



[Color index: **Important** | **Notes** | **males notes** | Extra]
Editing file [link](#)



Anatomy of the Female Pelvic Organs

Objectives:

- 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
- 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

References:

- Slides and notes- Essentials of Obstetrics and Gynecology- Kaplan Lecture Notes- Moore's Clinically Oriented Anatomy- Human Reproductive Biology
- The doctor said: "**whatever I skip, isn't going to be in your exam**" we advise you to read them tho :) is it may come in other lectures

Done by: Bedoor Julaidan & Lama Alzamil

Revised by: Luluh Alzeghayer & Dalal Alhuzaimi

1. Female Genitalia

Female External Genitalia (vulva): you really should only focus on bartholin glands

Include:

- ❖ Mons veneris (cushion of fatty tissue, covered by skin and pubic hair, that lies over the pubic symphysis)
- ❖ Labia majora (male homologous = scrotum)
- ❖ Labia minora
- ❖ The clitoris (male homologous = glans of penis)
- ❖ Vaginal introitus "vaginal orifice"
- ❖ Hymen
- ❖ The vestibule (The cavity between the labia minora)

has six openings:

- Urethral meatus • Opening of two skene's ducts¹ • Vaginal orifice • Opening of two Bartholin ducts.

- ❖ **Bartholin glands** "greater vestibular glands"

- lies on each side of the vagina, in the posterior lower third 1/3 of the introitus.
- Secrete mucus –alkaline "These glands are homologous to bulbourethral glands of male"

➤ They might ask about it in OSCE:

- What is this ? (A picture will be shown)= bartholin gland or bartholin cyst
- How do you treat it ? You open it by "marsupialization"
- What are the causes?
- **Bartholin cyst:** when the orifice of the Bartholin duct becomes obstructed, mucous produced by the gland accumulates, leading to cystic dilation proximal to the obstruction. Obstruction is often caused by local or diffuse vulvar edema. Bartholin cysts are usually sterile.
Management: is conservative unless pressure symptoms occur due to size.
- **Bartholin abscess:** it may occur due to infection (mostly caused by E. coli and anaerobic Bacteroides species, and seldom due to gonococcus). **Management:** Outpatient treatment is I&D with placement of a Word catheter under local anesthesia. The balloon is inflated and left in place for a month to allow a drainage tract to form. Antibiotic treatment is usually not needed.

Procedures of the vulva during labor:

- Catheterization²
- Episiotomy³
- Anaesthetic infiltration

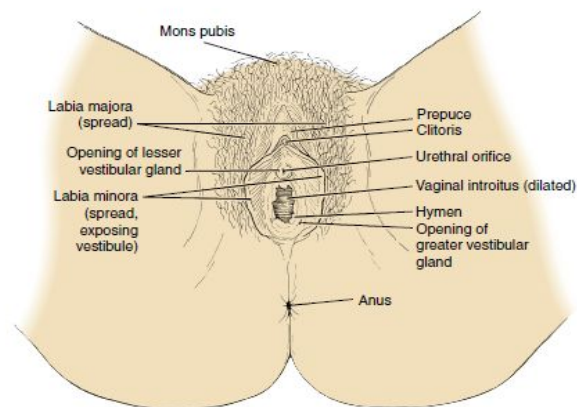


FIGURE 2.12 The female external genitalia, or vulva.

¹ Also called lesser vestibular glands or paraurethral glands.

² [Know when to do it ?](#)

³ Surgical incision of the perineum during parturition to reduce the possibility of tearing the perineal tissues. To do this, a local anesthetic (pudendal anesthesia) is injected into the perineum (the region between the anus and the vagina) and a small incision is made in the perineal skin. [Know how to avoid it?](#)

Internal reproductive Organs

1- The vagina⁴

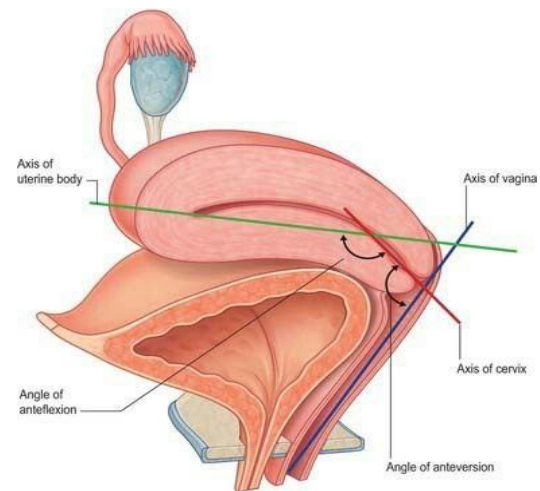
In vagina only know the epithelium and acidity.

- The covering epithelium of vagina is **non-keratinized squamous epithelium**, it's tough.
- The vagina is **acidic**. It has low PH= 4.5, so it's very difficult to get bacterial infections. This acidity is buffered by **menstrual cycle** so vagina becomes alkaline which makes it **prone to infections**. (ويسألونك عن المبيض قل هو أذى)

A Canal/tube extend from the vulva to the uterus.

All not mentioned by the doctor

- ❖ Runs upwards and backwards
- ❖ Walls lie in close contact, easily separated.
- ❖ The posterior vaginal wall "11.5 cm (4.5 in) " is longer than the anterior wall "7.5 cm"
- ❖ Cervix enters the vagina at a right angle.
- ❖ Four fornices: Anterior, posterior, and 2 lateral



Relations of the vagina:

Anterior:

- base of the bladder on upper ½ of vagina.

- Urethra in the lower ½ of vagina

Posterior:

Pouch of Douglas is located posterior to the posterior fornix of vagina

Rectum centrally

Anal canal in perineum

Perineal body⁵ inferiorly

Lateral:

ureters and uterine arteries

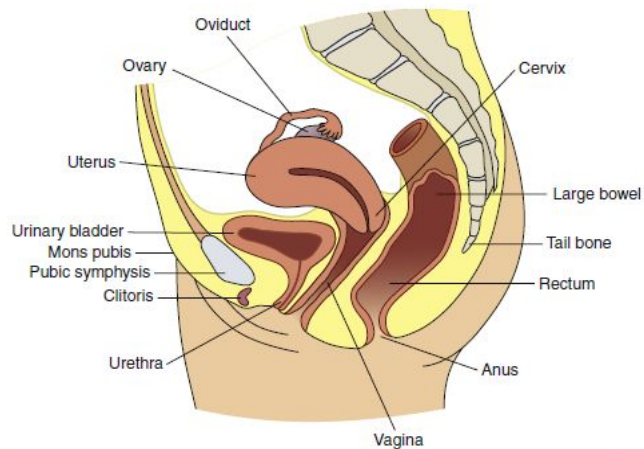


FIGURE 2.1 Side view of the female pelvic region showing some major components of the reproductive system.

