GUS..

Lecture (4)

Radiology of Urinary System & Anatomy of Pelvis

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ILOs

1.Understand the standard anteroposterior radiograph, intravenous and retrograde pyelography.

2. Understand the greater and lesser pelvis..

3. Describe the pelvic inlet and outlet.

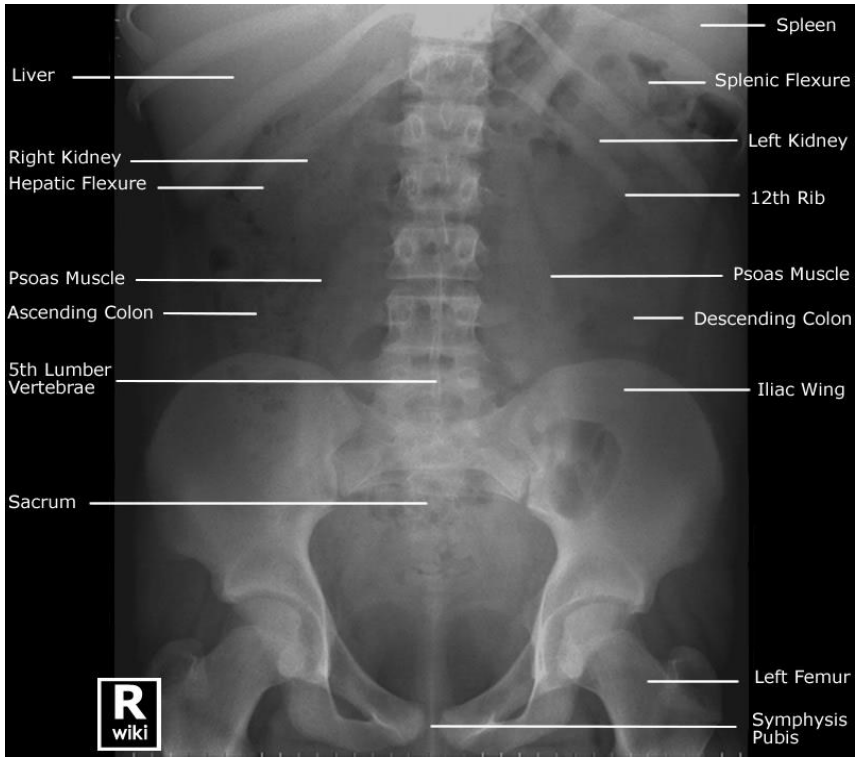
4. Describe the sex differences of the pelvis.

5. Describe the muscles of the lesser pelvis.

Radiographic Appearances of the Urinary Tract

Kidneys:

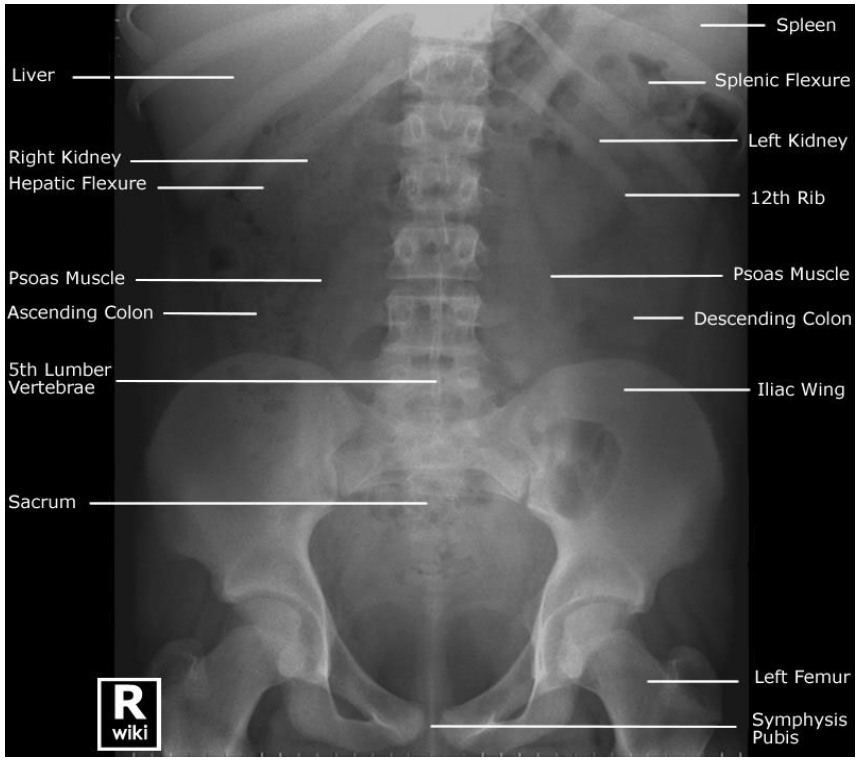
- The kidneys are visible on a standard anteroposterior radiograph of the abdomen (Plain X-Ray) because the perirenal fat surrounding the kidneys produces a transradiant line.
- Gives us quick diagnosis of renal colic (used in emergency department).
- Good evaluation of radio-opaque stones.



Radiographic Appearances of the Urinary Tract

Calyces, Renal Pelvis, and Ureter:

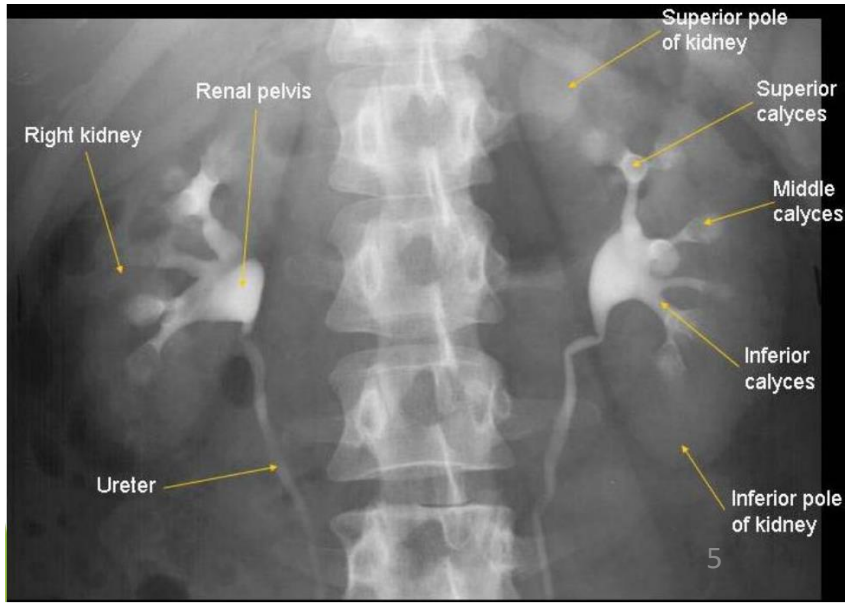
- Calyces, the renal pelvis, and the ureter are not visible on a standard radiograph.
- The lumen can be demonstrated by the use of radiopaque compounds in **Intravenous pyelography or Retrograde pyelography.**



Radiographic Appearances of the Urinary Tract

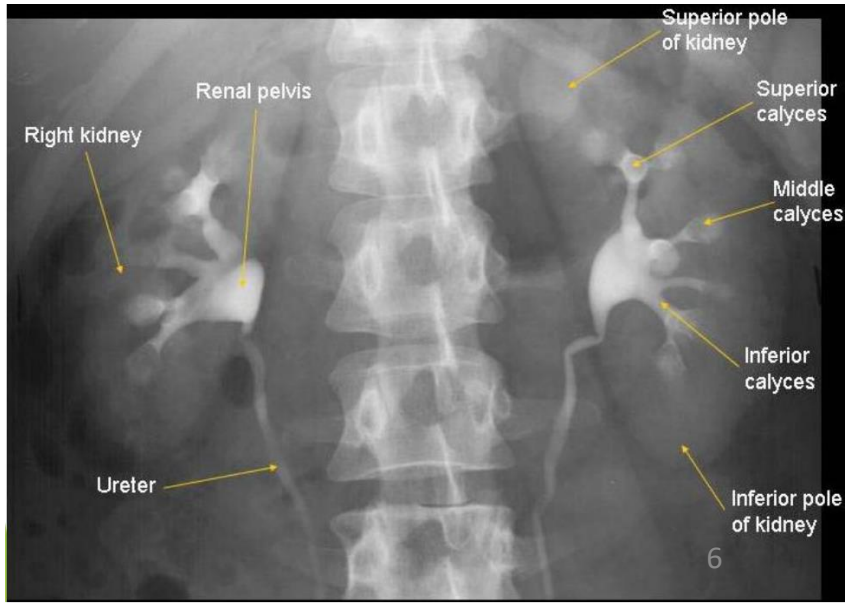
With Intravenous pyelography (IVP):

- It is **an X-ray exam that uses an injection of contrast material** to evaluate your kidneys, ureters and bladder.
- Contrast (an iodine-containing compound) is injected into a subcutaneous arm vein.
- It is excreted by the kidney and urinary system so produce an outline of the calyces and the ureter opaque to x-rays.
- When enough of the opaque medium has been excreted, the bladder is also revealed.



