University of Baghdad
College of Medicine
2024-2025

Title: The Pelvis (Bones, Walls, Fascia, Peritoneum)

Grade: TWO

Module: HSF-II

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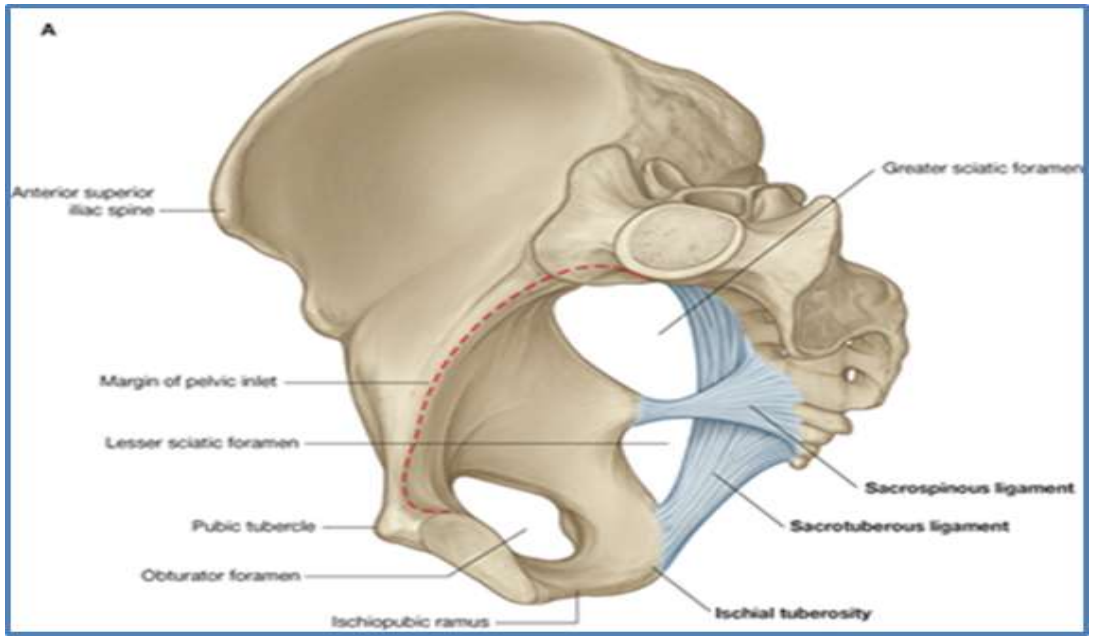
Date: 23/2/2025

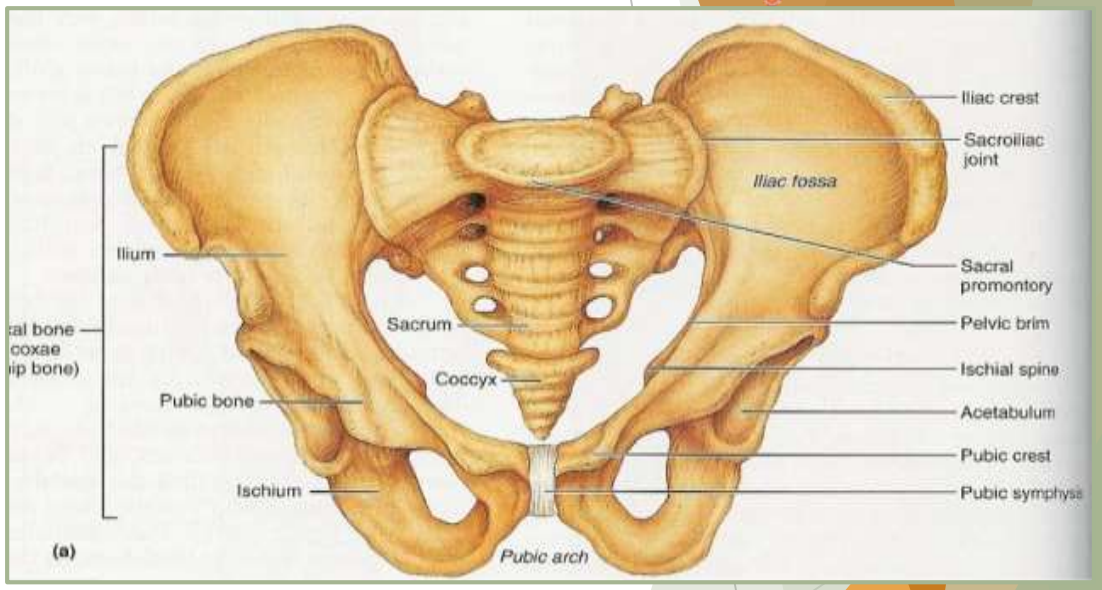
Objectives

- **Describe** the bony pelvis with gender differences
- **Define** the muscles of walls & floor of the pelvis
- **Follow** peritoneal arrangement in male & female pelvises
- **Describe** fascia of the pelvis
- **State** some clinical correlates

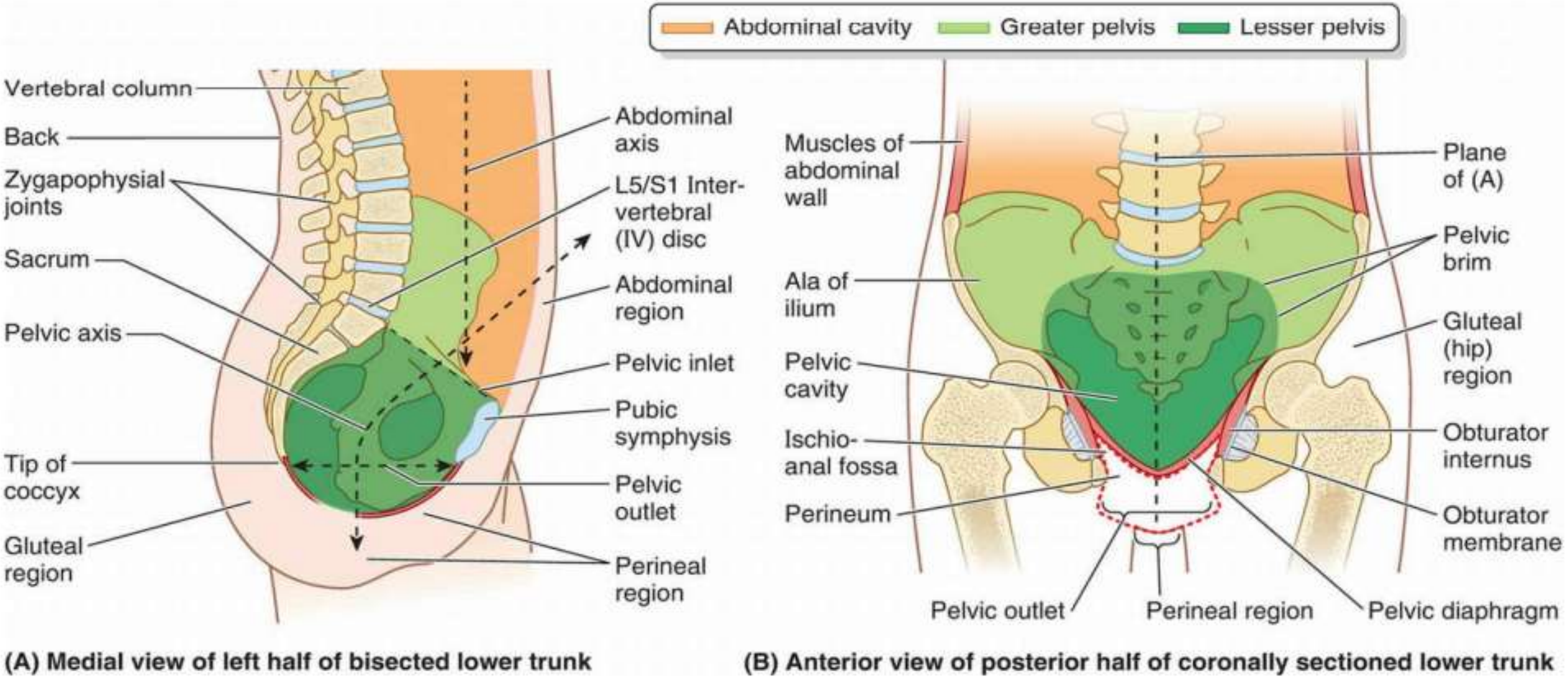
Bony pelvis

- The 2 hip bones form the major part of the bony pelvis
- They meet anteriorly at the pubic symphysis
- They are separate from each other posteriorly by the sacrum





- **Sacrotuberous & sacrospinous ligaments** convert the greater & lesser sciatic notches into foramina
- **GSF** leads from the pelvis to the gluteal region
- **LSF** leads from the gluteal region to the perineum