2- Cervix

Forms the lower 1/3 of the uterus.

- ❖ Enters 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 os⁶ (it keeps the baby inside & opens during labor. In nulliparous external os is circular, whereas in multiparous women it's slit-like.)
- ❖ Cervical canal between the internal and external os. covered by columnar epithelium

⁴ Cells of the vaginal epithelium accumulate large amounts of glycogen (a sugar) under the influence of estrogen. As these cells die and are sloughed into the vaginal cavity, they release this glycogen. Certain bacteria present within the vagina then metabolize the glycogen to lactic acid, rendering the vaginal environment acidic. This acidic condition retards yeast (fungal) infection. The vaginal acidity also kills sperm. semen deposition into the vagina during coitus changes the vaginal environment to a more basic condition and allows sperm to survive and move up the female tract.


⁵ The perineal body (or central tendon of perineum) is a pyramidal fibromuscular mass in the middle line of the perineum at the junction between the urogenital triangle and the anal triangle

⁶ opening of the cervical canal to the uterine cavity is the internal cervical os, whereas the opening of the cervical canal into the vagina is the external cervical os.

❖ **Transformation zone vs squamous-columnar junction.**

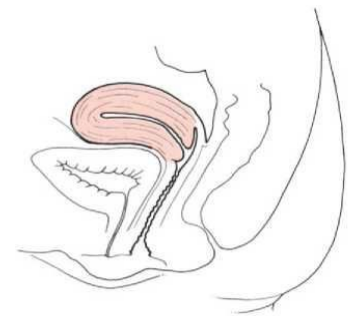
- **These two are NOT the same thing you have to Differentiate between them.**
- The squamocolumnar junction (SCJ) is defined as the junction between the squamous epithelium and the columnar epithelium. Its location on the cervix is variable. At birth and during premenarchal years, the SCJ is located at or very close to the (original SCJ). During reproductive age, the SCJ is located at variable distances from the external os. In a postmenopausal woman, the new SCJ is not visible and has receded into the endocervix.
- Transformation zone is an area between the original SCJ and the new SCJ where the columnar epithelium (ectropion⁷) has been replaced and/or is being replaced by the new metaplastic squamous epithelium.
- **Transformation zone is a very important part of cervical os. It's a common site of cervical malignancy, when taking a pap smear you have to include it.**

❖ Not mentioned by the doctor

❖ The cervix in pregnancy:	Late in pregnancy	❖ In labor:
<ul style="list-style-type: none"> - Rich blood supply – bluish coloration - Soft - Cervical glands – mucus plug “operculum” -a plug that fills and seals the cervical canal during pregnancy- 	softer and starts to dilate	<ul style="list-style-type: none"> - The longitudinal 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.

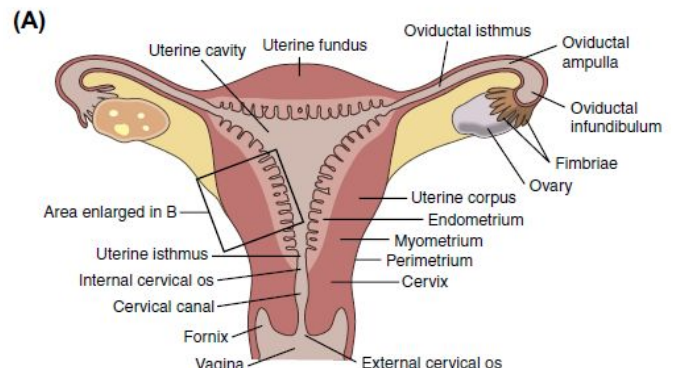
3-The Uterus

- ❖ The uterus lies in the true pelvis.
- ❖ Mostly **Anteverted**⁸ (A/V) and anteflexed⁹ (A/F) in position.
- ❖ The body of the uterus lies above the bladder
- ❖ Gross structures: • The cervix lower 1/3 • The isthmus • The cavity • **The corpus • The cornua. • The fundus**
- ❖ Layers: •Endometrium •Myometrium¹⁰ •Perimetrium - peritoneum



(a) Normal (anteflexed, anteverted)

Size	
length	• 7.5 cm length
wideness	• 5 cm wide
thickness	• 2.5 cm thick
weight	• 50 -75 gm



⁷ Cervical ectropion (or cervical eversion) is a condition in which the cells from the 'inside' of the cervical canal, known as glandular cells (or columnar epithelium), are present on the 'outside' of the vaginal portion of the cervix. The cells on the 'outside' of the cervix are called squamous epithelial cells. [Picture link](#)

⁸ angle b/w vagina and cervical canal

⁹ angle b/w junction of cervix and body of uterus

¹⁰ [We remove fibroid form this via myomectomy.](#)

Ovarian and uterine arteries meet at the **lateral side of uterus**, so any problem lateral to uterus cause heavy bleeding.

❖ The relationship between the ureter and uterine artery:

Uterine artery runs behind the peritoneum, cross transverse cervical ligament (Cardinal ligament) then it pass **anterior to and above** the ureter 1.5cm from lateral vaginal wall fornix.

❖ **Supports of cervix and uterus:** **MCQs !!!! Only these three ligaments support the uterus.**

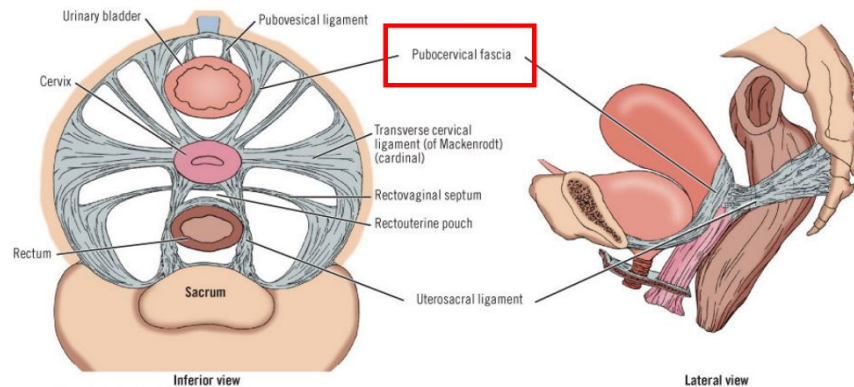
Cardinal ligaments

Pubocervical ligaments

Uterosacral ligaments

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

Broad & round ligament has NOTHING to do WITH SUPPORT OF UTERUS.