With Intravenous pyelography (IVP):

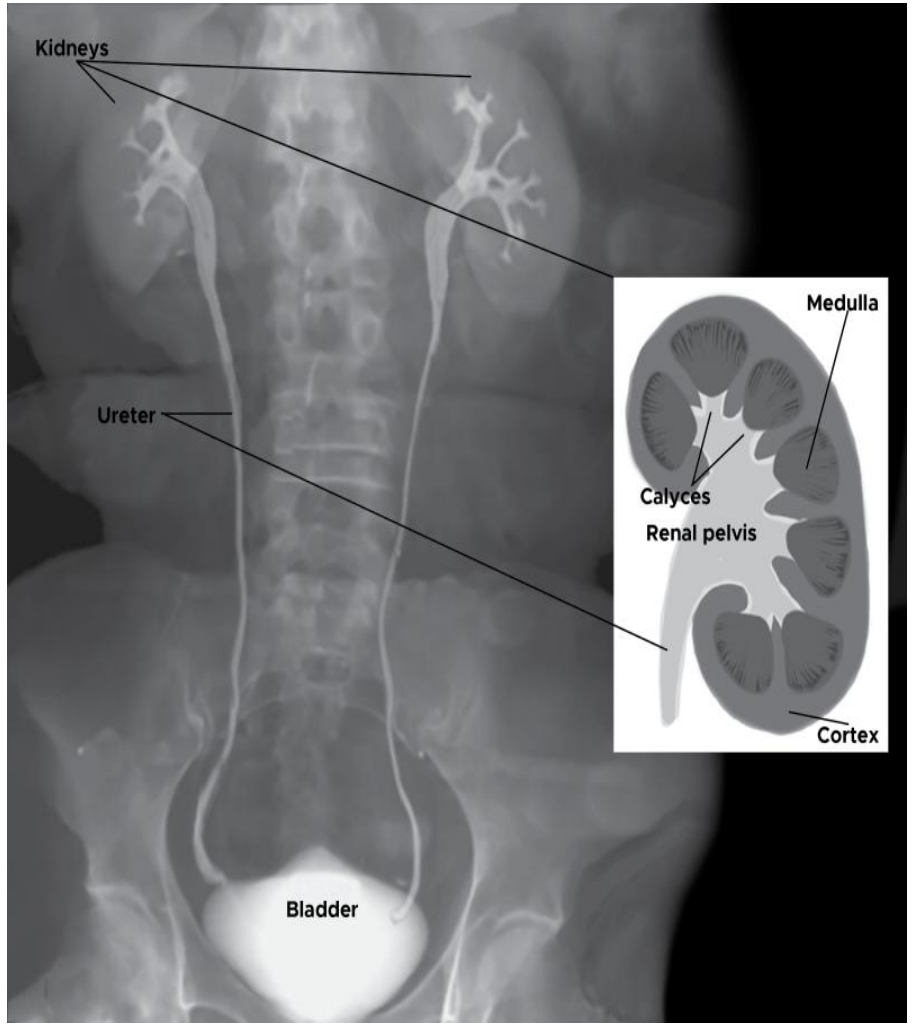
- **A series of x-ray images are taken** at different times.
- **It allows us to see** the parts of urinary tract and how well they work.
- **Provides** functional and anatomical information.
- **This test can help with diagnosis of problems** such as kidney stones, urinary tract tumors or congenital anomalies.



Radiographic Appearances of the Urinary Tract

With Retrograde Pyelography:

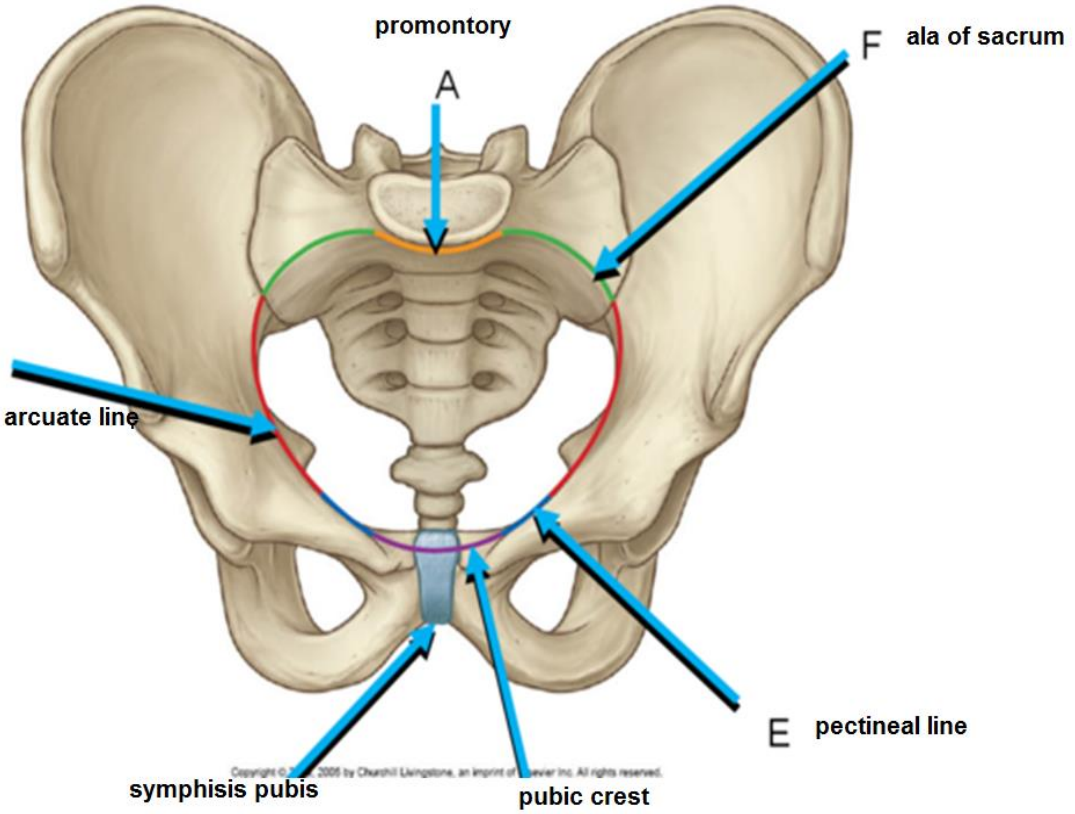
- It is an imaging study of the urinary tract using X-ray technology by retrograde injection of radiopaque material through the ureter.
- It is an alternative to intravenous pyelography when a patient have allergy to contrast agents.
- The test involves placing a flexible catheter into the ureter through a cystoscopy, injecting an iodine-based contrast dye through the ureter and up to the kidney and taking several x-rays.



Pelvis

The bony pelvis is composed of the following:

- Two hip bones: form the anterior and lateral walls.
- Sacrum and coccyx: form the posterior wall.



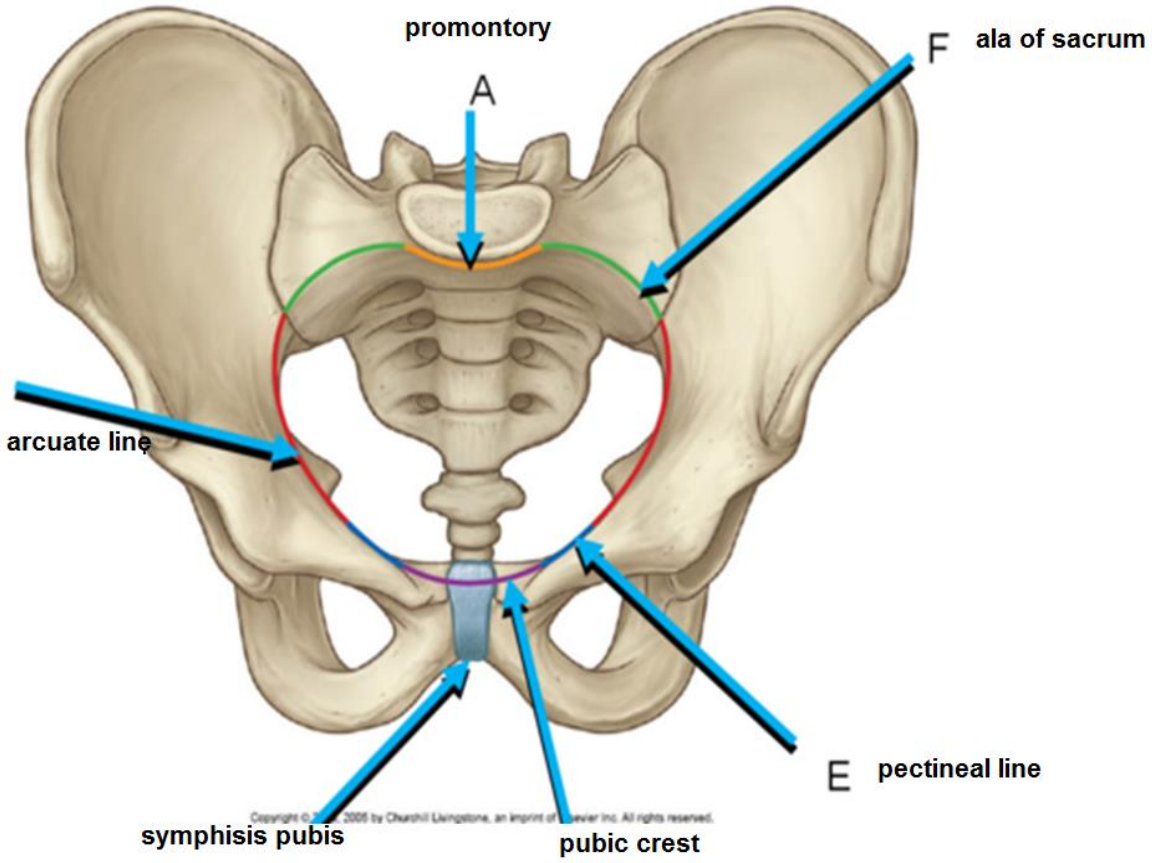
The pelvis is divided into 2 parts:

- **Greater or false pelvis:** Lies above the level of the pelvic brim (Pelvic inlet).
- **Lesser or true pelvis:** Lies below the pelvic brim.