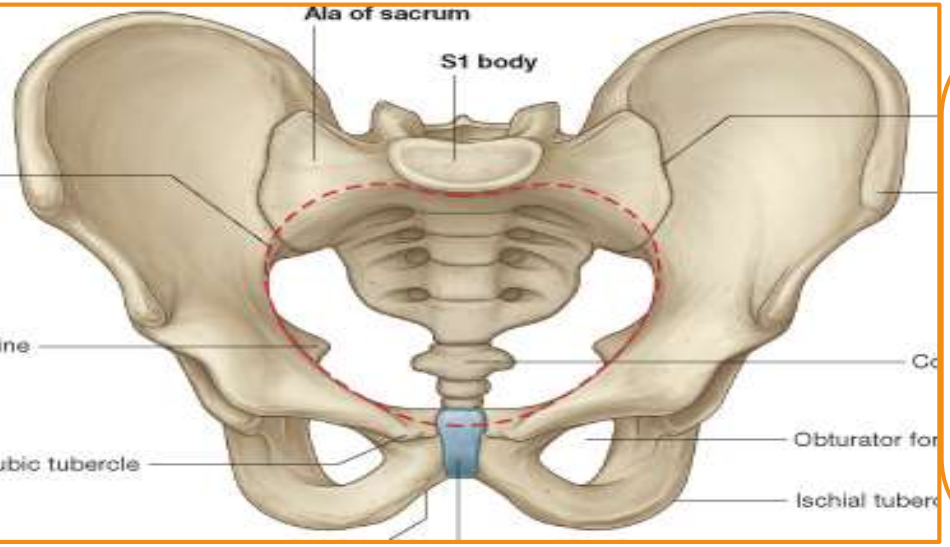


(A) Medial view of left half of bisected lower trunk

(B) Anterior view of posterior half of coronally sectioned lower trunk

The pelvis is divided into **greater (false)** and **lesser (true) pelves** by the oblique plane of the **pelvic inlet** (**superior pelvic aperture**)

Pelvic inlet

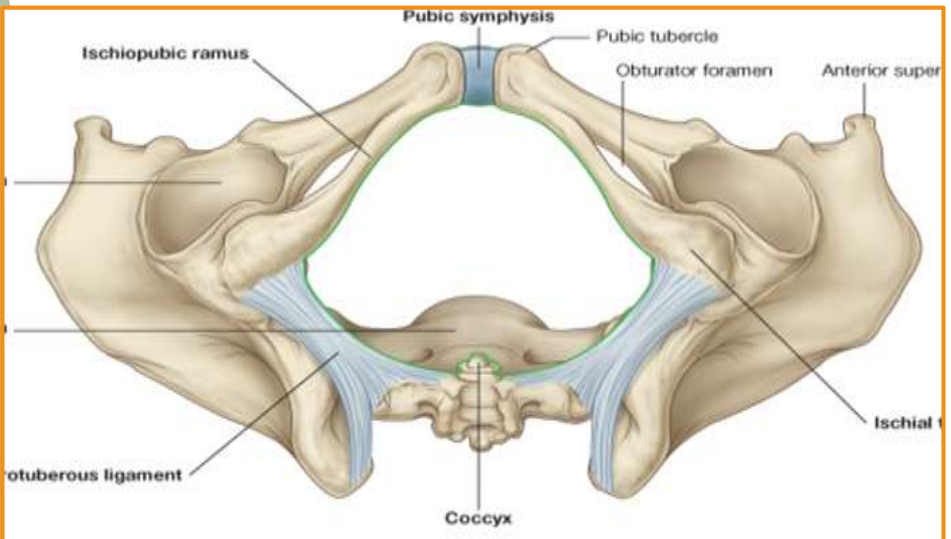


- promontory and ala of the sacrum
- linea terminalis (terminal line) consisting of

✓ arcuate line

✓ pecten pubis (pectineal line) and pubic crest

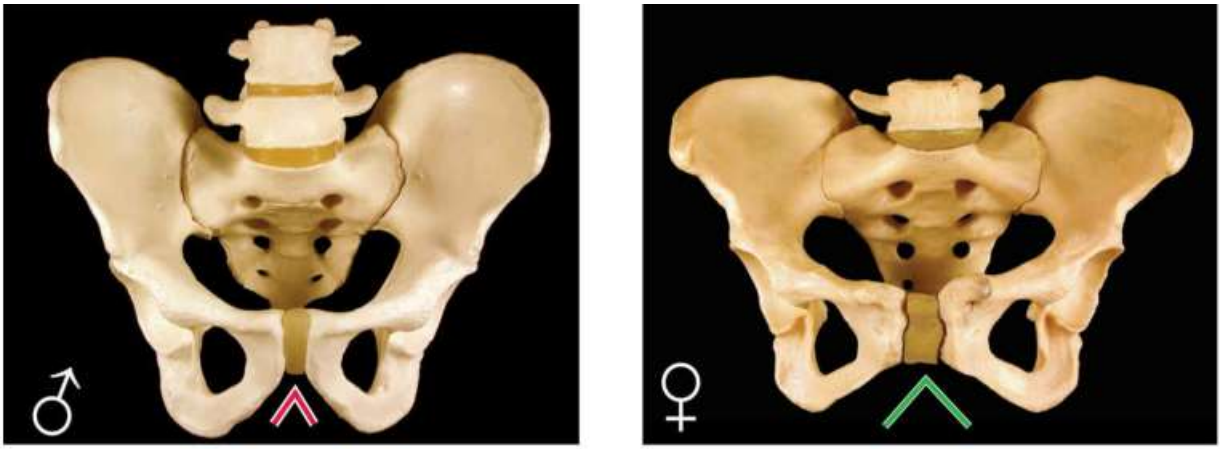
Pelvic outlet



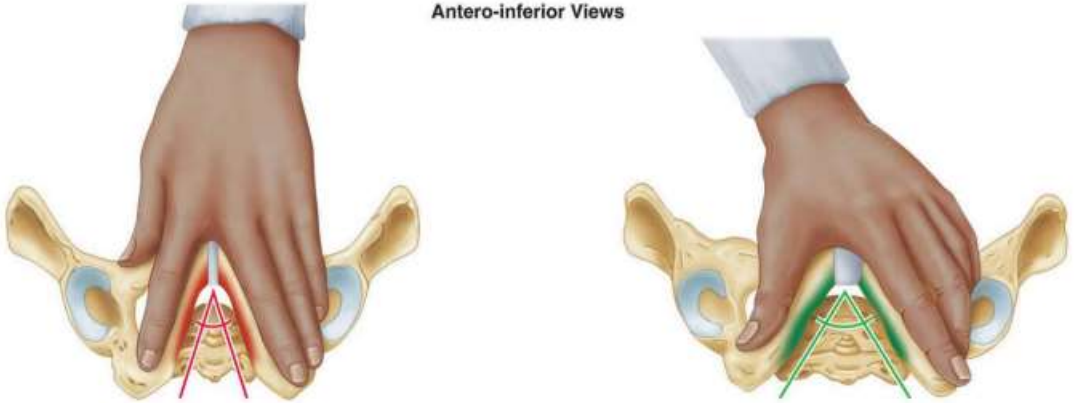
- Pubic symphysis
- Ischiopubic ramus
- ischial tuberosities
- Sacrotuberous ligaments
- Coccyx

Sex differences

Parameter	Female	Male
General structure	Thin and light	Thick and heavy
Greater Pelvis	Shallow	Deep
Lesser Pelvis	Wide, Shallow & cylindrical	Narrow , deep & Tapering
Pelvic Inlet	Oval & rounded-wide	Heart shape-narrow
Pelvic outlet	Comparatively large	Comparatively small
Sacrum	Flat	C-shape
Ischial spine	Backward	Projects medially
Pubic arch& Subpubic angle	Wide > 80	Narrow <70
Obturator Foramen	Round	Oval
Acetabulum	Small	Large
Greater Sciatic notch	Almost 90°	Narrow (~70°); inverted V