4- The Fallopian Tubes

Extend from the cornua of the uterus, travels towards the sidewalls of the pelvis. Then turns downwards and backwards. **Check Tubal patency in case of infertility**

- ❖ The tube lies in the upper margin of the broad ligaments
- ❖ Length 10 cm (4 in): 3 mm thick

The Fallopian Tubes	
Communicate	with the uterine cavity and perineal cavity
Parts	✓ Intramural ¹¹ ✓ Isthmus ✓ Ampulla ¹² ✓ infundibulum ✓ Fimbriae ¹³

5- The Ovaries

Lie in the **posterior wall of the broad ligament** at the fimbrial end of the fallopian tubes at the level of the pelvic brim. **Most ovarian cancers come from the Fallopian tubes**

Not mentioned by the doctor:

- ❖ Size: almond like = 3 x 2 x 1 cm
- ❖ Dull white colour, Corrugated surface
- ❖ Structure varies with woman's age.
- ❖ They lie in a fossa.

¹¹ Intramural (Interstitial) part is the part of the oviduct that is embedded within the uterine wall

¹² **Widest part, site of fertilization**

¹³ Fingerlike Projections at The edges of the infundibulum. **It catches ova from ovary.**

Support of ovaries

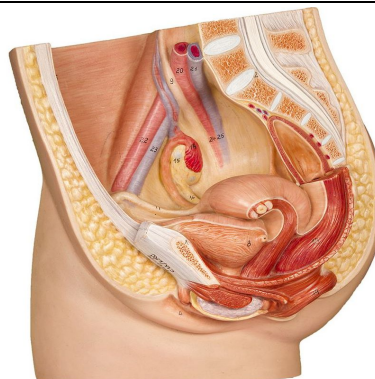
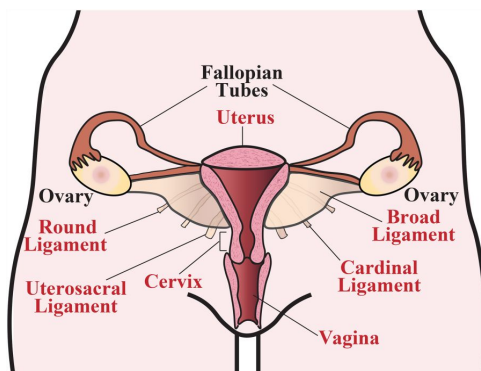
- 1) The **ovarian ligament** is a thin, rope-like support that attaches the ovary to the uterus.
- 2) The **suspensory ligament** attaches the lateral surface of the ovary to the pelvic wall. In addition to supporting the ovary, another important role of this ligament is to carry the blood vessels that supply nutrients and stimulatory hormones to the ovaries.
- 3) **The broad ligament (mesovarium)**¹⁴ is a thin sheet of connective tissue that covers the ovaries, uterus, and oviducts, stabilizing their position and anchoring them to the walls and floor of the pelvic cavity.

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

- Hematosalpinx is bleeding into the fallopian tubes
- Hydrosalpinx is fallopian tube filled with serous or clear fluid
- Pyosalpinx refers to a fallopian tube that is filled, and often distended, with pus.

Ligaments

Round ligaments Doesn't support the uterus; only supports the peritoneum	-Maintain uterus in Anteverted A/V + anteflexed A/F position -From the cornua of the uterus – pass downwards and insert in the tissue of the labia majora. -Round ligament is the analogue of spermatic cord in male, it pass through inguinal canal to labia majora. -Women in mid-trimester come with pain radiating to inguinal canal and genitalia? round ligament pain .
Broad ligaments	- Not true ligament but <u>folde of peritoneum</u> extend laterally from the uterus to the pelvic side walls. -The broad ligament may be divided into three subcomponents: <ul style="list-style-type: none"> ● Mesometrium – the <u>mesentery of the uterus</u>; the largest portion of the broad ligament ● Mesosalpinx – the <u>mesentery suspending Fallopian tube</u>. It extends between the fallopian tube and the ovary. ● Mesovarium – the <u>mesentery of the ovaries</u>.
Cardinal ligaments (transverse cervical ligament)	Inserted into the lateral portion of the cervix and vagina. It prevents prolapse.
Pubocervical ligament	firm bands of connective tissue from <i>post surface of pubis</i> → <i>cervix of uterus</i>
Uterosacral ligament	firm fibromuscular bands of pelvic fascia from <i>lower end of sacrum</i> → <i>to cervix, upper end of vagina</i> <u>*palpable in rectal exam</u>
Ovarian ligament	- Ovarian ligament is a fibrous ligament that connects the ovary to the lateral surface of the uterus.



¹⁴ fold of peritoneum that connects *ant surface of ovary w/ post layer of broad ligament*

The doctor didn't talk about this and said no need to know the blood supply

	Blood Supply	Venous drainage	Lymphatic Drainage	Nerves
Vulva	Pudendal artery from the femoral artery	corresponding vein	-Inguinal glands -External iliac glands	Branches of the pudendal nerve, perineal nerve (T12, L1-2, S2-4) ¹⁵
Vagina	Vaginal artery, uterine artery , middle hemorrhoidal, inferior vesical, pudendal branch of the internal iliac a.	corresponding veins	inguinal, internal iliac, sacral glands	Sympathetic (hypogastric plexus) and parasympathetic (S2-S4)
Cervix	Uterine artery		Internal iliac, sacral glands	-
Uterus	Fundus – ovarian artery Body – uterine artery, directly from internal iliac artery ¹⁶	Uterine venous plexus	Internal and external iliac gland Inguinal /Sacral gland	Sympathetic (hypogastric and ovarian plexus) and Parasympathetic (S2-S4)
Fallopian Tubes	ovarian artery & Uterine artery	corresponding veins	-	-
Ovaries	Ovarian artery	Right ovarian vein drains to IVC Left ovarian vein drains to left renal	Lumbar glands	Ovarian plexus

2. Female Pelvis

The Normal Female Pelvis

The pelvis articulates 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** “hip bones”