Lesser (true) Pelvis

Boundaries of lesser pelvis:

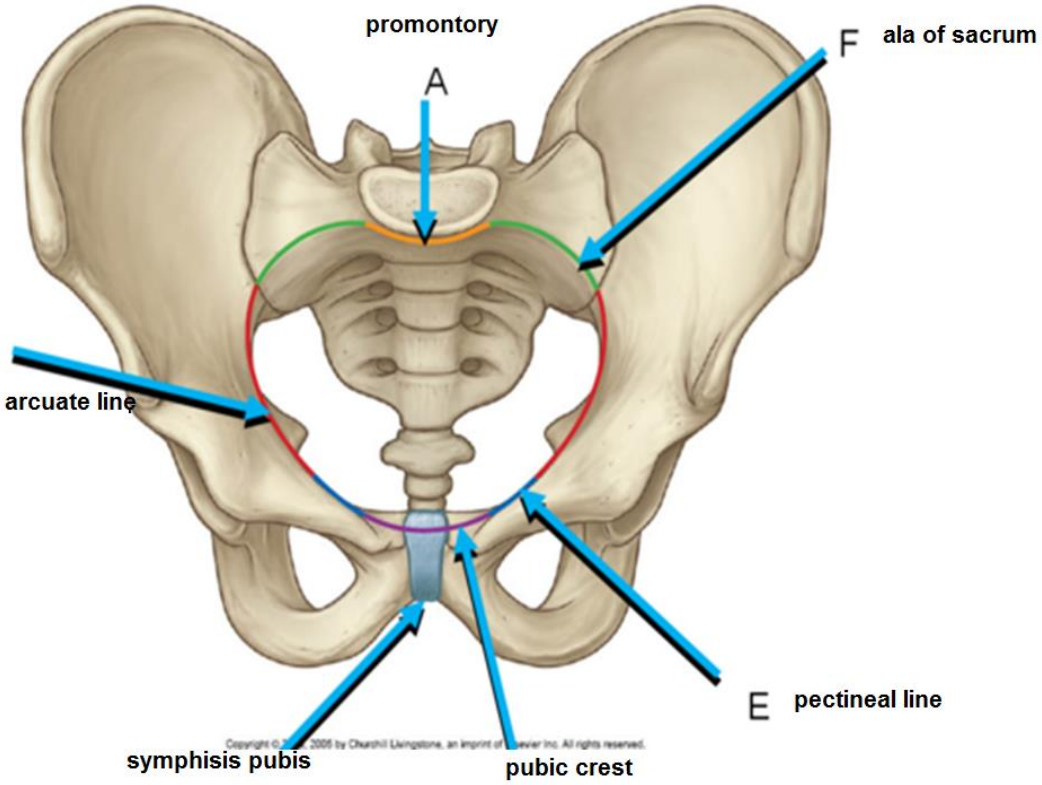
- **In front and below:** Pubic symphysis, bodies of the 2 pubic bones and the 2 pubic rami.
- **Behind and above:** Concave pelvic surface of the sacrum & coccyx.
- **On each side:** Pelvic surfaces of the ischium and ilium.
- **Its cavity has an inlet and an outlet.**



Pelvic Inlet

❑Boundaries:

- **Posteriorly**: Promontory &ala of the sacrum.
- **Anteriorly and on each side**: Pubic crest, Pectineal line & Arcuate line of the ilium.



❑Diameters of the inlet:

1- Antero – posterior (true conjugate) diameter:

- From the midpoint of the sacral promontory to the upper border of the symphysis pubis.
- It is (**11 cm**) in the female, and (**10 cm**) in the male.

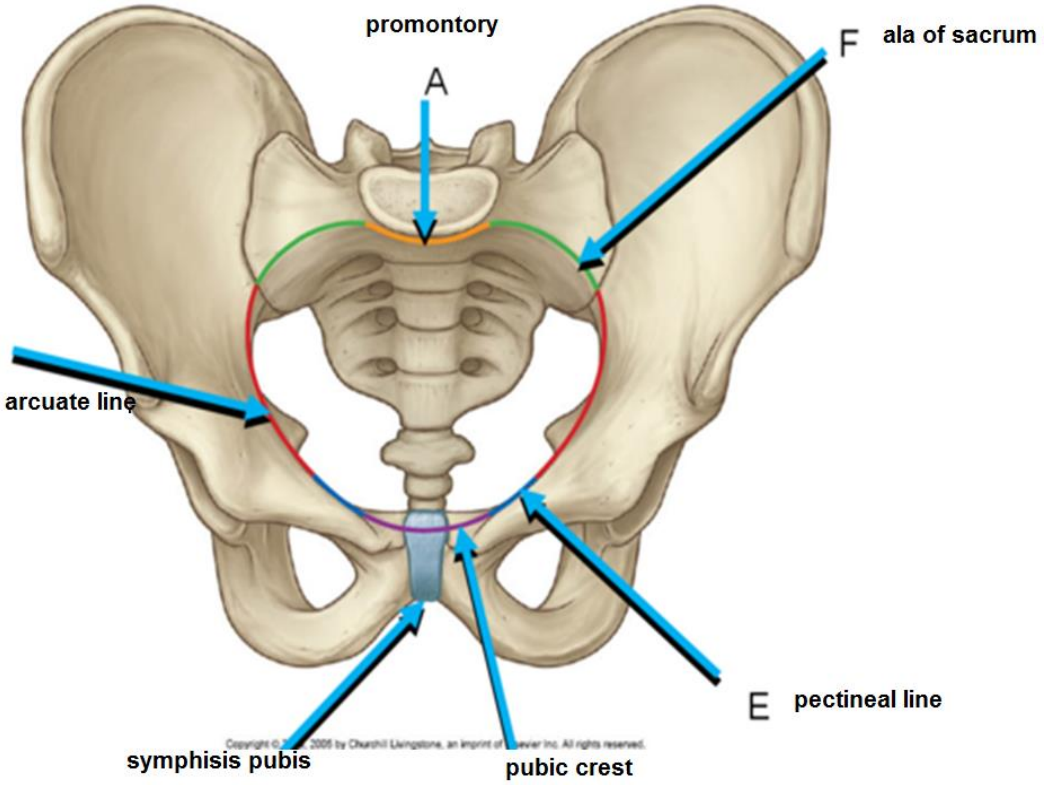
Pelvic Inlet

2- <u>Transverse diameter:</u>

- Between farthest points of arcuate line.
- It is (**13 cm**) in the female, and (**12 cm**) in the male.

3- <u>Oblique diameter:</u>

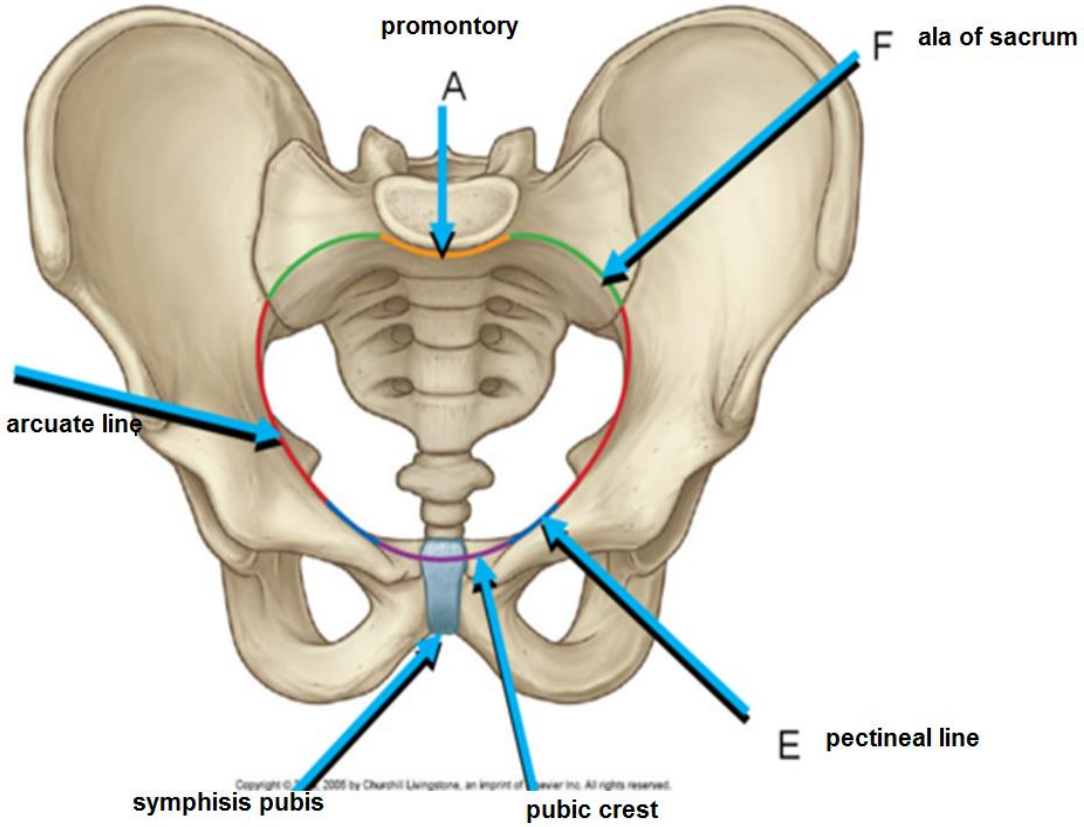
- It extends from iliopubic eminence of one side to sacro-iliac joint of opposite side.
- It measures (13 cm) in the female, and (12 cm) in the male.



Pelvic Inlet

Clinically:

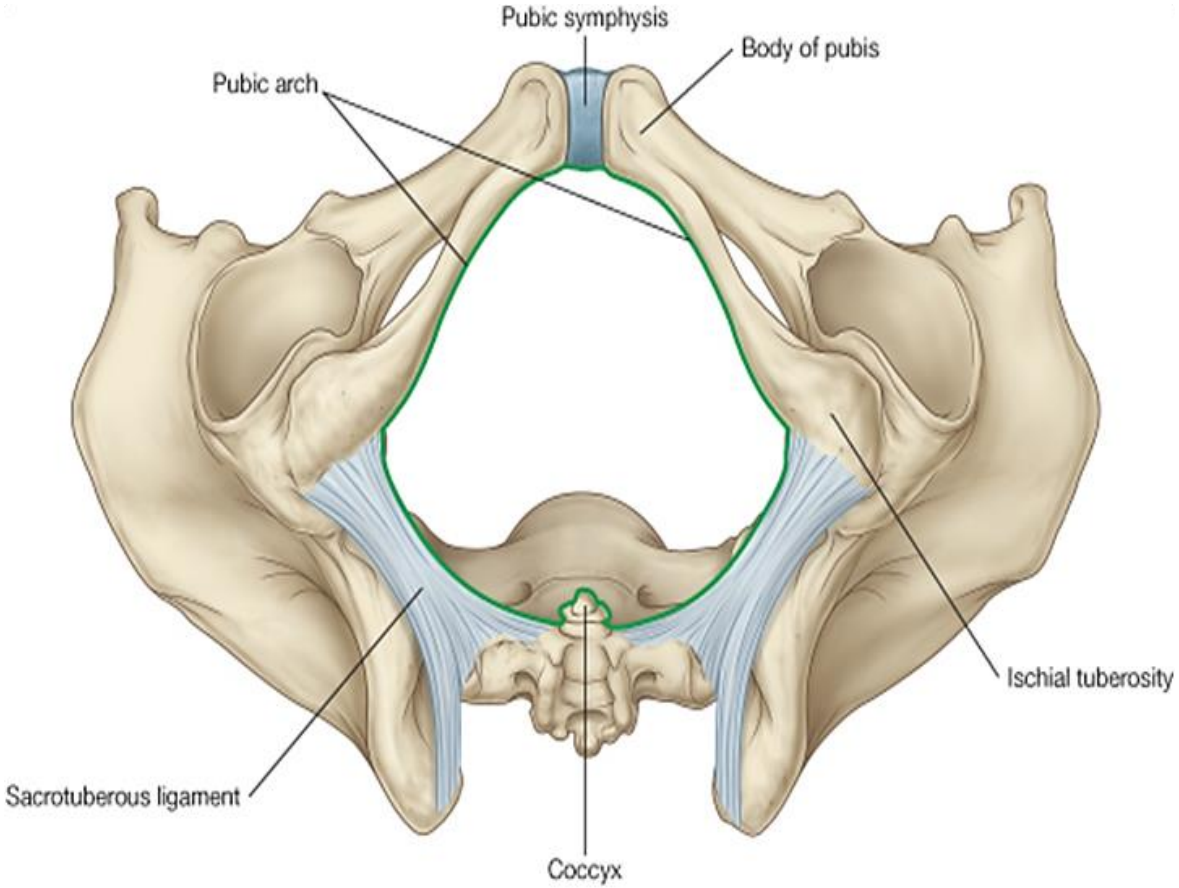
- **Antero – posterior diameter** of the inlet is measured per vagina, extending from the lower border of the symphysis pubis to the midpoint of the sacral promontory.
- It is called (**Diagonal or oblique conjugate diameter**).
- It measures (**12.5 cm**) in the female.