Antero-inferior Views

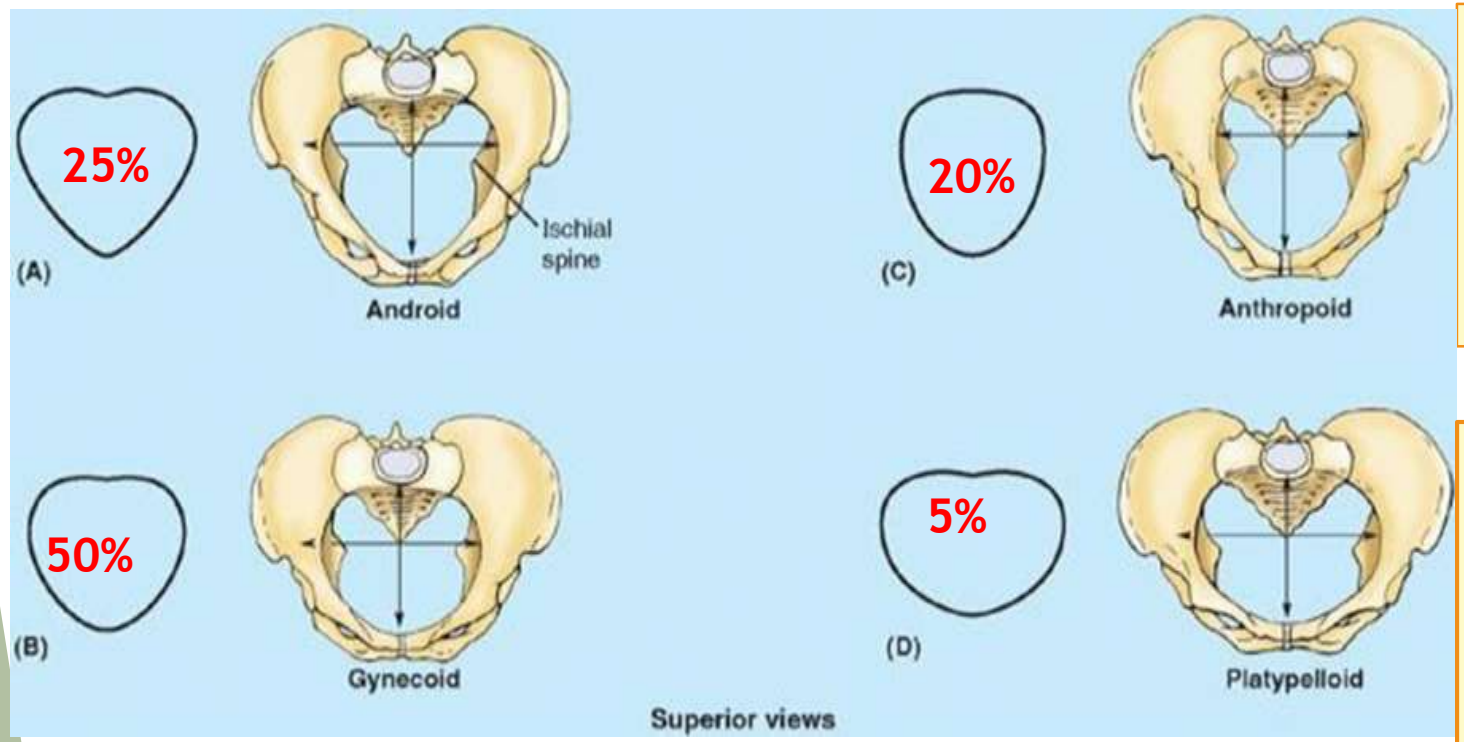


- The **pubic arch** is formed by the right and left ischiopubic rami .
- These rami meet at the pubic symphysis, their inferior borders defining the **subpubic angle**

- The **width of the subpubic angle** is determined by the distance between the right and the left ischial tuberosities.
- This can be measured with the **gloved fingers in the vagina during a pelvic examination**

Types of Bony pelvis

Information of the shape & dimensions of the female pelvis is of great importance in **obstetrics**



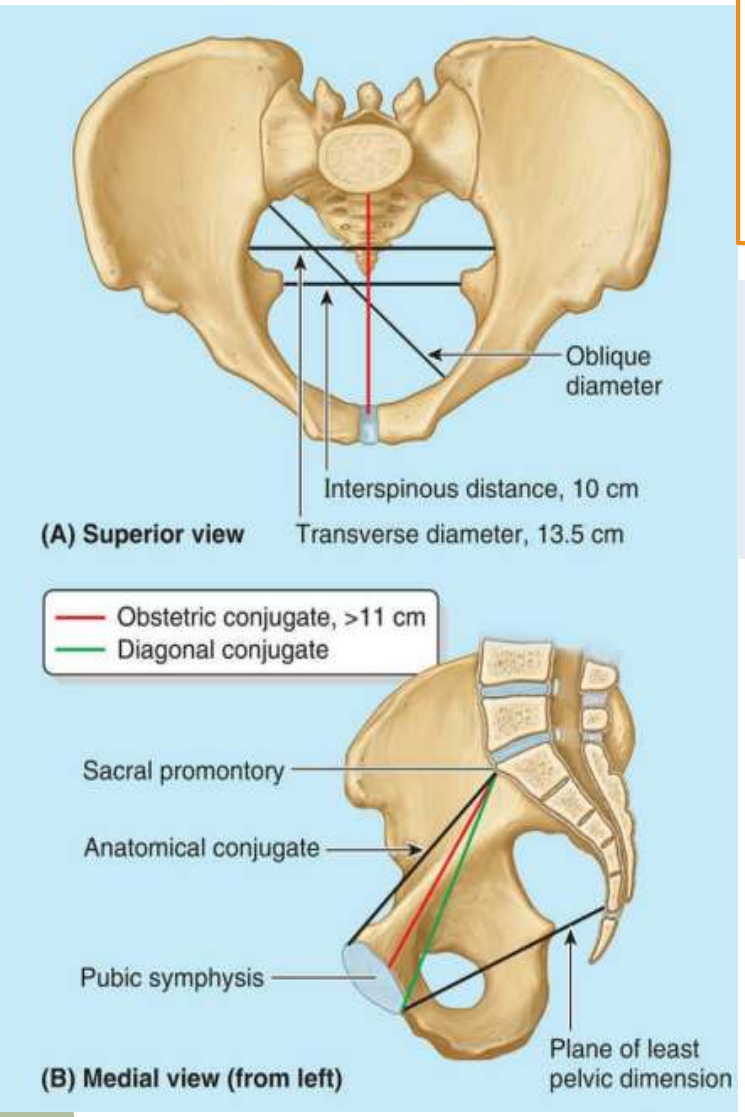
The pelvic types

- ✓ **A and C** are most common in males,
- ✓ **B and A** in white females
- ✓ **B and C** in black females
- ✓ **D** is uncommon in both sexes.

- The **gynecoid pelvis** is the normal female type
- A **platypelloid** or **android** may present hazards to successful vaginal delivery of a fetus

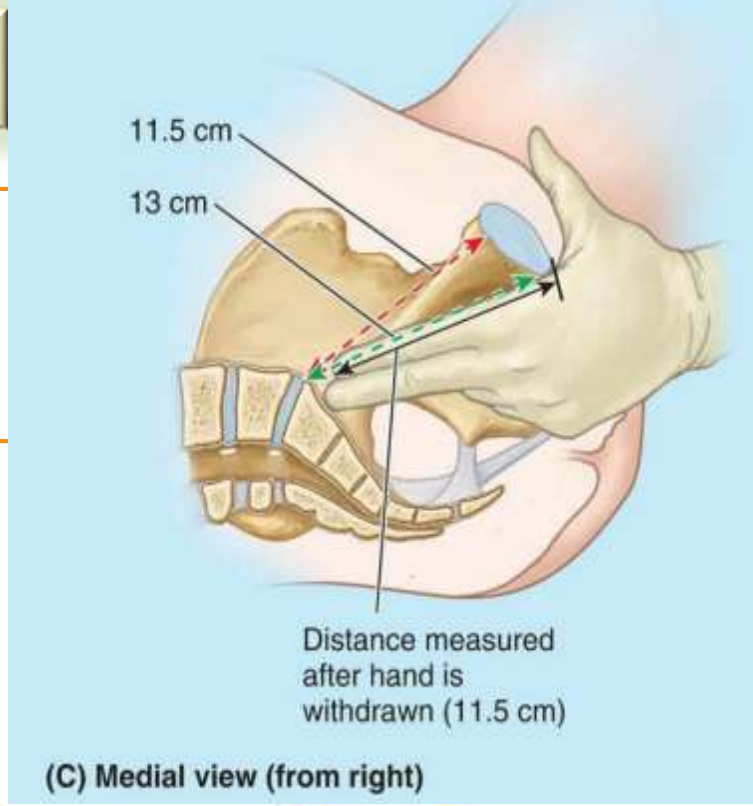
In **forensic medicine**, A prime focus of attention is **the pelvic girdle** because **sexual differences** are usually clearly visible. Even **fragments of the pelvic girdle** are useful in **determining sex**.