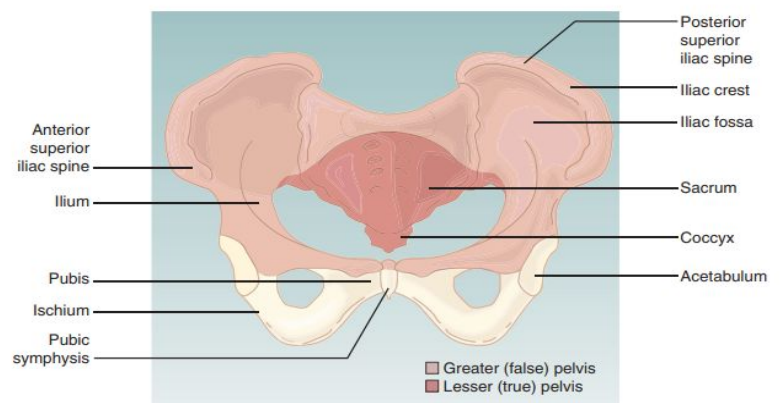


FIGURE 3-12 The bony pelvis.

¹⁵ Vulva is innervated by [pig] : Pudendal, ilioinguinal, and genitofemoral nerves.

¹⁶ Ovarian and uterine arteries meet at the **lateral side of uterus**, so any problem lateral to uterus cause heavy bleeding.

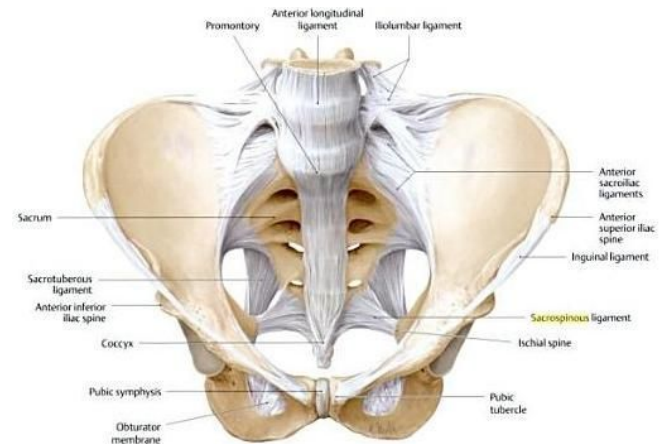
Pelvic bones	
The Sacrum	<ul style="list-style-type: none"> • Triangular shape, 4 pairs of holes (for passage of nerves, blood vessels and lymph) • The hollow of the sacrum – smooth and concave • The ala of the sacrum - give the appearance of wings • The sacral promontory → is the centre point of the upper border of the first sacral vertebrae. • The sacral canal opens at the level of 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 in labour is Pain relief from perineal distention in stage 2 of labor and involves sacral roots, S2 to S4
The Coccyx	<ul style="list-style-type: none"> • 4 Fused coccygeal vertebrae • Triangular shape • Articulate with the sacrum • Muscles are attached to its tip.
Right & Left Innominate Bones	<p>Each made of 3 separate parts meet in the acetabulum.</p> <ul style="list-style-type: none"> • Ilium: upper part is iliac crest (anterior and posterior, superior iliac crest) • Ischium: ischial tuberosity, 2 cm above is the ischial spines¹⁷. • Pubis: both meet the pubic body fused by cartilage “symphysis pubis”

PELVIC JOINTS

1. The two sacroiliac joints
2. The symphysis pubis
3. The sacrococcygeal joint

Pelvic Ligaments

1. Sacroiliac ligament = **strongest in the body**
2. Sacrotuberous ligament
3. Sacrospinous ligament
4. Inguinal ligament



Division of Pelvis: brim (inlet), cavity, outlet “diamond shaped with the inferior remi”.

It forms the curved canal through which the fetus pass during labour.

1. **The Brim or Inlet**

The brim divides the pelvis into the parts:	
False¹⁸	lies above the pelvic brim “not important in obstetrics”
True¹⁹	what lies below the pelvic brim

The inlet is Round in shape. Bounded anteriorly by the pubis “pubic crest”, Laterally by iliopectineal lines, Posteriorly by ala and sacral promontory.

¹⁷ Ischial spine is an important landmark for women in labor.

¹⁸ The only obstetric function of false pelvis is to support pregnant uterus

¹⁹ The true pelvis is a bony canal and is formed by sacrum and coccyx posteriorly, and by ischium and pubis laterally and anteriorly.

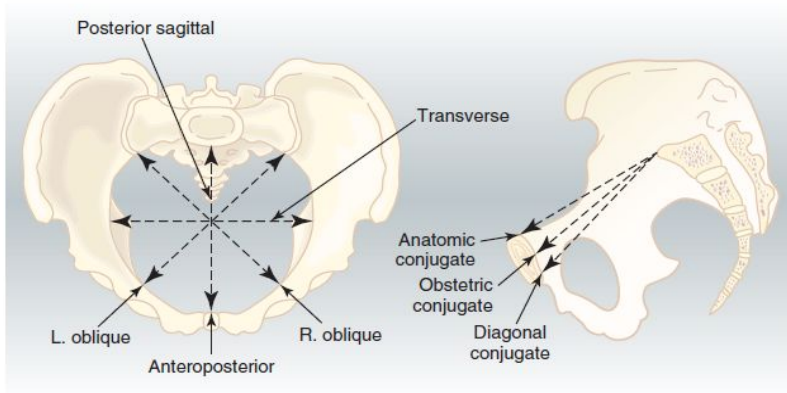
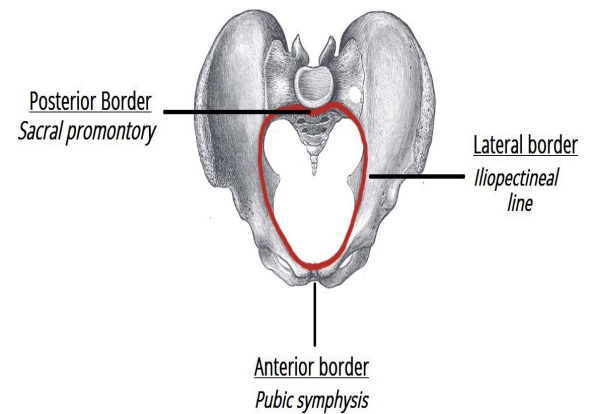


FIGURE 8-3 Pelvic inlet and its diameters.