Pelvic outlet

❑Boundaries of the outlet:

- **Posteriorly:** Apex of the coccyx.
- **Anterior & anterolateral:** Lower border of the symphysis pubis& pubic arch.
- **On each side &posterolateral:** Ischial tuberosity, sacrotuberous ligament.



Pelvic outlet

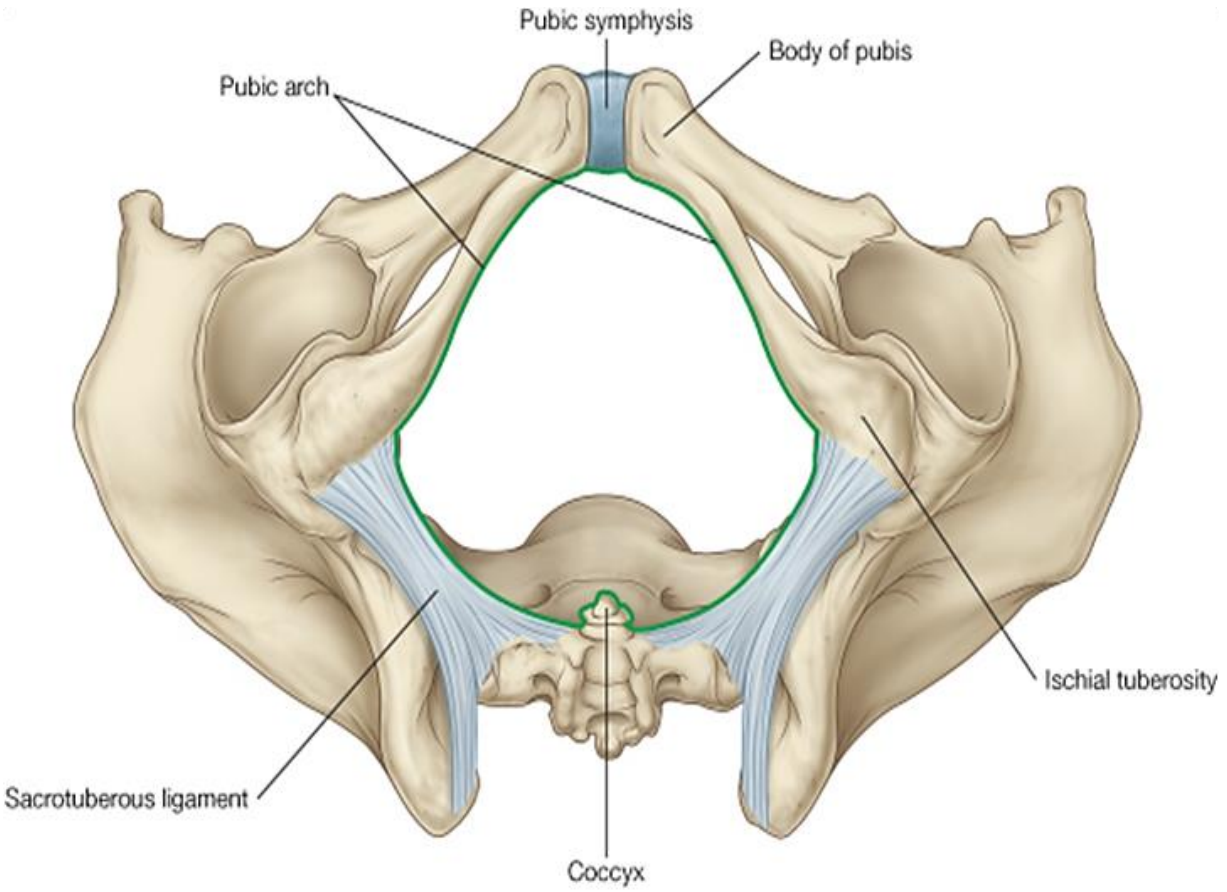
❑Diameters of the outlet:

1- Antero-posterior diameter:

- It extends from apex of coccyx to the lower border of the symphysis pubis.
- It is (**12 cm**) in female.

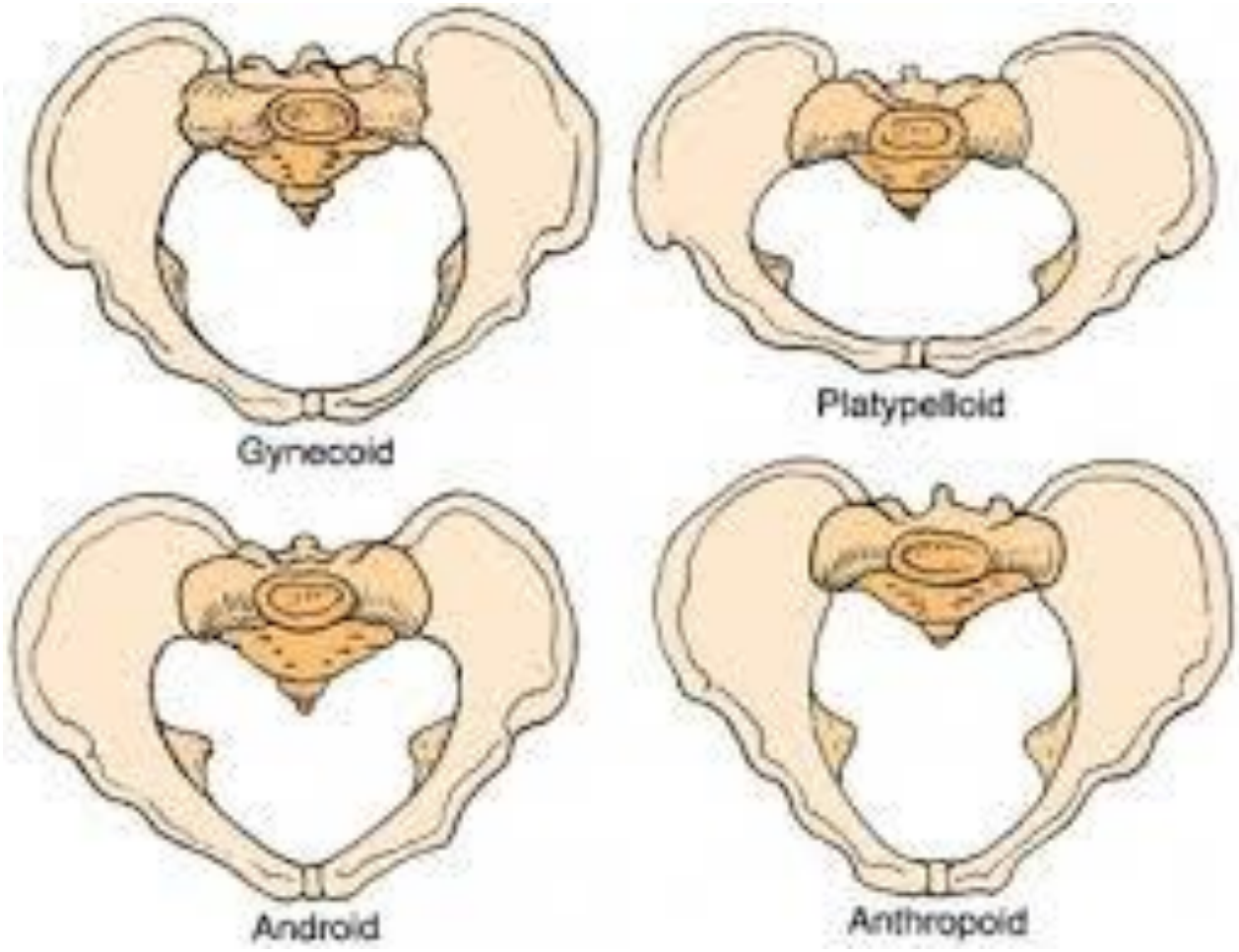
2- Transverse diameter:

- It extends between the two ischial tuberosity.
- It is (**11 cm**) in female.



Types of the Female Pelvis

- **Gynaecoid type (50%):** Transverse diameter of pelvic inlet larger than antero – posterior diameter.
- **Android type (20%):** with a heart –shaped inlet. It resembles male pelvis.
- **Anthropoid type (25%):** Antero – posterior diameter of pelvic inlet larger than transverse diameter.
- **Platypelloid type (5%):** It is a flat type pelvis.
- **Contracted pelvis:** Small female pelvis. It shows decrease in all diameters of pelvis.



Difference of Male & Female pelvis

	Male pelvis	Female pelvis
Pelvic bone	Heavier and thicker bone.	Lighter and thinner bone.
	It is designed to support a heavy body with a stronger muscle structure.	It serves for the purpose of childbearing and easier delivery.
Pelvic inlet (Pelvic brim)	Smaller and heart shaped.	Large and circular in outline.
Pelvic cavity	Narrower &longer	Wider &shorter.
Sacrum	Longer, narrower and more curved.	Shorter, wider and less curved.
Greater sciatic notch	Narrower.	Wider.
Pelvic outlet.	Narrower	Wider.
Pubic arch	V shaped and is less than 90^0	Wider and is greater than 90^0.
Coccyx	Immoveable and projected inwards.	Flexible and straight.