Pelvic Diameters (Conjugates)

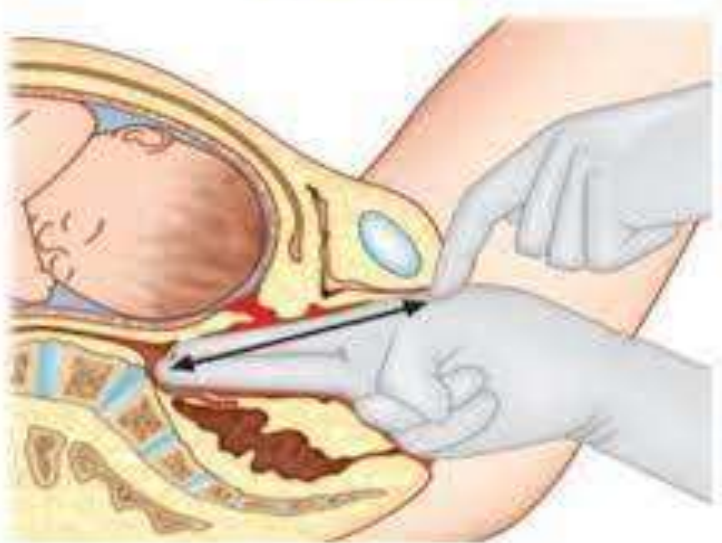


- **Anatomical conjugate**
- **Obstetric Conjugate**
- **Diagonal conjugate**

- **True (obstetrical) conjugate:** is the **narrowest fixed distance** through which the **baby's head** must pass in a vaginal delivery



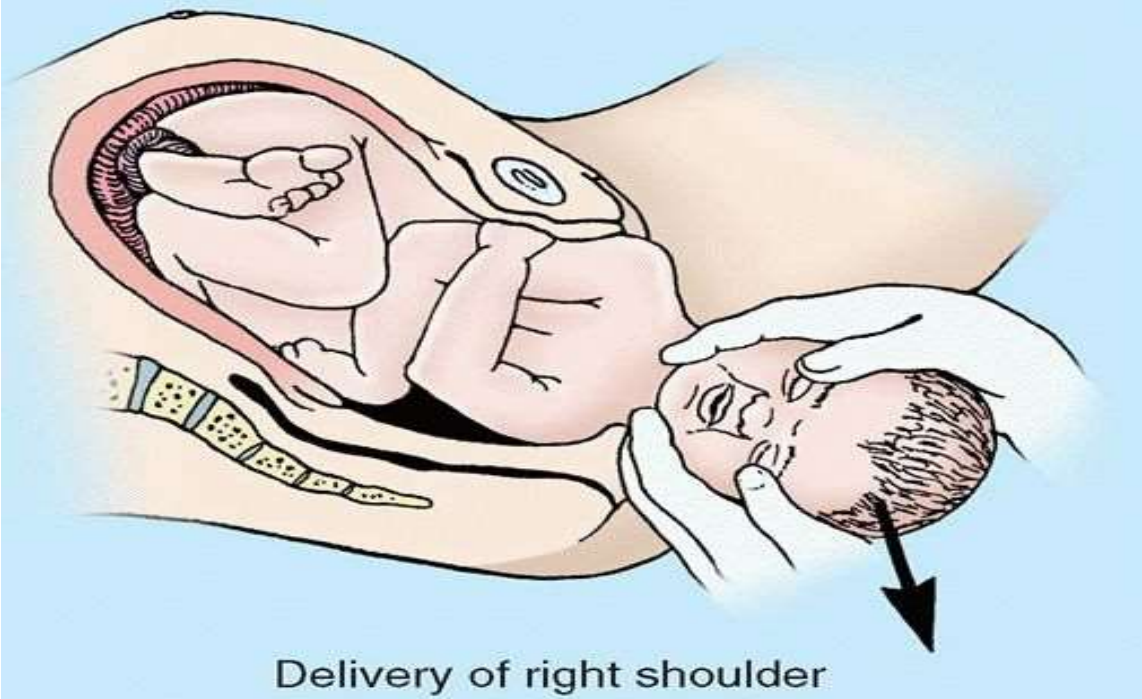
- The **diagonal conjugate** is measured by palpating **the sacral promontory** with the **tip of the middle finger**, using the other hand to mark the level of the inferior margin of the pubic symphysis on the examining hand. This should be 11.0 cm or greater.
- The **interspinous distance** is normally the narrowest part of the pelvic canal



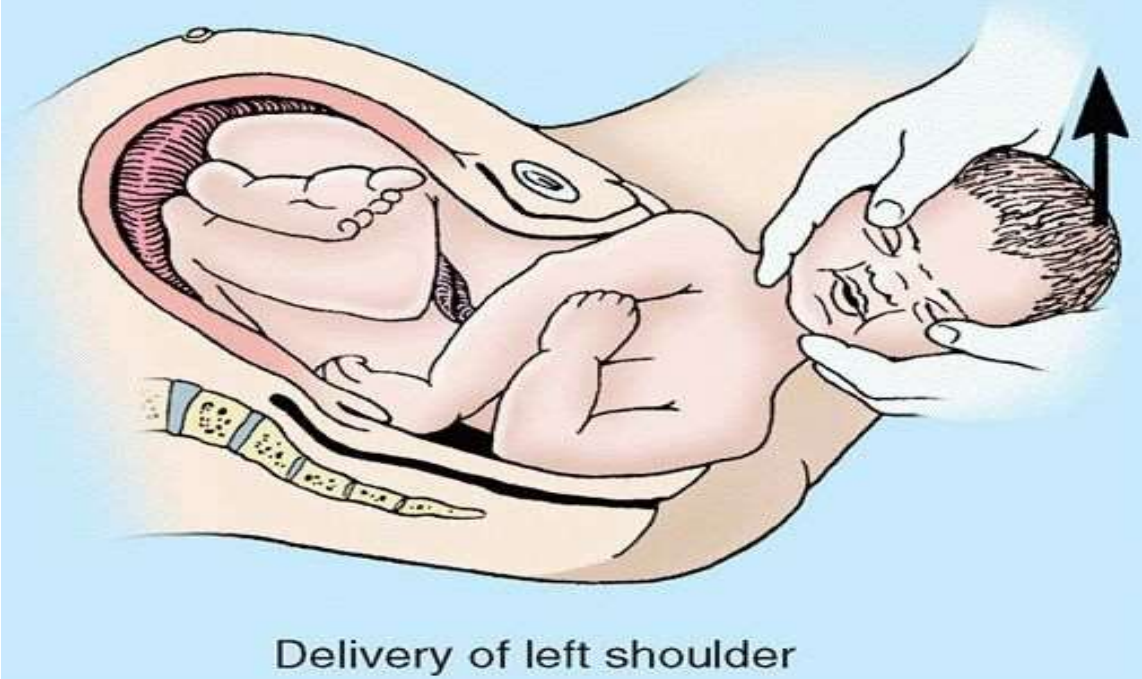
The fetus changes the **direction of his head** while passing through **the birth canal**

Obstructed labour

- **2-4%**
- The most frequent cause of obstructed labour is **cephalo-pelvic disproportion** - a mismatch between the **fetal head** and the **mother's pelvic brim**