Pelvic Inlet has eight points as demonstrated “figure 8-3”, formed by 5 important diameters:

1. The **anteroposterior diameter** is described by one of two measurements:
 - a. The **true conjugate (anatomic conjugate)** is the anatomic diameter and extends from the **middle of the sacral promontory** to the **superior surface of the pubic symphysis** “11.5 cm”.
 - b. The **obstetric conjugate** represents the **actual space available** to the fetus and extends from the **middle of the sacral promontory** to the closest point on the convex **posterior surface of the symphysis pubis** “11 cm”.
 - c. The Diagonal Conjugate²⁰
2. The **transverse diameter** is the widest diameter. Measured by the **widest** distance **between the iliopectineal lines**.
3. Two **oblique diameters** (right or left) that extends from the **sacroiliac joint** to the **opposite iliopectineal eminence**.
4. The **posterior sagittal diameter** extends from the **anteroposterior and transverse intersection** to the **middle of the sacral promontory**.

2. Pelvic Cavity (true pelvis)

- Extends from the **brim above** to the **pelvic outlet below**
- The posterior wall (11 cm): formed by hollow of the sacrum
- The anterior wall (3.8 cm): is formed by the symphysis pubis and obturator foramen
- The lateral walls: sacrosiatic ligament and ischial spines
- Interspinous Diameter is the **diameter** between the two ischial spines, considered the shortest diameter in the true pelvis.

²⁰ the anteroposterior dimension of the inlet that measures the clinical distance from the promontory of the sacrum to the inferior margin of the pubic symphysis, **measured manually per vagina or by ultrasonography**

3. The pelvic outlet

Anatomical outlet	Obstetrical outlet
<p>The anatomical outlet is formed by fixed points useful landmarks for taking pelvic measurement.</p> <p>Bounded anteriorly by pubic Arch</p> <p>Laterally by sacrosiatic ligaments & Ischial tuberosities</p> <p>➤ Posteriorly by tip of Coccyx</p>	<p>The landmarks are:</p> <ul style="list-style-type: none"> • The lower border of the symphysis pubis • The ischial spines • The sacrospinous ligament • The lower border of the sacrum.

Pelvic outlet is formed by **two** triangular planes with a common base **at the level of the ischial tuberosities.**

- The **anterior triangle** is bordered by the **subpubic angle at the apex**, the **pubic rami on the sides**, and the **bituberous diameter at the base.**
- The **posterior triangle** is bordered by the **sacrococcygeal joint at its apex**, the **sacrospinous ligaments on the sides**, and the **bituberous diameter at the base.**

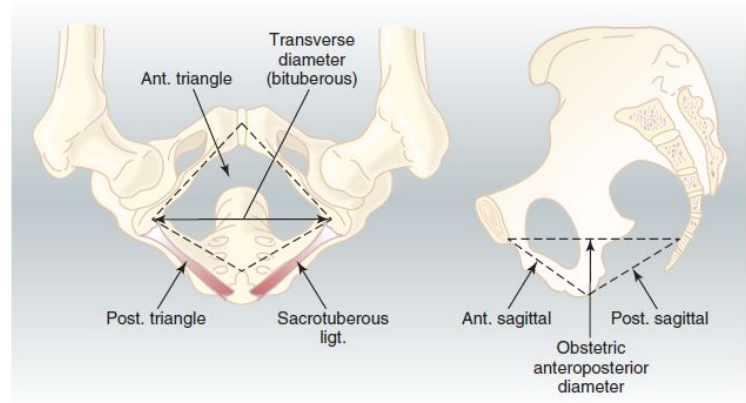


FIGURE 8-4 Pelvic outlet and its diameters.

The pelvic outlet has four important diameters:

1. The **anatomic** anteroposterior diameter extends from the inferior margin of the pubis to the **tip of the coccyx.**
2. The **obstetric** anteroposterior diameter extends from the inferior margin of the pubis to the **sacrococcygeal joint.**
3. The **transverse (bituberous) diameter** extends between the inner surfaces of the ischial tuberosities.
4. The **posterior sagittal diameter** extends from the middle of the transverse diameter to the sacrococcygeal joint.

In short, the pelvis is divided into 4 planes:

1. **The pelvic inlet** “Through which the fetal head enters the pelvis **in transverse position**”
2. **The plane of greatest diameter** “largest part of pelvic cavity, the fetal head rotates to the anterior position in this plane”
3. **The plane of least diameter** “the most important from clinical standpoint because most instances of arrest of descent occur at this level - level of ischial spines-”
4. **The pelvic outlet** “the site of low pelvic arrest”

Average measurements of pelvis

	Brim	Cavity	Outlet
Anteroposterior	11.5 cm	12.0 cm	12.5 cm
Transverse	13.0 cm	10.5 cm	11.0 cm

Pelvis shapes:

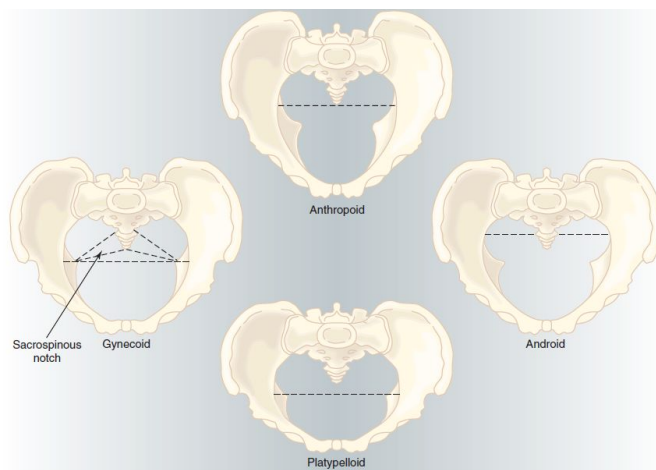
Gynecoid	Anthropoid	Android	Platypelloid -flat-
50%	25%	20%	5%

Gynecoid shape is the classical female pelvis, the inlet is a round oval with largest diameter transverse. It has straight sidewalls, well curved sacrum and spacious subpubic arch with a 90 degree. Assessment: spacious for the fetal head to pass through

Android is the typical male pelvis, the inlet is triangular with convergent side walls, shallow sacral curve. Assessment: pelvis is restricted, Arrest of descent in labour is common

Anthropoid shape resembles that of anthropoid apes. The inlet is larger anterior-posteriorly with side walls that converge. Subpubic arch is narrow. Assessment: The fetal head engages anterior-posteriorly, often in occiput posterior position, making delivery difficult.