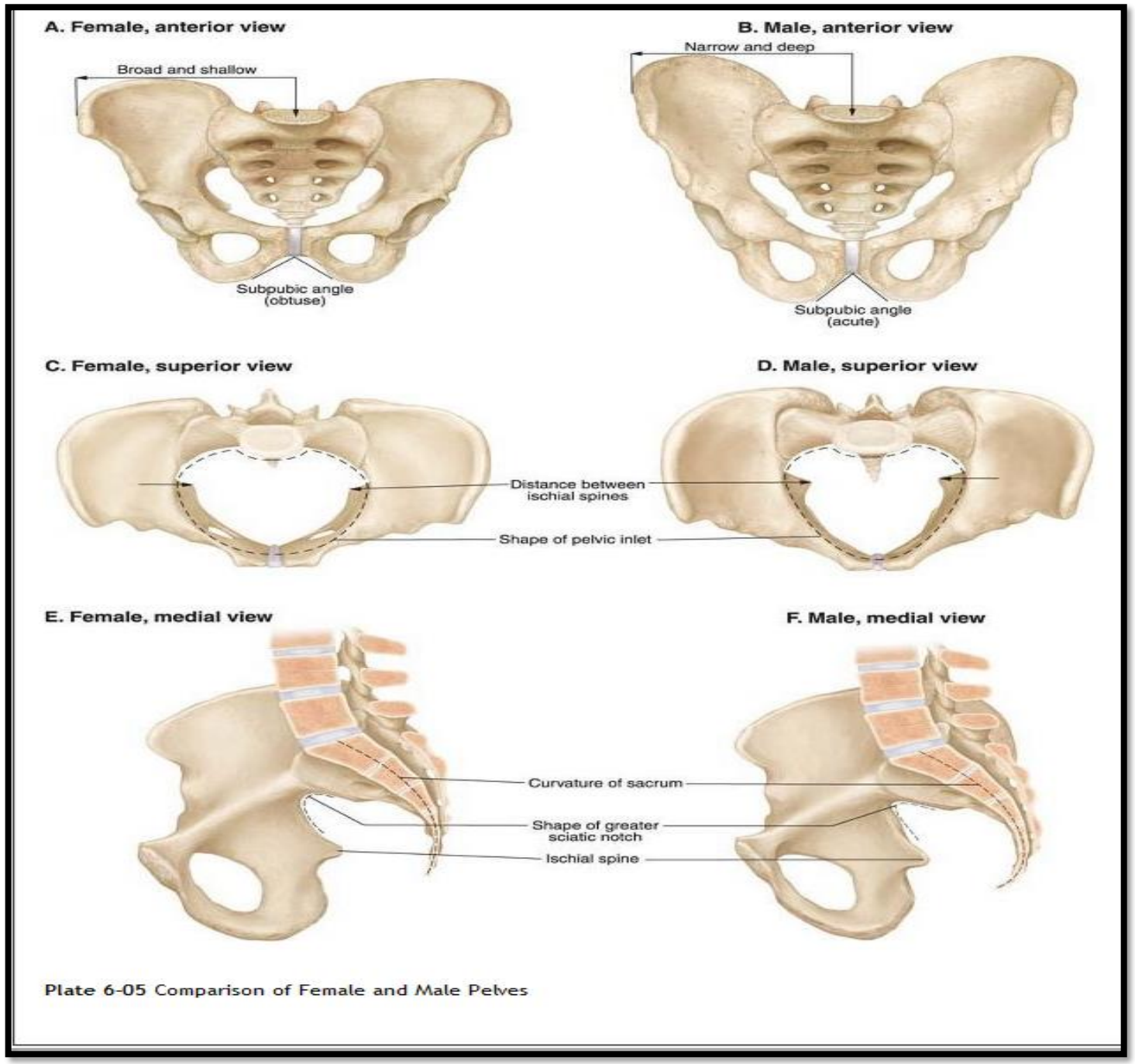
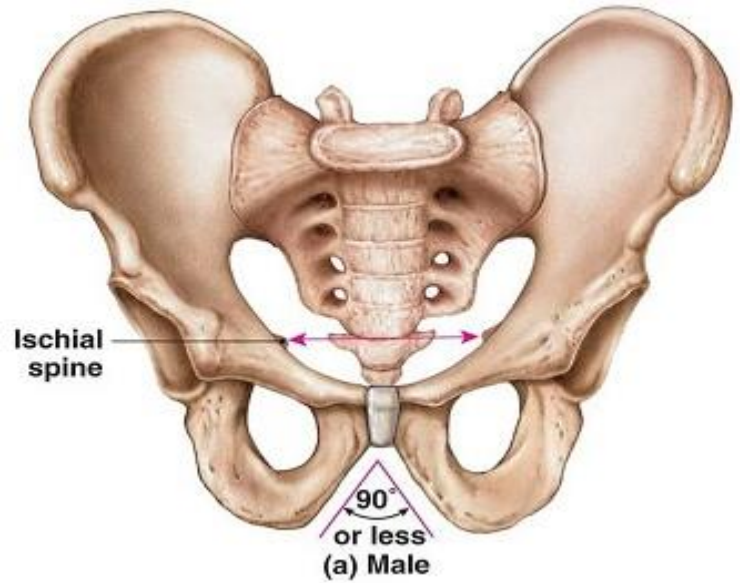
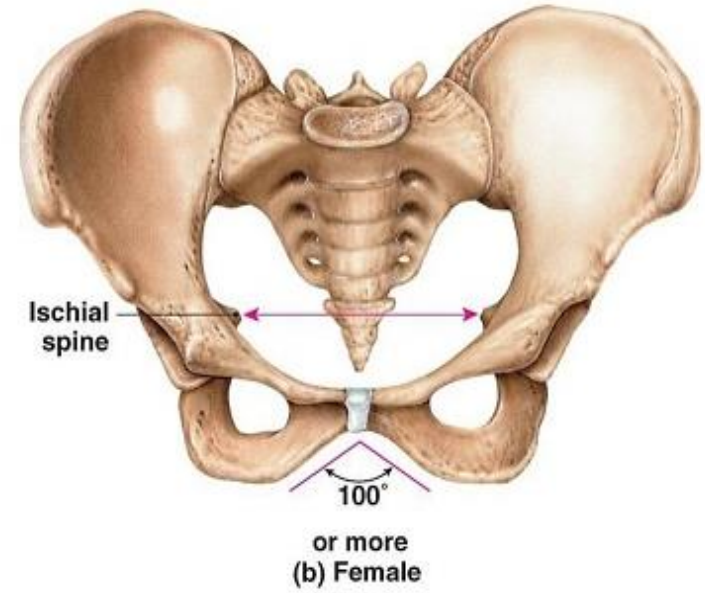


Plate 6-05 Comparison of Female and Male Pelves

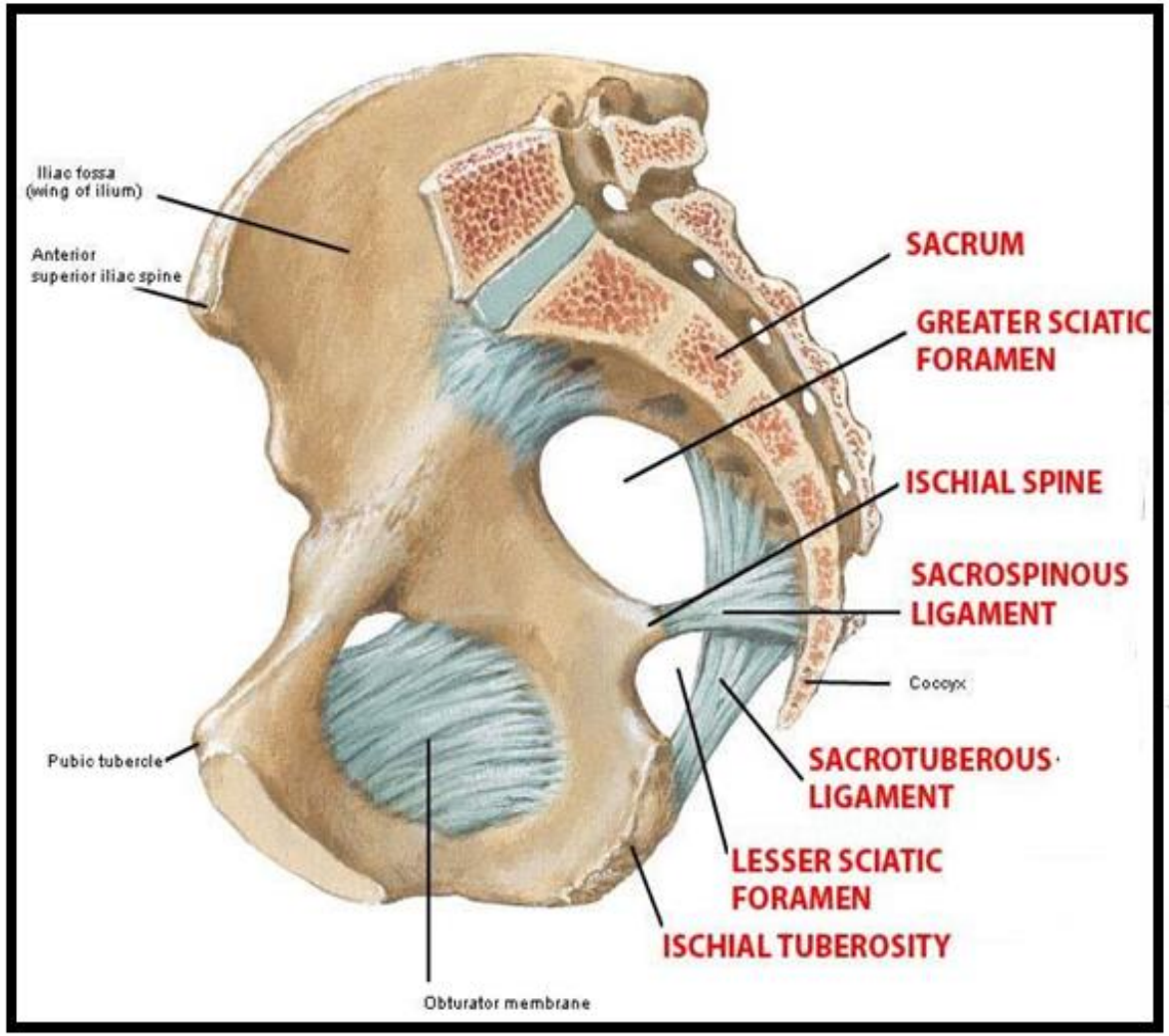




Ligaments of pelvis

- **Sacrotuberous ligament:** Fan shape attached to ischial tuberosity and radiates above to get attached to lateral margin of sacrum, coccyx.