Delivery of right shoulder

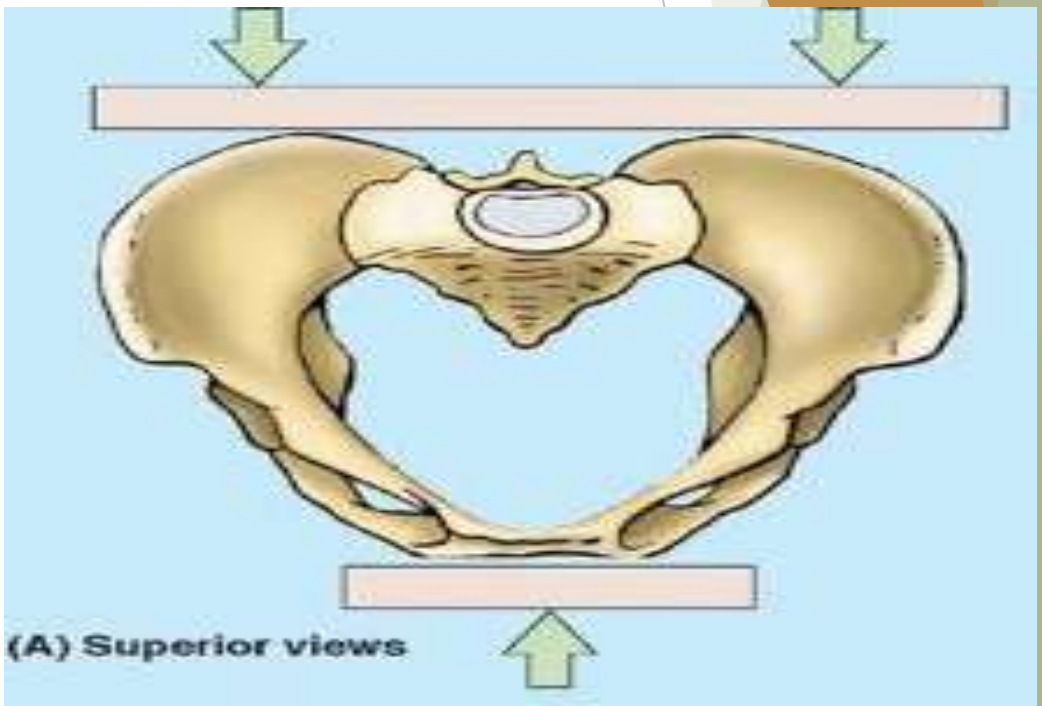


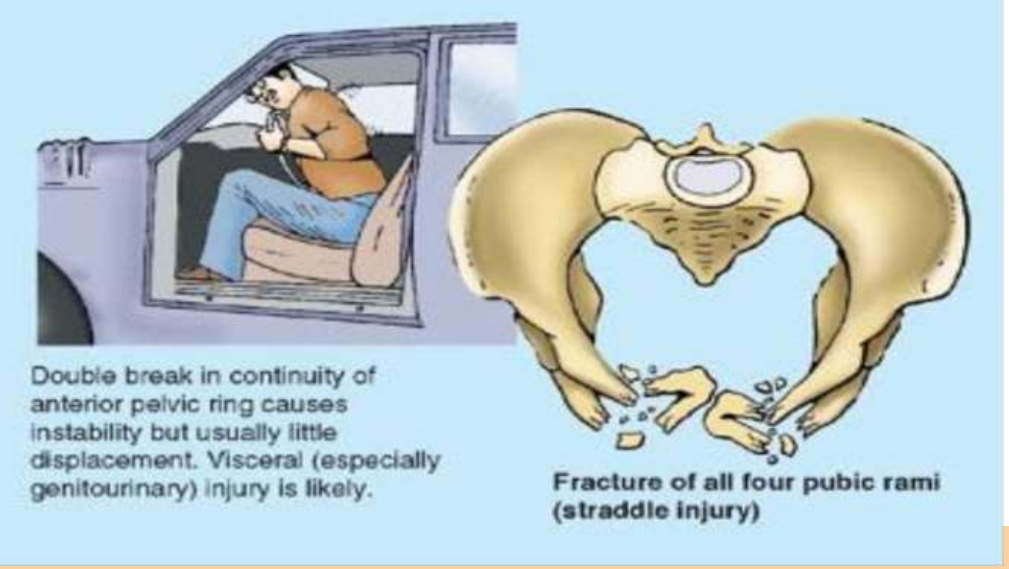
Delivery of left shoulder

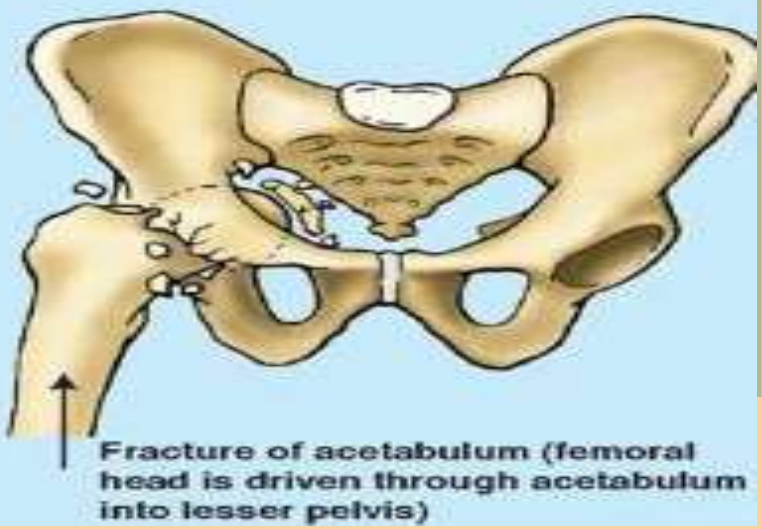
Pelvic Fractures

- **Anteroposterior compression of the pelvis -** crush accidents-fractures of the pubic rami
- **Lateral compression of the pelvis** the acetabula and ilia are squeezed toward each other and may be broken
- **Fractures of the bony pelvic ring** are almost always **multiple fractures** or a **fracture combined with a joint dislocation**.

- Pelvic fractures may cause injury to pelvic soft tissues, blood vessels, nerves, and organs.
- Fractures in the **pubo-obturator area** are relatively **common** and are **often complicated** because of their relationship to the urinary bladder and urethra, which may be ruptured or torn







- Pelvic fractures can result from
  - ✓ direct trauma to the pelvic bones, -automobile accident
  - ✓ forces transmitted to these bones from the lower limbs during falls on the feet

In **individuals younger than 17 years** of age,

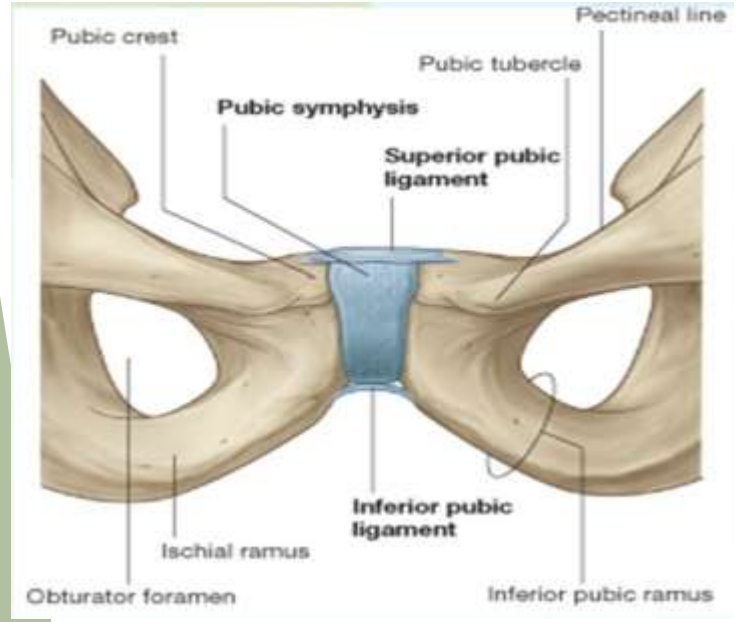
- ✓ **the acetabulum** may fracture **through the triradiate cartilage** into its **three developmental parts** or
- ✓ the bony acetabular margins may be torn away

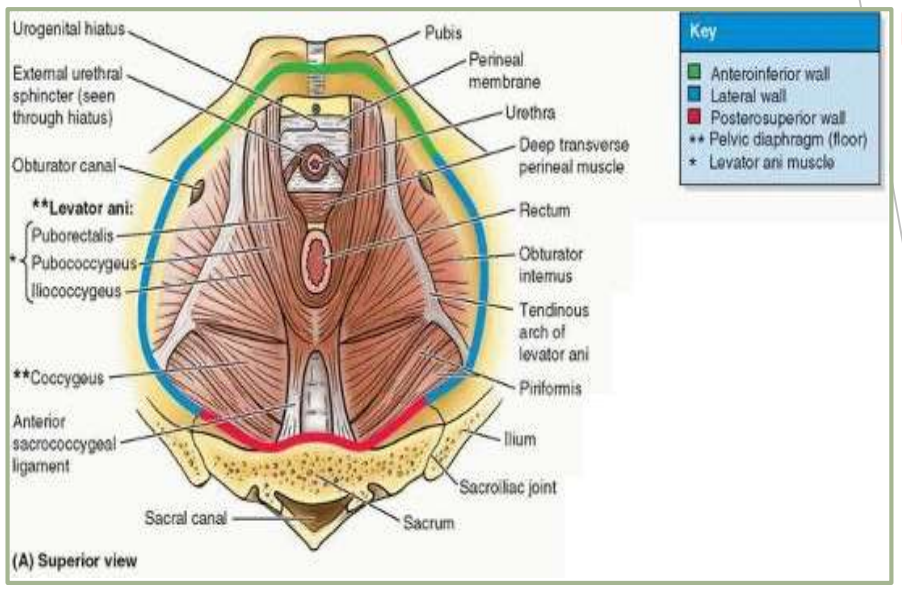
- **Weak areas of the pelvis**, where fractures often occur, are the
  - ✓ pubic rami,
  - ✓ the acetabula (or the area immediately surrounding them),
  - ✓ the region of the sacroiliac joints,
  - ✓ the alae of the ilium.