Platypelloid shape is like a flattened gynecoid pelvis. The inlet is an elongated transverse oval. It has straight sidewalls with deep sacral curve and wide subpubic arch. Assessment: The fetal head engages transversely and delivers occiput transverse position.

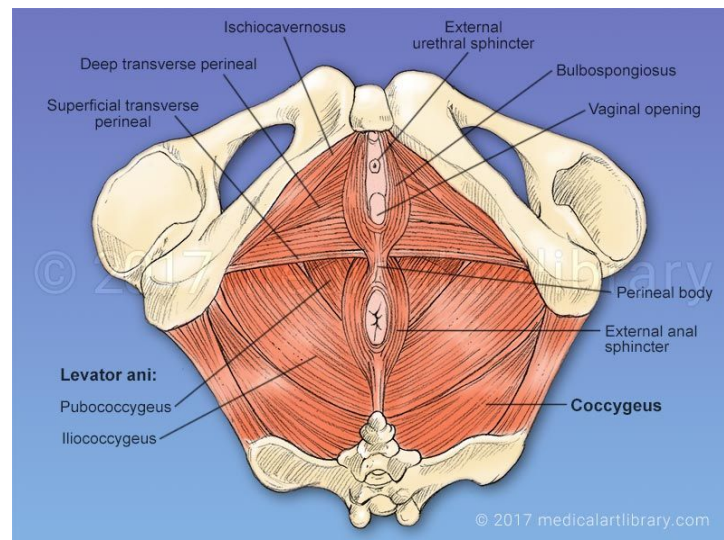


The Pelvic Floor²¹ Not mentioned by the doctor

Helpful videos: [Pelvic Floor Part 1](#)

[Pelvic Floor Part 2](#)

- ❖ 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**
- ❖ The pelvic floor is formed by the bowl- or funnel-shaped pelvic diaphragm, which consists of the **coccygeus and levator ani muscles** and the fascias (L. fasciae) covering the superior and inferior aspects of these muscles. The levator ani consists of three parts: Puborectalis, Pubococcygeus and Iliococcygeus, all have their insertion around the coccyx.



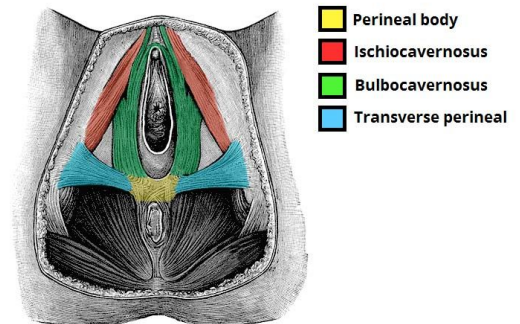
²¹ The pelvic floor is formed by the bowl- or funnel-shaped pelvic diaphragm, which consists of the coccygeus and levator ani muscles and the fascias covering the superior and inferior aspects of these muscles. The pelvic diaphragm lies within the lesser pelvis, separating the pelvic cavity from the perineum, for which it forms the roof.

Perineum

- ❖ The perineum refers to a shallow compartment of the body (perineal compartment) bounded by the pelvic outlet and separated from the pelvic cavity by the fascia covering the inferior aspect of the pelvic diaphragm, formed by the levator ani and coccygeus muscles. Perineum is divided into: urogenital triangle anteriorly and anal triangle posteriorly.
- ❖ There are *six* layers of tissue:
 1. An outer covering of skin
 2. Subcutaneous fat
 3. Superficial muscles enclosed in fascia:
 - 1) Transverse perinei 2) Bulbocavernosus (bulbospongiosus) 3) Ischiocavernosus
 4. Deep muscles enclosed in fascia:
transversus perinei profundus, sphincter urethrae membranaceae
 5. Pelvic fascia, thickened to form pelvic ligaments:
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) pubo-rectalis 3) pubo- coccygeus
 6. Peritoneum

Perineal body Not mentioned by the doctor

- ❖ Lies between the **vaginal and rectal canals**
- ❖ triangular, the base is the skin and the apex pointing upward each side is 3.8 cm in length
- ❖ Perineal body attaches three layers of tissue
 1. outer covering of skin
 2. superficial pelvic floor:
 - bulbo-cavernous •transverse perinei
 3. deep pelvic floor muscle.



© teachmeanatomy
This is an Approximate Anatomy Diagram

Episiotomy, types & indications: **important**

1-Midline Episiotomy: the incision is made in the middle of the vaginal opening, straight down toward the anus. The advantages of a midline episiotomy include easy repair and improved healing. The main disadvantage of a midline episiotomy is the increased risk for tears that extend into or through the anal muscles..

2-Mediolateral Episiotomy: the incision begins in the middle of the vaginal opening and extends down toward the buttocks at a 45-degree angle. The primary advantage of a mediolateral episiotomy is that the risk for anal muscle tears is much lower. However, there are much more disadvantages associated with this type of episiotomy, including: more severe pain and difficult repair

Indications:

- fetal weight greater than 4 kg,
- operative delivery,
- and shoulder dystocia

3. Fetal Skull

Fetal Skull²²

- Skull is divided into regions
 - **The vault** : From orbital ridges to the nape of neck. **formed from membrane** and not cartilage.
 - **The face** : From orbital ridges to junction of chin & neck
 - **The base**
- There are **5** points – ossification centres. Calcification begins as early as 5 weeks after conception. If a premature baby is born, there is a risk of intracranial damage!!!! *B/c Skull bones are not well ossified in preterm baby.*
- **Bones:** *These are the important bones in obstetrics, temporal bone we don't ask you about it.*
 - **Two frontal bones,** ➢ **Two parietal bones,**
 - **One occipital bone.**
 Bones are separated by? Sutures
- **Suture**, an area of membrane which has **not ossified**
 - **Lambdoidal suture** ➢ **Sagittal suture**
 - **Coronal suture** ➢ **Frontal suture.**

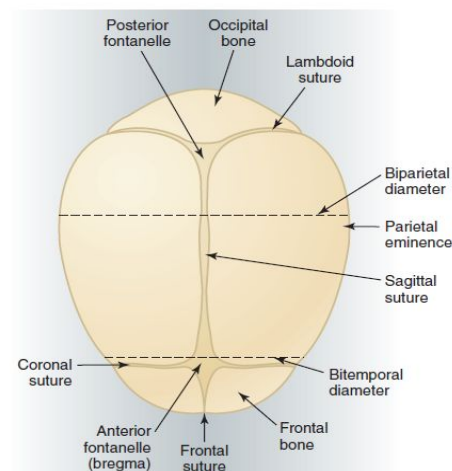
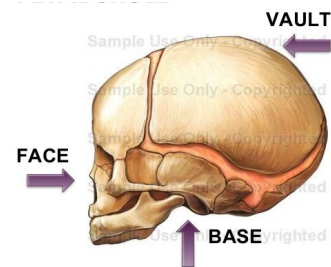


FIGURE 8-1 Superior view of the fetal skull showing the sutures, fontanelles, and transverse diameters.

