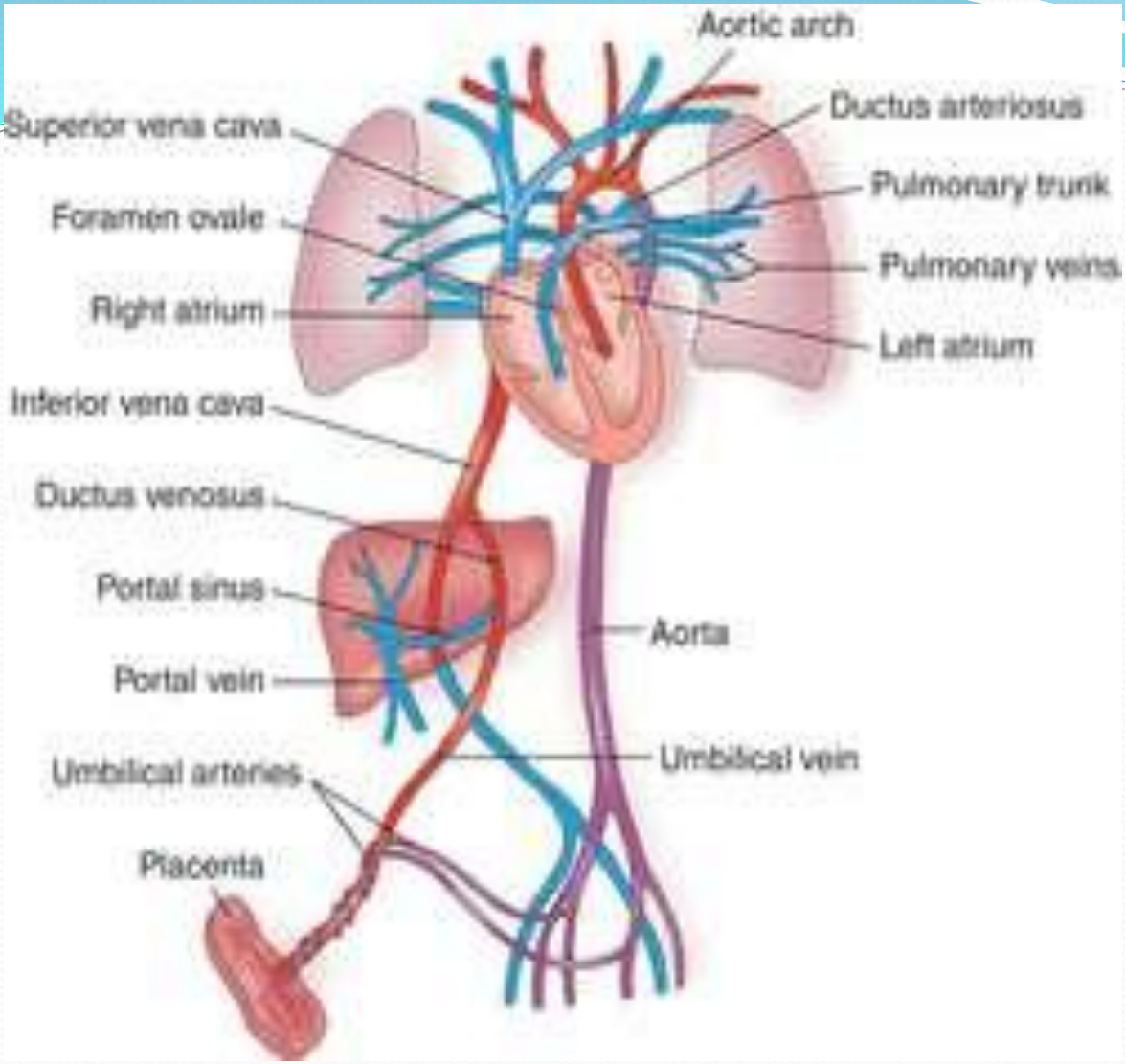
- the presence of umbilical-placental circulation

and

- absence of significant pulmonary circulation.