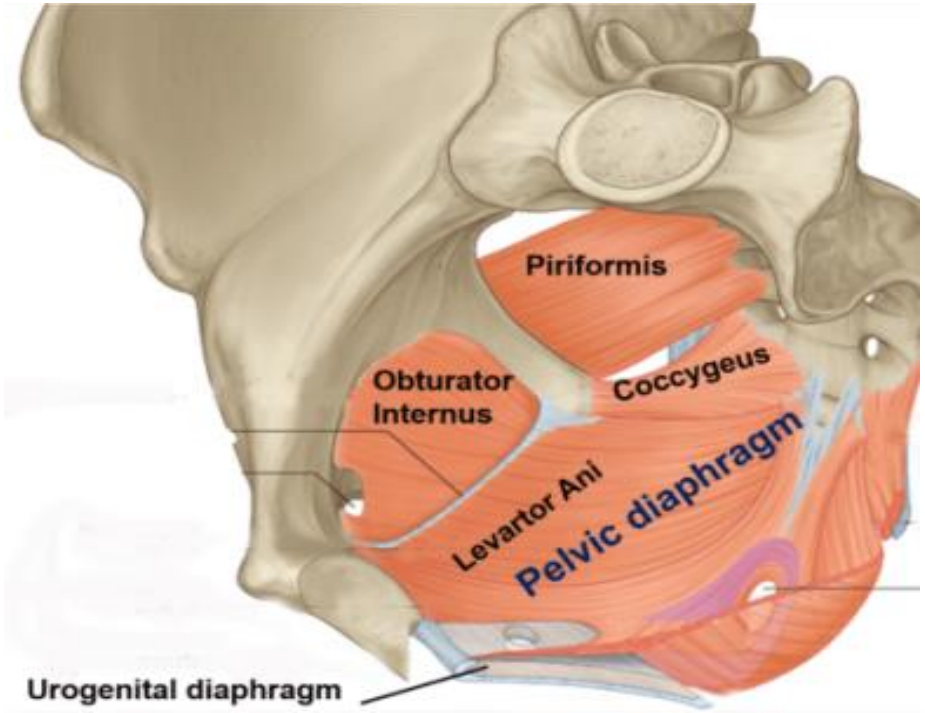
- **Sacrospinous ligament**: Triangular in shape attached to lower part of lateral margin of sacrum &to tip of ischial spine.



Muscles of the Lesser Pelvis

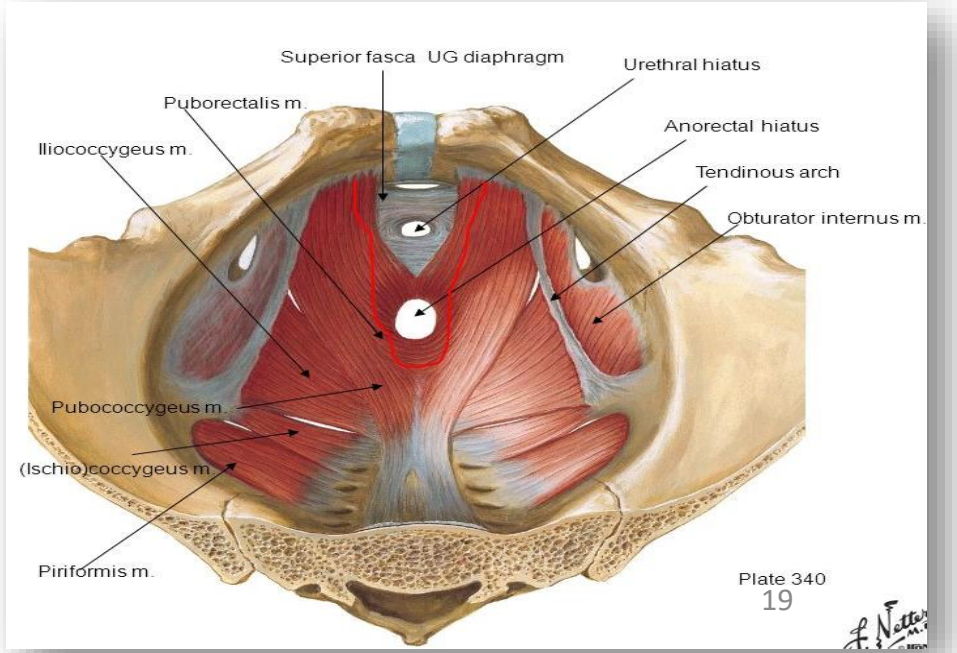
The muscles arising within the pelvis form two groups:

- **Piriformis and obturator internus**, forming part of the walls of the pelvis.
- **Levator ani and coccygeus** form the pelvic diaphragm and delineate the lower limit of the true pelvis.



❑ Obturator fascia:

- It **covers** the pelvic surface of obturator internus.
- Its **thickened part (tendinous arch)** extending from the lower part of the symphysis pubis to the ischial spine.
- The fascia splits to form **the pudendal canal**.



Levator ani

- It is a broad muscular sheet.

Origin:

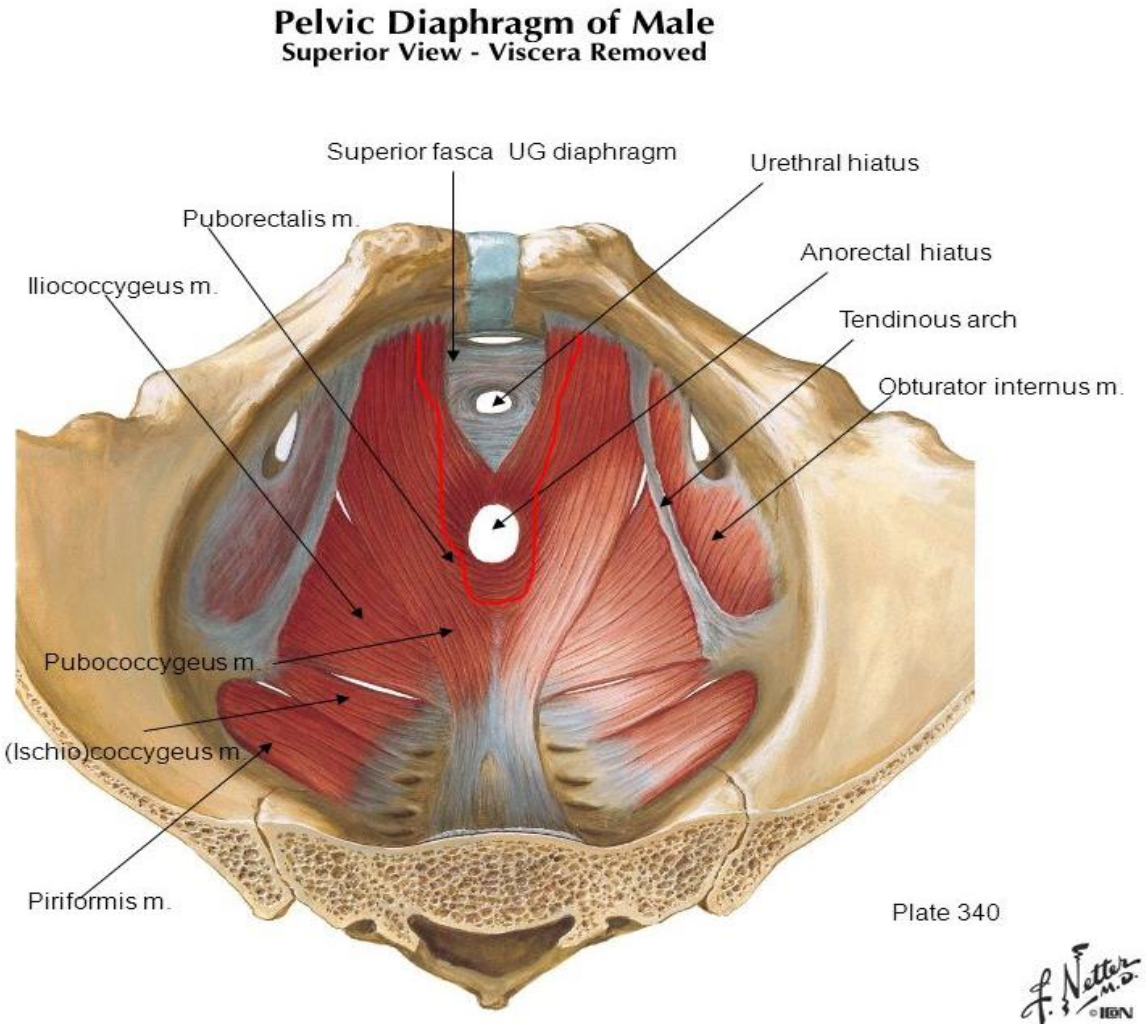
- Back of the body of the pubis.
- Inner surface of the ischial spine.
- Tendinous arch.

Insertion:

1- Pubococcygeus part:

a) Anterior fibers pass backwards to get inserted into the perineal body.