Fontanelles very important landmarks where two or more sutures meet.

- **Anterior fontanelle** : diamond in shape where sagittal, frontal and coronal sutures meet. *It looks like Mercedes logo*
- **Posterior fontanelle** : Y or T shaped where lambdoidal and sagittal sutures meet. *When the baby is delivered, the posterior fontanelle is already closed, while the anterior fontanelle closes later.*

AREAS OF THE SKULL

1. Glabella: the bridge of the nose -the elevated area between the orbital ridges-
2. Sinciput: the forehead
3. Bregma: the anterior fontanelle
4. Vertex
5. Lambda: the posterior fontanelle
6. Occiput
7. Suboccipital area
8. Mentum: the chin
9. Nasion: the root of the nose

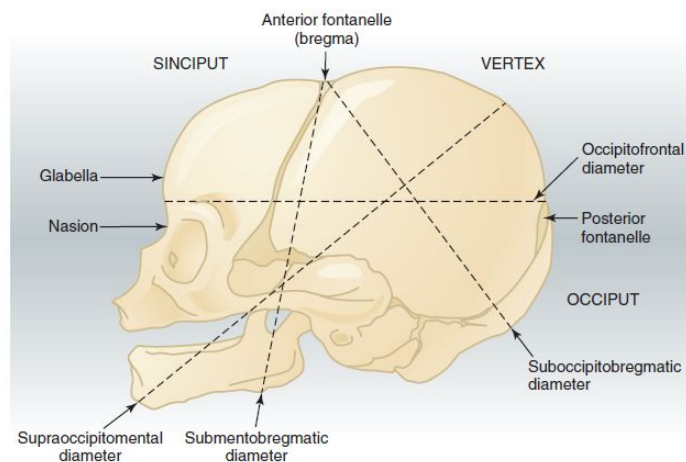


FIGURE 8-2 Lateral view of the fetal skull showing the prominent landmarks and the anteroposterior diameters.

²² The fetal skull consists of a base and a vault (the cranium). The base of the skull has large, ossified, firmly united, and noncompressible bones. This serves to protect the vital structures contained within the brainstem. The cranial bones at birth are thin, weakly ossified, easily compressible, and interconnected only by membranes. These features allow them to overlap under pressure and to change shape to conform to the maternal pelvis, a process known as **molding**.

DIAMETERS OF FETAL SKULL

Suboccipital-bregmatic (9.5cm)	the presenting anteroposterior diameter when the head is well flexed , as in an <i>occipitotransverse</i> or <i>occipitoanterior</i> position.
Occipito frontal (11cm)	the presenting anteroposterior diameter when the head is deflexed , as in an <i>occipitoposterior</i> presentation
Mentovertical or Supraoccipitomenta (13.5cm)	the presenting anteroposterior diameter in a brow presentation ²³ and the <u>longest</u> anteroposterior diameter of the head; it extends from the vertex to the chin.
Submento-bregmatic (9.5cm)	the presenting anteroposterior diameter in face presentations .(extended head) ²⁴
Biparietal (9.5cm)	the largest transverse diameter ; it extends between the parietal bones

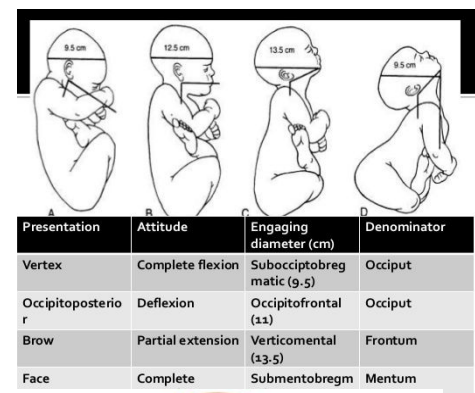
CIRCUMFERENCES OF THE FETAL SKULL

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

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

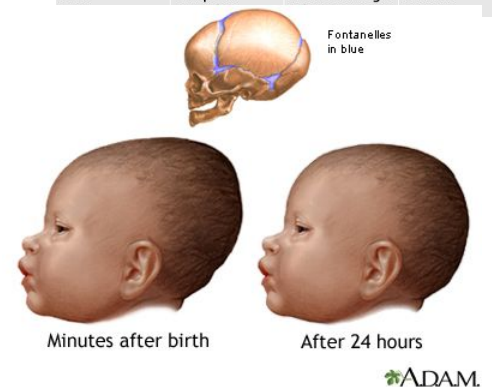
Malpresentation: Any presentation other than vertex

- **The normal position at delivery is occipito-anterior.**
- What's the landmark in vertex? Occipital bone
- What's the engaging diameter in vertex? Suboccipito-bregmatic. How long is it? 9.5 cm
- What's the landmark in face presentation? Mentum
- What's the engaging diameter in face presentation? Submento-bregmatic. How long is it? 9.5 cm.
- What's the engaging diameter in brow presentation? Mento-vertical. How long? 13.5 cm
- The commonest cause of breech delivery is preterm delivery.



Effect of Labour and delivery

- Molding: **Overlap of skull bones**. Moulding can decrease the biparietal diameter by ~1 cm.²⁵
- Caput succedaneum: **swelling of an infant's scalp**, which appears as a lump or bump on the head shortly after delivery
- Cephalhematoma, **-usually benign swelling formed from a hemorrhage** beneath the periosteum of the skull and occurring especially over one or both of the parietal bones in newborn infants. As Effect of **trauma** sustained during delivery **or as a consequence of instrumental delivery** with ventouse or forceps



²³ In brow presentation: We deliver by C/S.

²⁴ In face presentation: if the mentum is posterior we deliver by C/S. But if the mentum is anterior we can deliver vaginally.