PELVIC WALLS

The pelvic cavity has

- ✓ an antero-inferior wall
- ✓ two lateral walls
- ✓ a posterior wall, and
- ✓ a floor

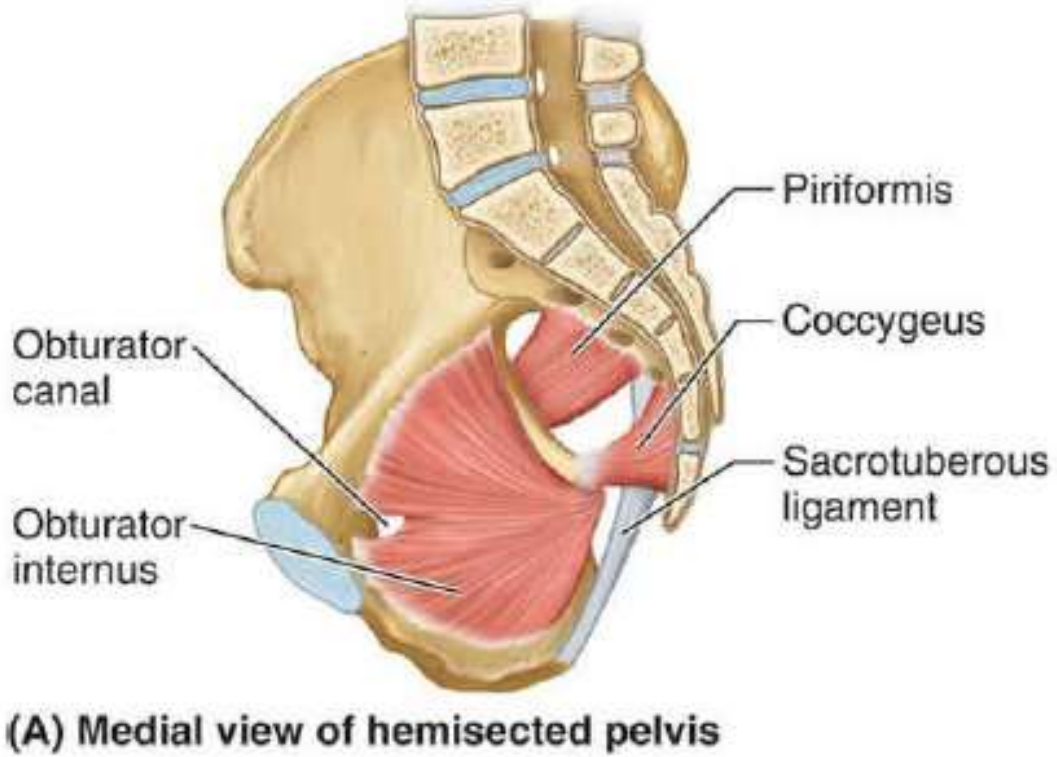




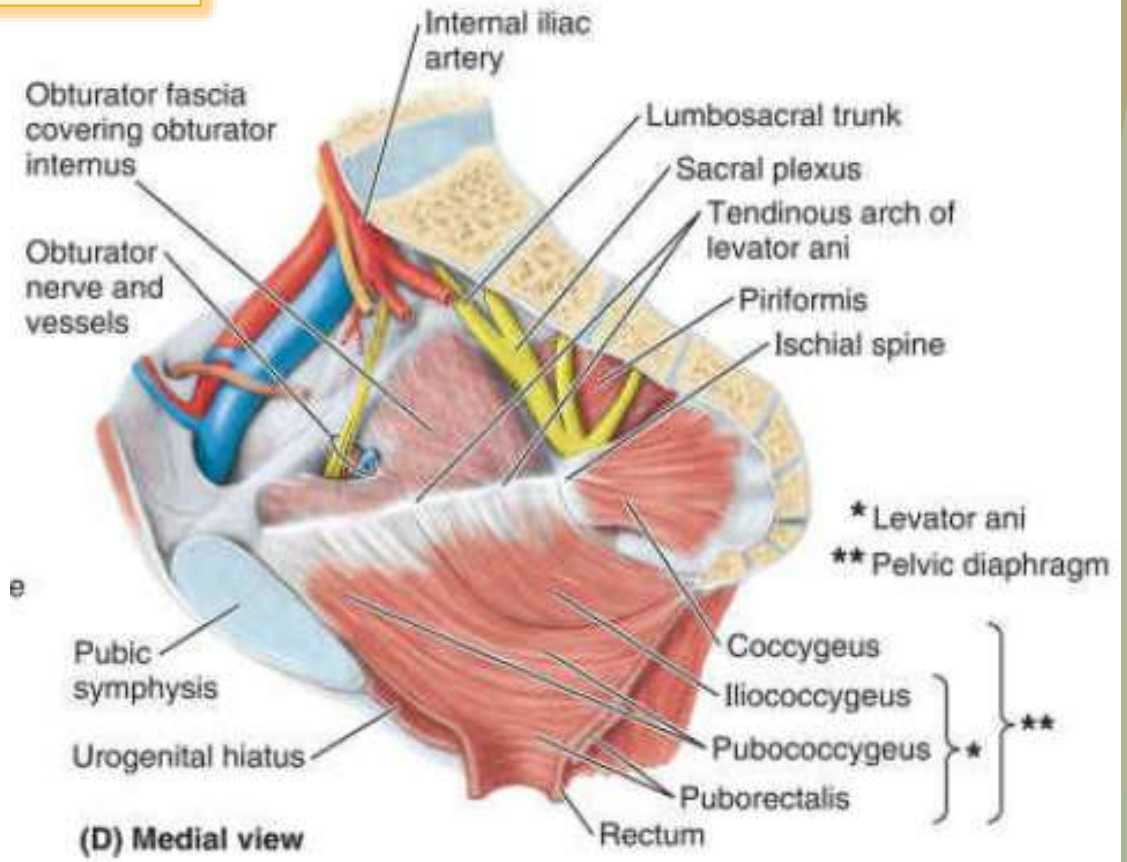
ANTERO-INFERIOR PELVIC WALL

- ✓ is formed primarily by the **bodies and rami of the pubic bones** and the **pubic symphysis**
- ✓ It participates in bearing the weight of the urinary bladder.