- **In male:** These anterior fibers run across the side of the prostate in the male where they form the **levator prostatae**.
- **In female:** across the side of the vagina where they form the **sphincter vaginae (pubovaginalis).**

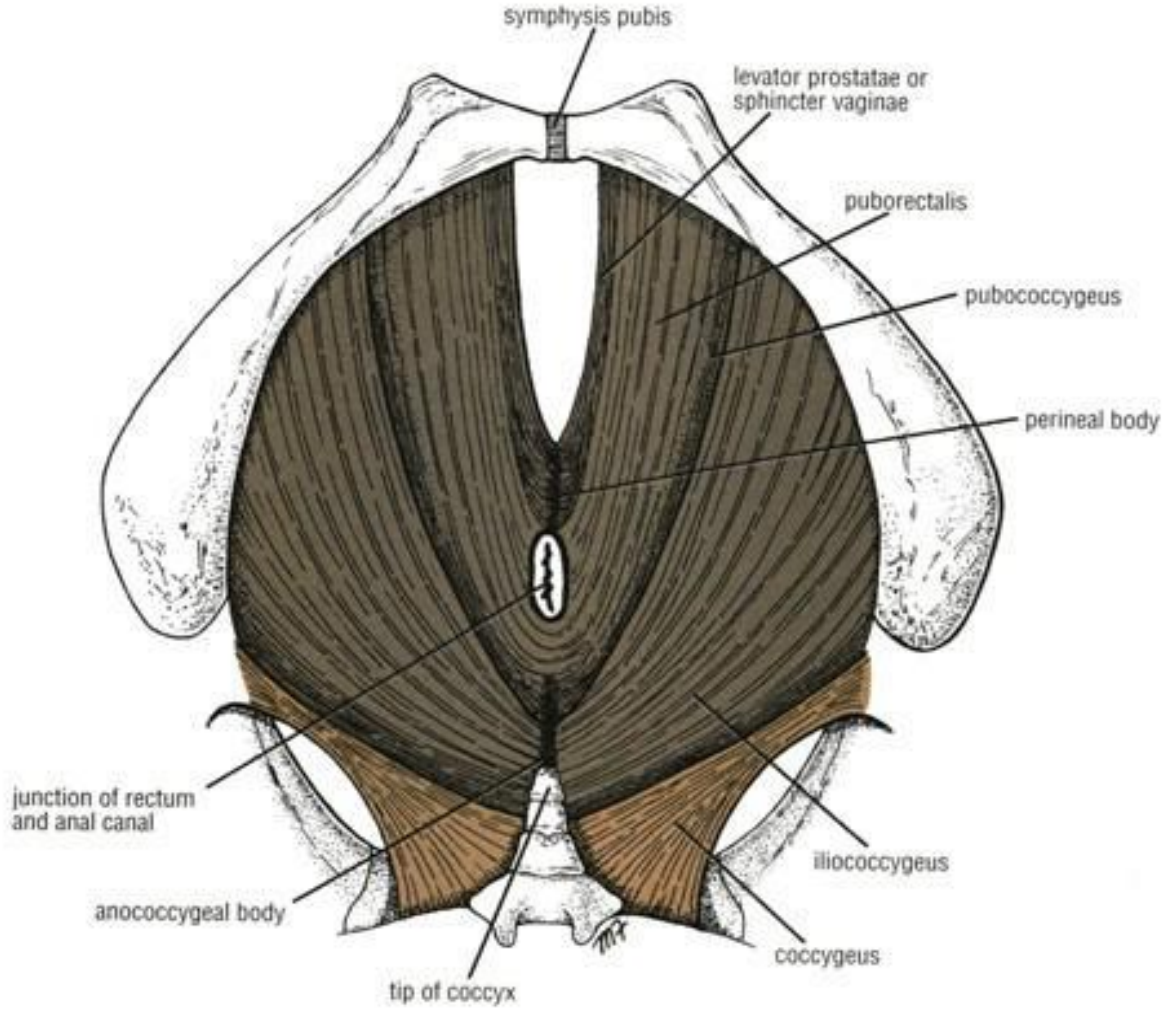


Levator ani

b) Intermediate fibers: The puborectalis forms a sling around the junction of the rectum and anal canal. The pubococcygeus passes posteriorly to be inserted into anococcygeal raphe.

2- Iliococcygeus part (posterior fibers):

- They pass backwards and downwards to be inserted into anococcygeal raphe.



❑Nerve supply:

- **Upper surface**: Direct branches of sacral plexus (4^{th} sacral nerve).
- **Lower surface**: From the inferior rectal nerve.

Levator ani

Action:

- It forms main part of pelvic diaphragm, it supports and maintains the pelvic viscera in position.
- Increase the intra – abdominal pressure, this helps in delivery.
- Puborectalis: acts as a sphincter for rectum.
- The anterior fibers: Support the prostate in the male, and act as a sphincter for the vagina in the female.
- Steady perineal body.
- Support head of fetus & rotate it during labor.

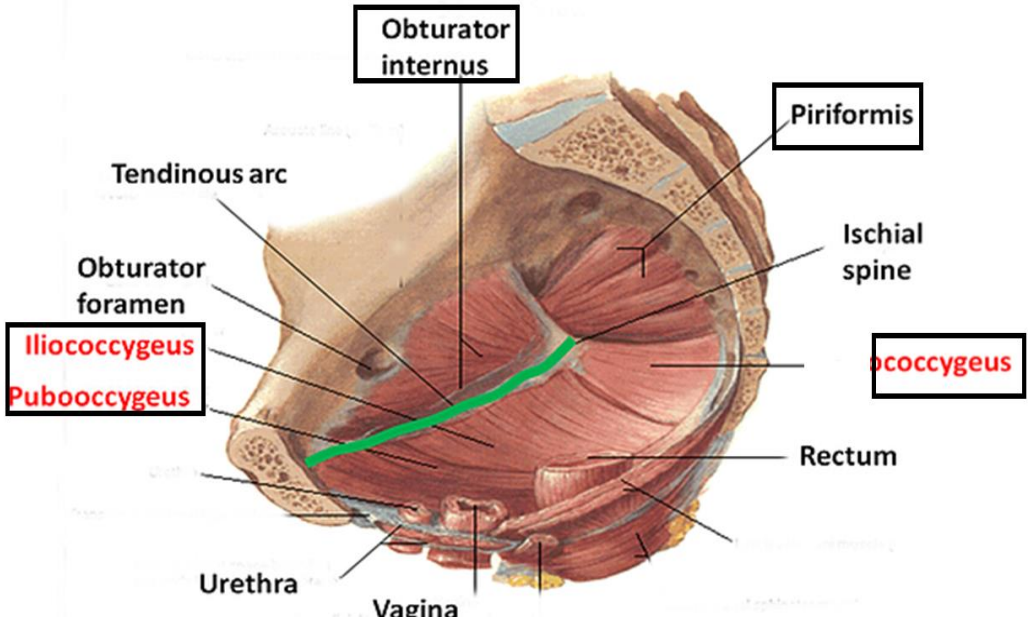
Relations of levator ani

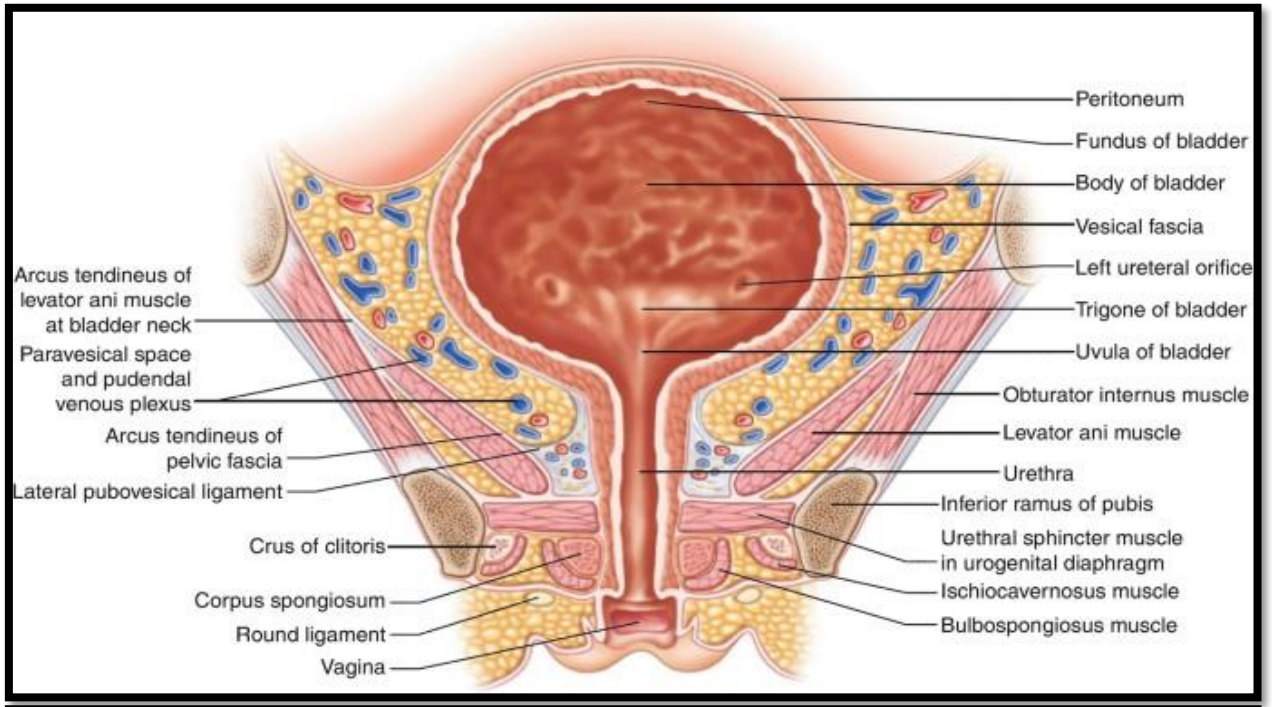
❑ Upper surface:

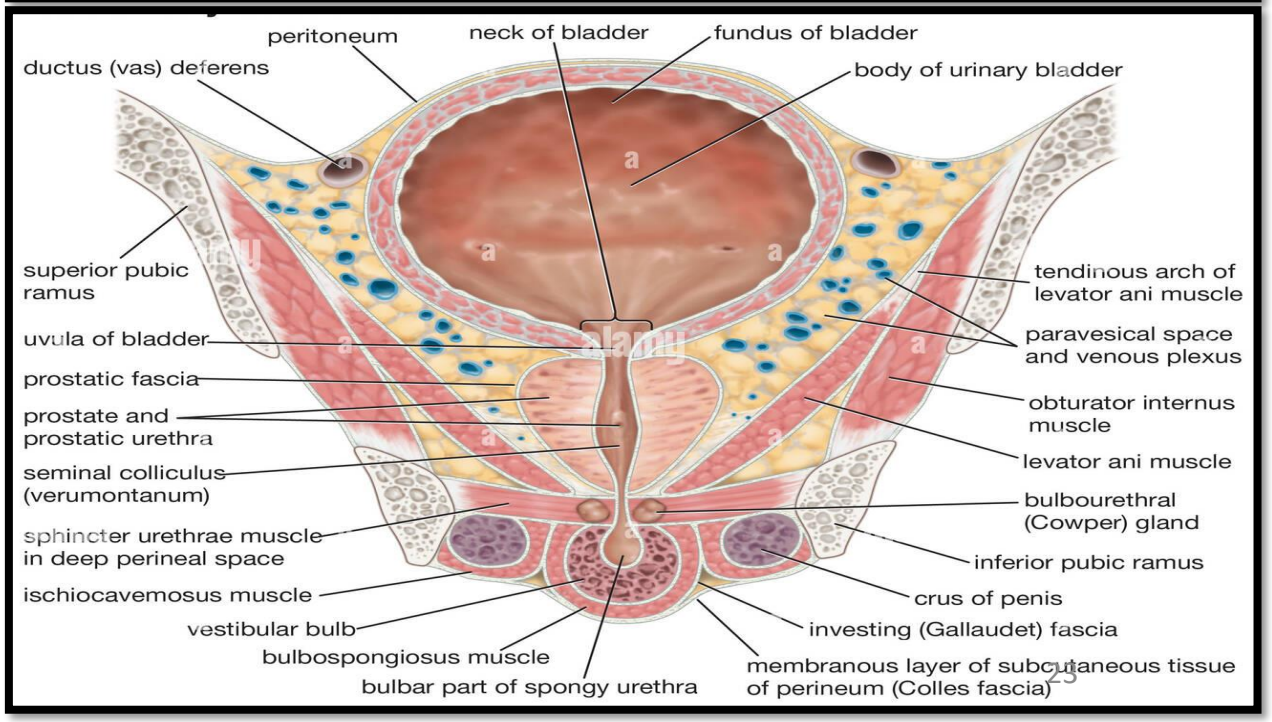
It is covered by the pelvic fascia.

This surface is related to the following:

- Urinary bladder.
- Seminal vesicle & prostate in male.
- Vagina, uterus &broad ligament in female.
- Rectum.



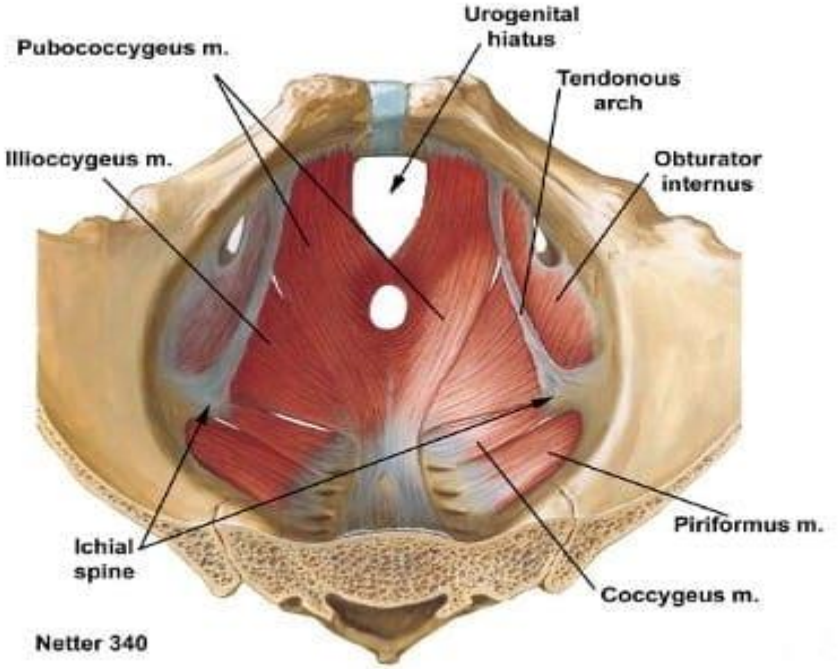


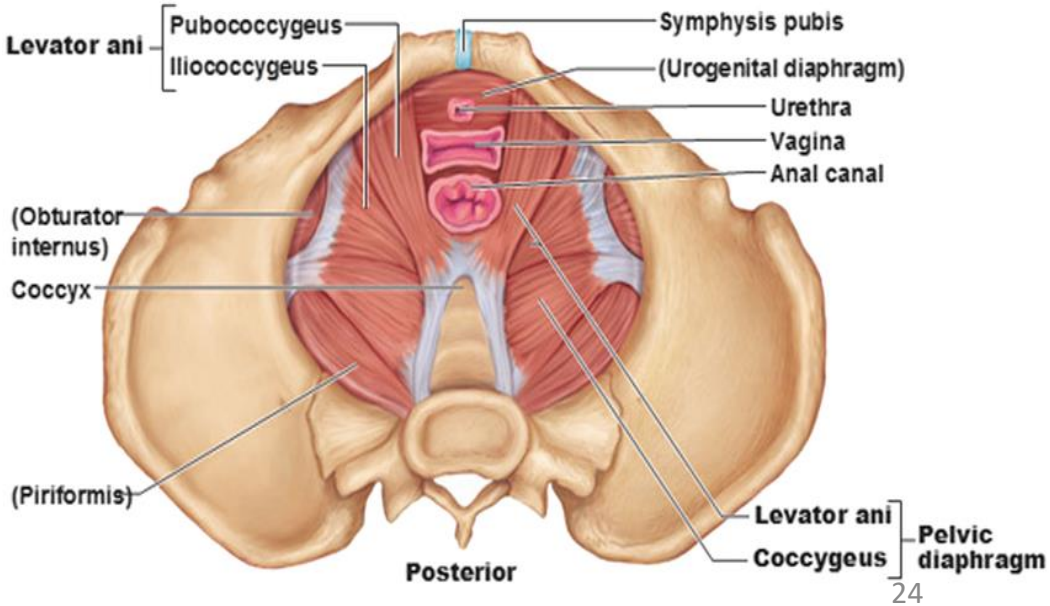


Relations of levator ani

❑**The anterior borders:** of the 2 muscles are free and are separated from each other by a triangular gap **(urogenital hiatus)**.

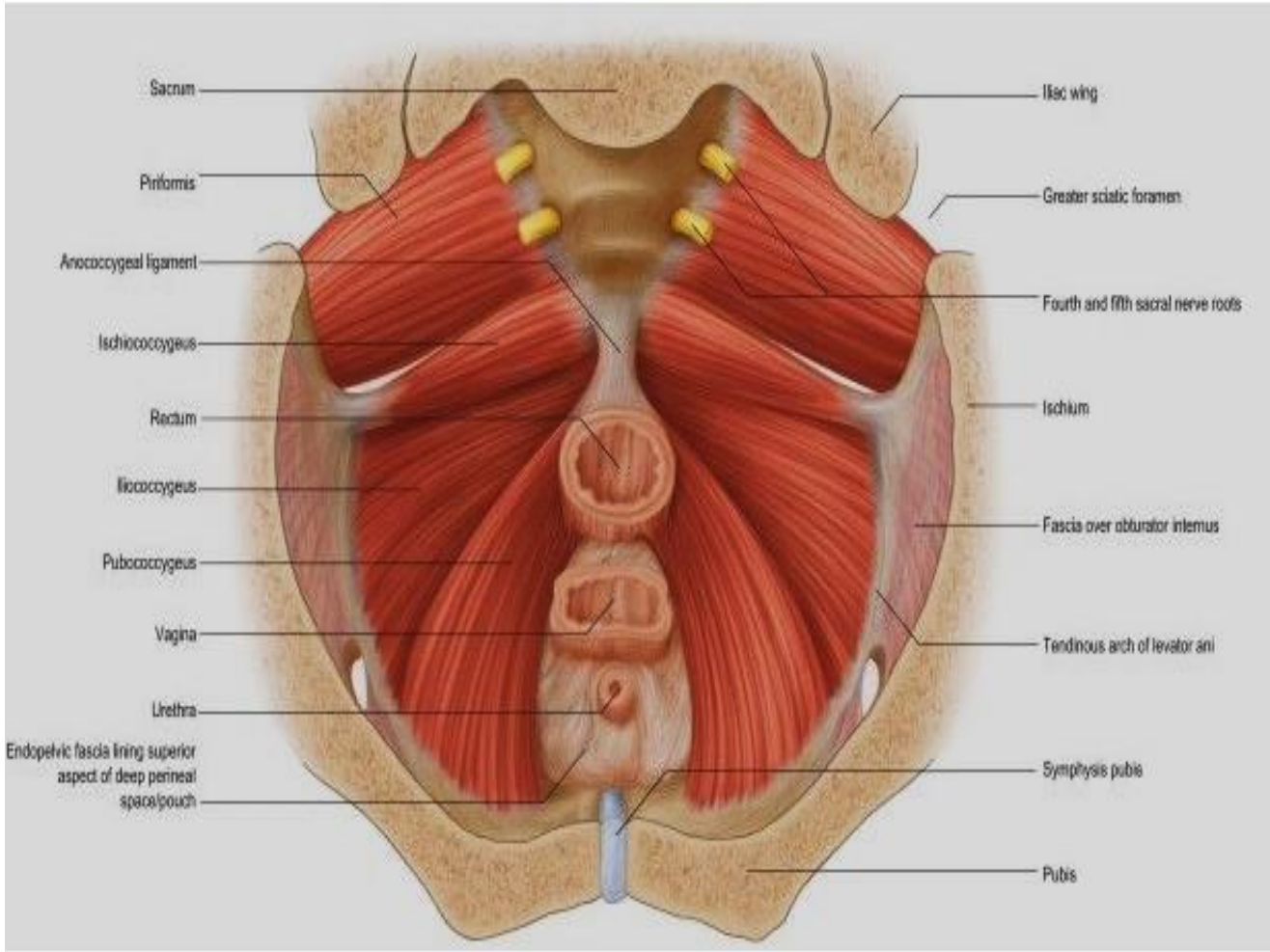
- The **urogenital hiatus** allowing passage of the;
- U**rethra**: in the male.
- **Vagina and urethra**: in the female.





Coccygeus (Ischiococcygeus)

- **Origin:** From the tip of the ischial spine.
- **Insertion:** Into the side of the last sacral segment and the 1st segment of the coccyx.
- **Nerve supply**: From sacral plexus.
- **Action**: Support coccyx.




Thank You!