²⁵ During a head first birth, pressure on the head caused by the tight birth canal may 'mold' the head into an oblong rather than round shape. It is a common occurrence that usually disappears after a few days. [Picture](#)

Placenta and fetal circulation

Not explained by the doctor

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



Maternal surface:	<ul style="list-style-type: none">• 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 /'uo,'
Fetal surface:	<ul style="list-style-type: none">• 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

Abnormalities of placental development

- **Placenta succenturiata:** An extra placenta separate from the main placenta
- **Placenta bipartita:** placenta duplex in which the two parts are separated by a constriction.
- **Placenta circumvallata:** the chorionic plate, which is the part of the placenta that's on the fetal side, is too small. That causes the membranes to double back on the fetal side and around the edges
- **Placenta velamentosa:** a placenta in which the umbilical cord is attached to the adjoining membranes, with the umbilical vessels spread out and entering the placenta independently.

Placenta succenturiata/ Placenta velamentosa and Vasa previa²⁶: **Antepartum Haemorrhage**

Umbilical cord

- At full term: 40-50 cm long, 1.5 cm in diameter
- Twisted in appearance. Two umbilical arteries and One umbilical vein
- **Wharton jelly:** A gelatinous substance made up of mucopolysaccharides (hyaluronic acid and chondroitin sulfate) that provides insulation and protection within the umbilical cord. Stem cells are present in Wharton's jelly, as well as in umbilical cord blood.
- **Abnormal insertion of the cord:**
 - Battledore insertion²⁷
 - Velamentous insertion²⁸

²⁶ a condition in which fetal blood vessels cross or run near the internal opening of the uterus. These vessels are at risk of rupture when the supporting membranes rupture, as they are unsupported by the umbilical cord or placental tissue. The unprotected vessels may rupture at any time during pregnancy, causing fetal hemorrhage and death.

²⁷ In Battledore placenta, the umbilical cord is attached to the placental margin. AKA marginal insertion

²⁸ In velamentous cord insertion, the umbilical cord inserts into the fetal membranes (choriamniotic membranes), then travels within the membranes to the placenta (between the amnion and the chorion). The exposed vessels are not protected by Wharton's jelly and hence are vulnerable to rupture.

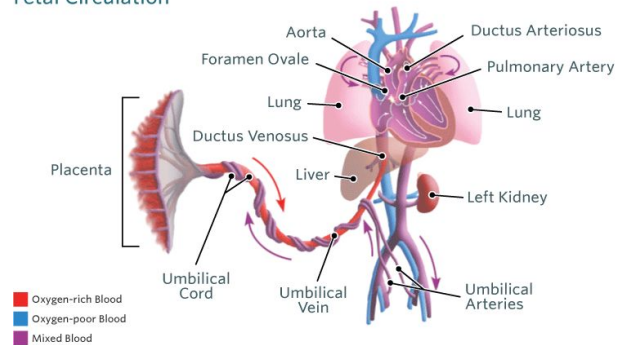
Fetal circulation

Highly recommended:

[Fetal circulation right before birth](#)

[Baby circulation right after birth](#)

Fetal Circulation



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

In the fetus, the circulation is a parallel system with the cardiac outputs from both **the right and left ventricles** directed primarily to **different** vascular beds.

1- **The umbilical vein**, carrying oxygenated blood from the placenta (o₂ saturation 70-80%) to the fetal body, enters the portal system. A portion of this blood passes through the hepatic microcirculation, but the majority of the blood bypasses the liver through the **ductus venosus**, which directly enters the inferior vena cava, which also receives the unsaturated venous return from the lower body.

2- Approximately one-third of blood returning to the heart from the inferior vena cava preferentially streams across the **foramen ovale** (through crista dividens) into the left atrium → left ventricle → ascending aorta → brain and upper body

Most of the blood returning via the inferior vena cava enters the right atrium, where it mixes with the unsaturated blood returning via the superior vena cava → right ventricle → pulmonary artery → **ductus arteriosus** → descending aorta → lower body. 10% of it goes through the pulmonary artery to the lung. It then passes into the umbilical arteries (branches of left and right internal iliac arteries)

In short,

- Right ventricle will pump the blood through pulmonary artery → ductus arteriosus → descending aorta → lower body
- Left ventricle will pump the blood to ascending aorta → aortic arch → brain and the upper body

TABLE 6-6

COMPONENTS OF THE FETAL CIRCULATION

Fetal Structure	From/To	Adult Remnant
Umbilical vein	Umbilicus/ductus venosus	Ligamentum teres hepatis
Ductus venosus	Umbilical vein/inferior vena cava (bypasses liver)	Ligamentum venosum
Foramen ovale	Right atrium/left atrium	Closed atrial wall
Ductus arteriosus	Pulmonary artery/descending aorta	Ligamentum arteriosum
Umbilical artery	Common iliac artery/umbilicus	Superior vesical arteries; lateral vesicoumbilical ligaments

Data from Main DM, Main EK: *Obstetrics and gynecology: a pocket reference*, Chicago, 1984, Year Book, p 34.

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

1. **Ductus arteriosus**: shunts mildly oxygenated blood from pulmonary artery to descending aorta

2. **Ductus venosus**: shunts highly oxygenated blood from umbilical vein to the IVC

3. **Foramen ovale**: shunts highly oxygenated blood from right atrium to left atrium

- **Cardiovascular system major variants are explained by:**

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

- **What maintains patency of ductus arteriosus in utero?**

High pulmonary vascular resistance maintains the right-left shunt through the ductus arteriosus & the relaxant action of a prostaglandin, most probably prostaglandin E₂

Blood circulation after birth

1. **The closure of the shunts** (Ductus arteriosus & Foramen ovale) completes the transition of fetal circulation to newborn circulation
2. **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 ovale.
3. **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.



1) Fetal circulation is designed to push full oxygenated blood to fetal vital organs. Which one of the following is a characteristic of fetal circulation?

- A- Blood is shifted from right atrium to left atrium through the foramen ovale.
- B- Fetal lung actively participate in fetal blood oxygenation
- C- Fetal hemoglobin has a lower affinity to oxygen than maternal hemoglobin
- D- Umbilical arteries carry the oxygenated blood from placenta to fetus.

2) 40 year old lady had vaginal delivery she complains of postpartum hemorrhage. After 3 hours you decide to ligate. what is the artery?

- A. Internal iliac
- B. External iliac
- C. Pudendal
- D. Vaginal

3) The most affected ligaments in uterine prolapse:

- A-Broad
- B-Cardinal
- C-Round

Answers: 1) a 2) a 3) b