LATERAL PELVIC WALLS



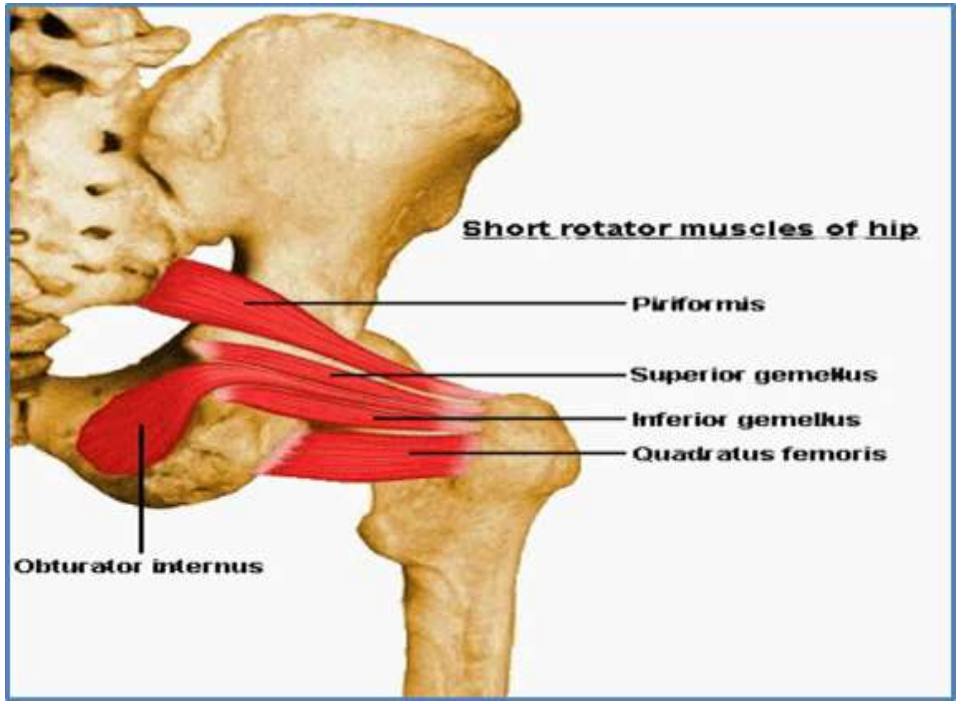
(A) Medial view of hemisected pelvis

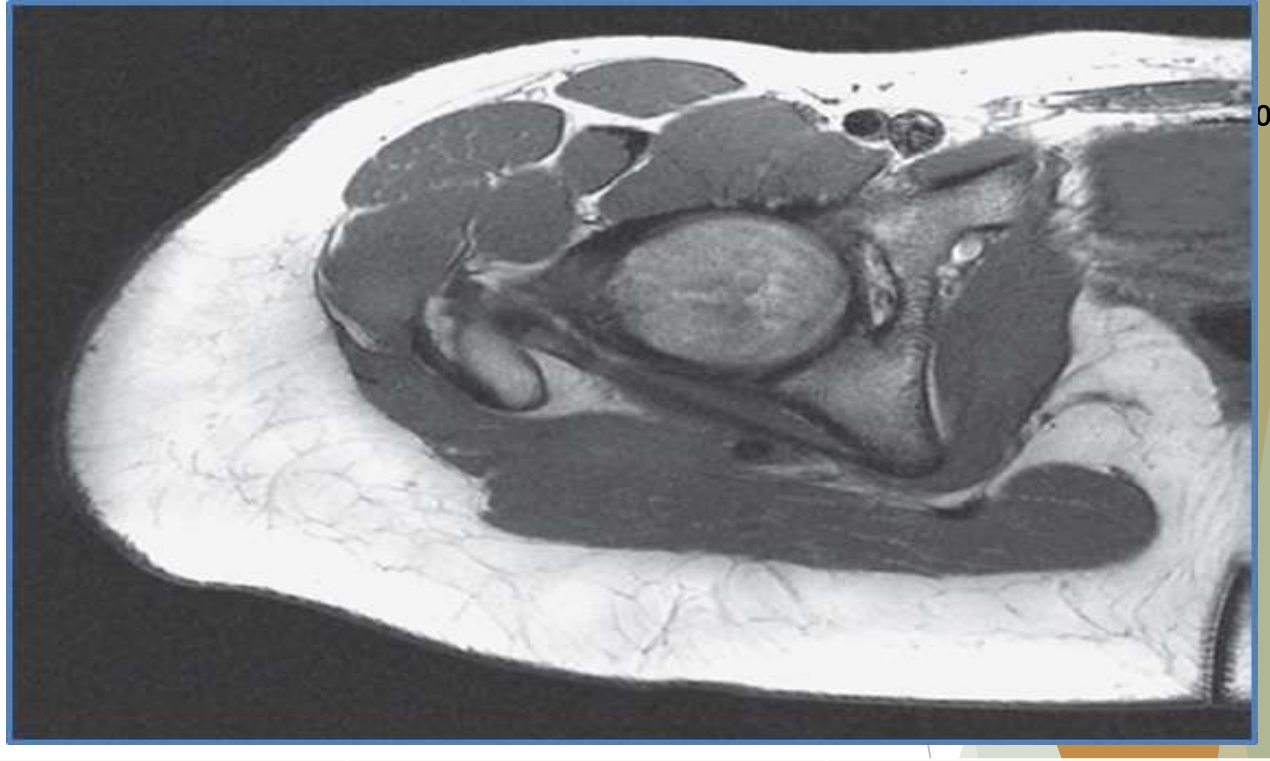


(D) Medial view

- are formed by
- ✓ the **right and left hip bones**, each of which includes an **obturator foramen** closed by an **obturator membrane** from which **obturator internus** muscles are attached.

The medial surfaces of obturator internus muscles are covered by **obturator fascia**, thickened centrally as a **tendinous arch** that provides attachment for the pelvic diaphragm





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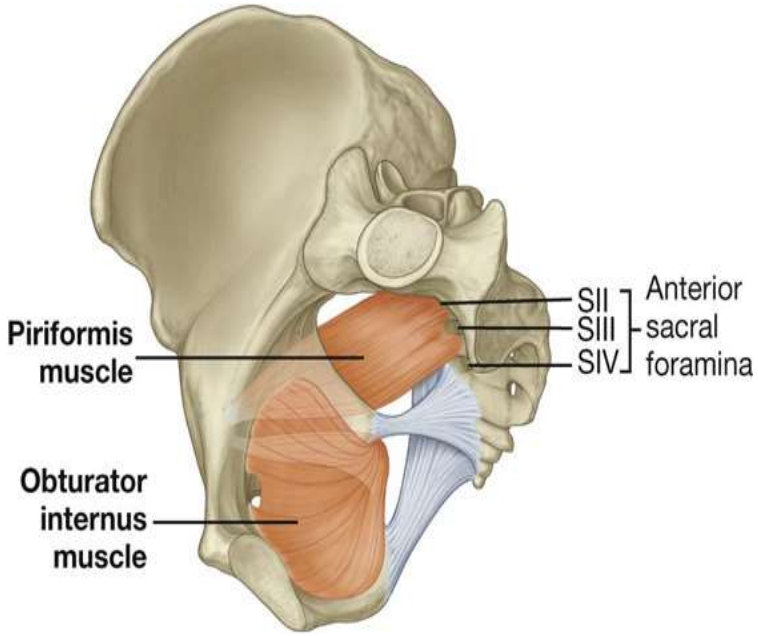
	Origin	Insertion	N supply	Action
Obturator internus	Pelvic surface of Obturator membrane and surrounding bones	Medial surface of greater trochanter (trochanteric fossa)	Nerve to obturator internus (L5, S1, S2)	✓ Rotates thigh laterally; ✓ assists in holding head of femur in acetabulum

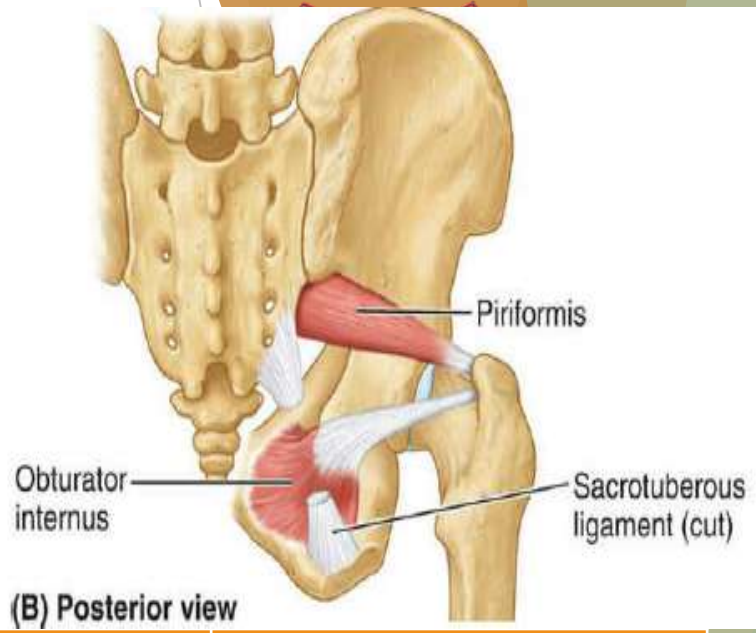
- **At the LSF the tendon bends 90^{O} to the muscle**

POSTERIOR PELVIC(POSTERO-LATERAL) WALL

consists of

- sacrum and coccyx
- Piriformis muscles and their parietal pelvic fascia
- ligaments include the anterior sacro-iliac, sacrospinous, and sacrotuberous ligaments





	Origin	Insertion	N supply	Action
Piriformis	Pelvic surface of 2nd-4th sacral segments; Superior margin of greater sciatic notch and sacrotuberous ligament	Superior border of Greater trochanter	Anterior rami of S1 and S2	✓ Rotates thigh laterally; ✓ Abducts thigh; ✓ assists in holding head of femur in acetabulum

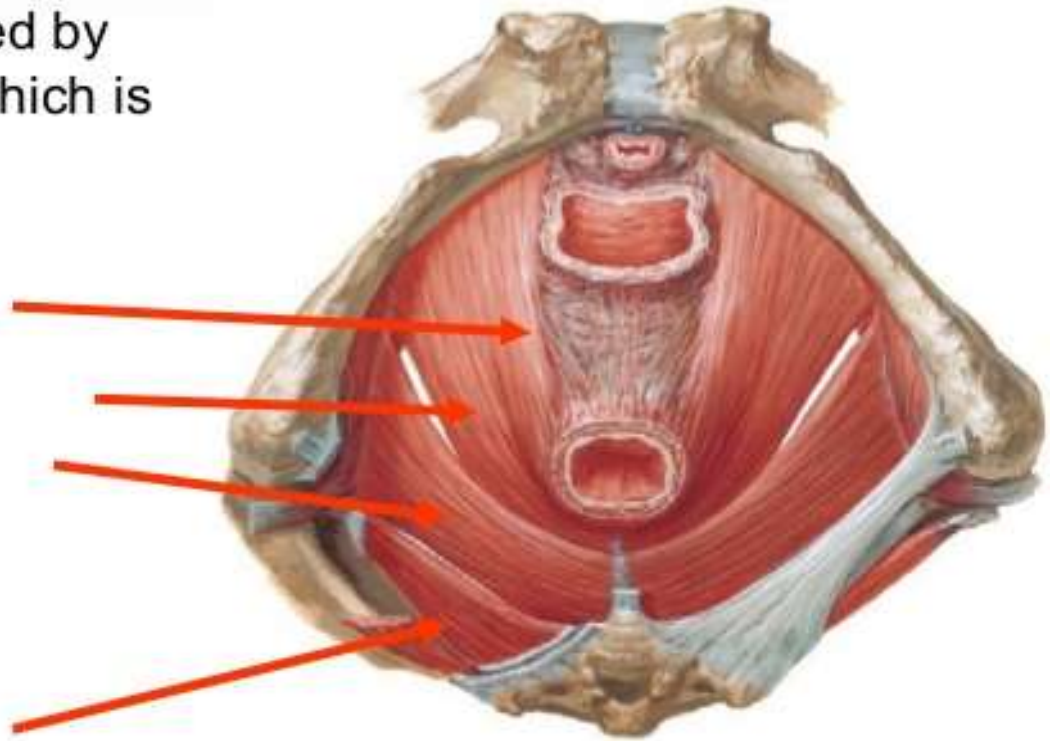
- Piriformis contains the sacral plexus

Pelvic Diaphragm (floor)