Fetal circulation

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



Adapted from:
http://img.tfd.com/MosbyMD/thumb/fetal-circulation.jpg

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 O2 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 kidneys, 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 pulomary 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

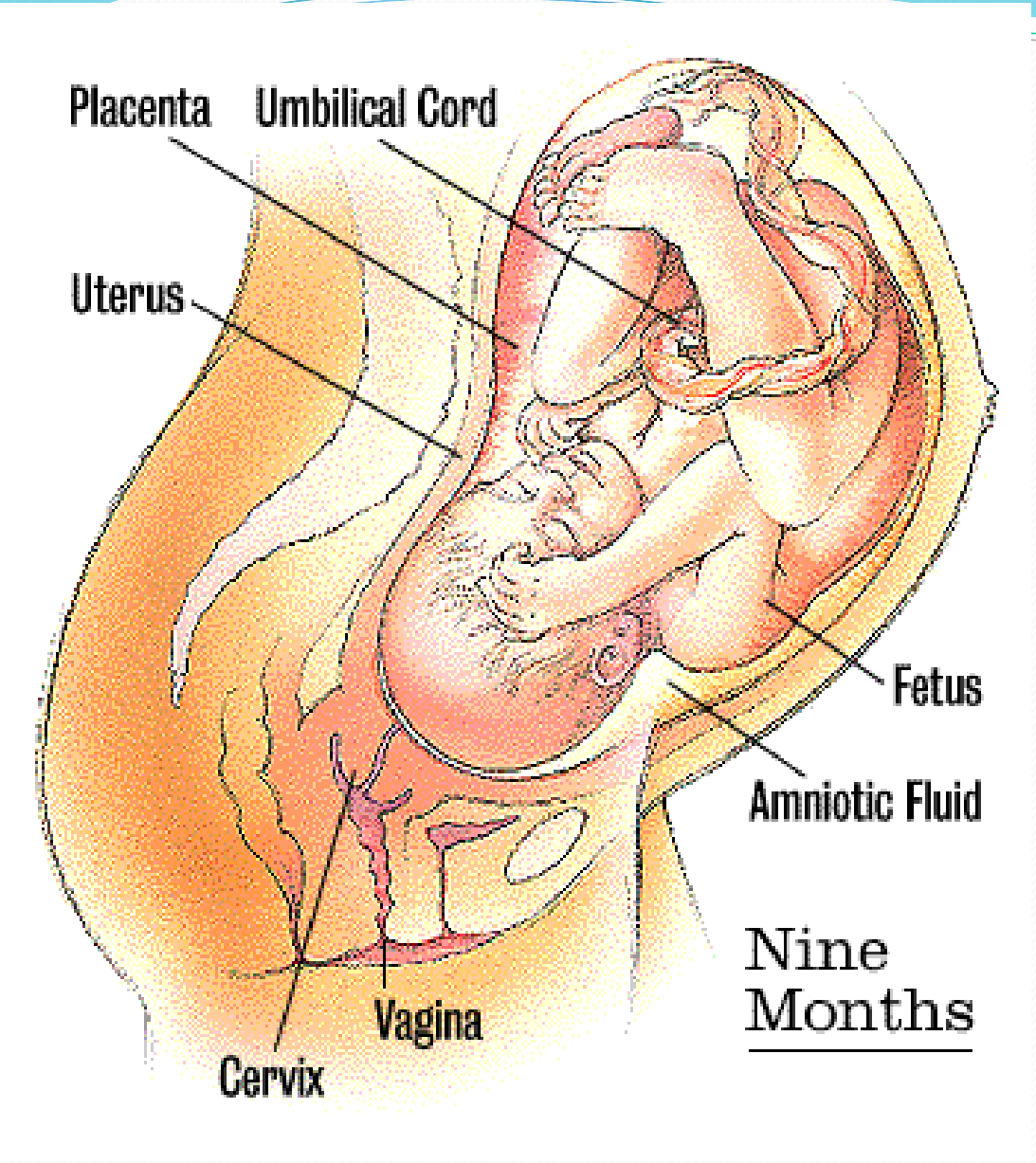
- Completes the transition of fetal circulation to newborn circulation

- **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**?



Adapted from: http://www.oocities.org/sunrise_starchild/diagram9.gif

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