- Pelvic floor is formed by pelvic diaphragm which is composed of

1) Levator ani
   - Puborectalis
   - Pubococcygeus
   - Iliococcygeus

2) Coccygeus (Ischiococcygeus)

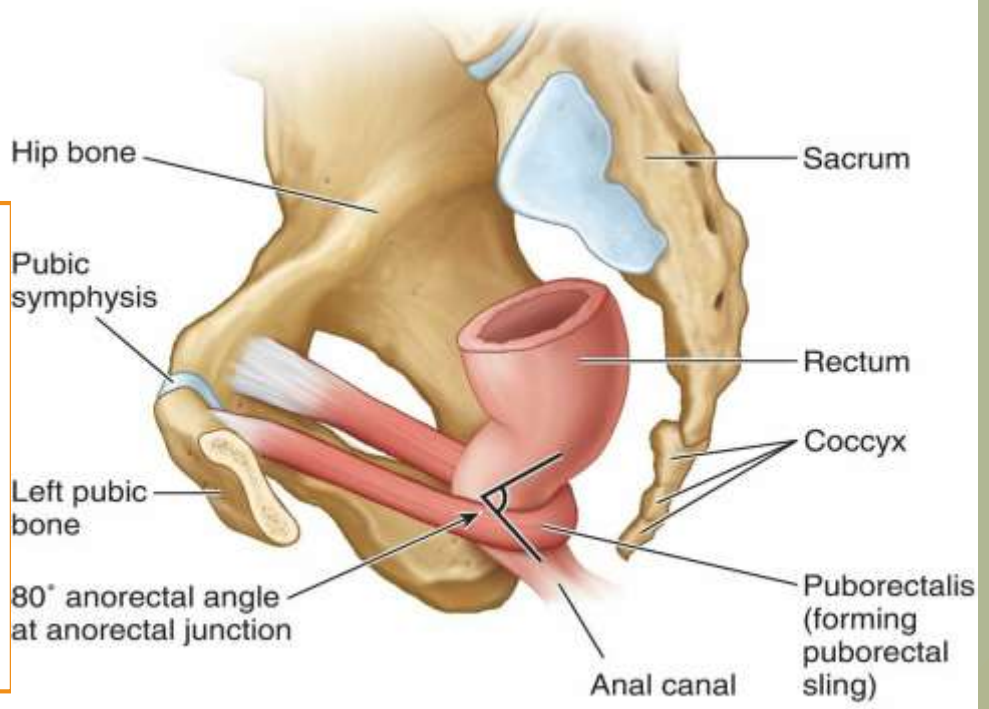


Lies at the level of **ischial spines** separating the pelvis above from the perineum below

Levator ani

❑ **Puborectalis**:

- the thicker, narrower, medial part of the levator ani,
- Arises from the **posterior aspects of the bodies** of the **right and left pubic bones.**
- It forms a **U-shaped muscular sling** that passes posterior to the **anorectal junction** bounding the **urogenital hiatus**.
- This part plays a major role in maintaining **fecal continence**.



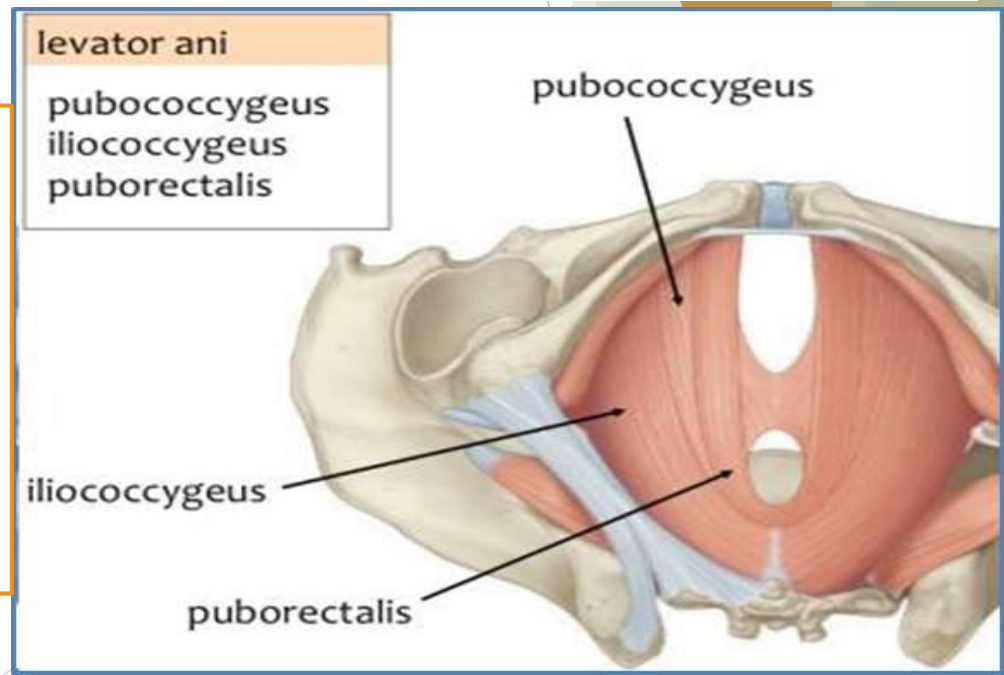
❑ **Pubococcygeus**:

✓ the wider but thinner intermediate part of the levator ani,

✓ arises from the posterior aspect of the body of the pubis and anterior tendinous arch

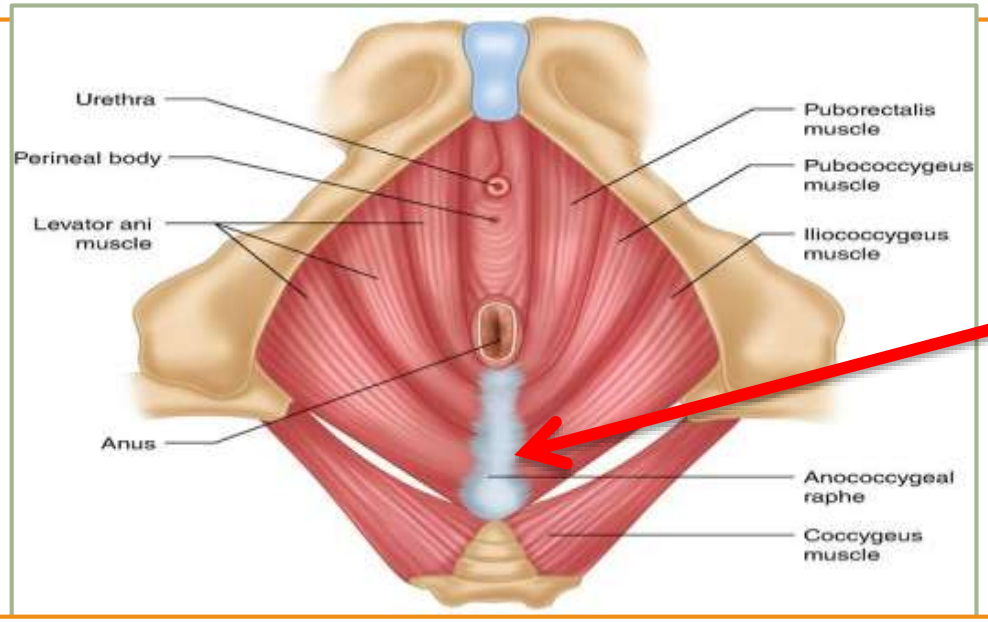
✓ Its lateral fibers attach to the coccyx and its medial fibers merge with those of the contralateral muscle to form a **tendinous plate**, part of the **anococcygeal body**

Medial view from left



❑ Iliococcygeus:

- ✓ the posterolateral part of the levator ani,
- ✓ arises from the posterior tendinous arch and ischial spine.
- ✓ blends with the anococcygeal body posteriorly.



anococcygeal body or ligament: between the anus and the coccyx (clinically the “levator plate”).

❑ Coccygeus muscles

- ➢ arise from the ischial spine
- ➢ Passes to lateral aspects of the inferior sacrum and coccyx, their fibers lying on and attaching to the deep surface of the sacrospinous ligament

- **Nerve supply of Levator ani**

✓ Nerve to levator ani (branches of S4),

✓ inferior anal (rectal) nerve,

✓ coccygeal plexus

- **Nerve supply of Coccygeus**

✓ Branches of S4 and S5 spinal nerves

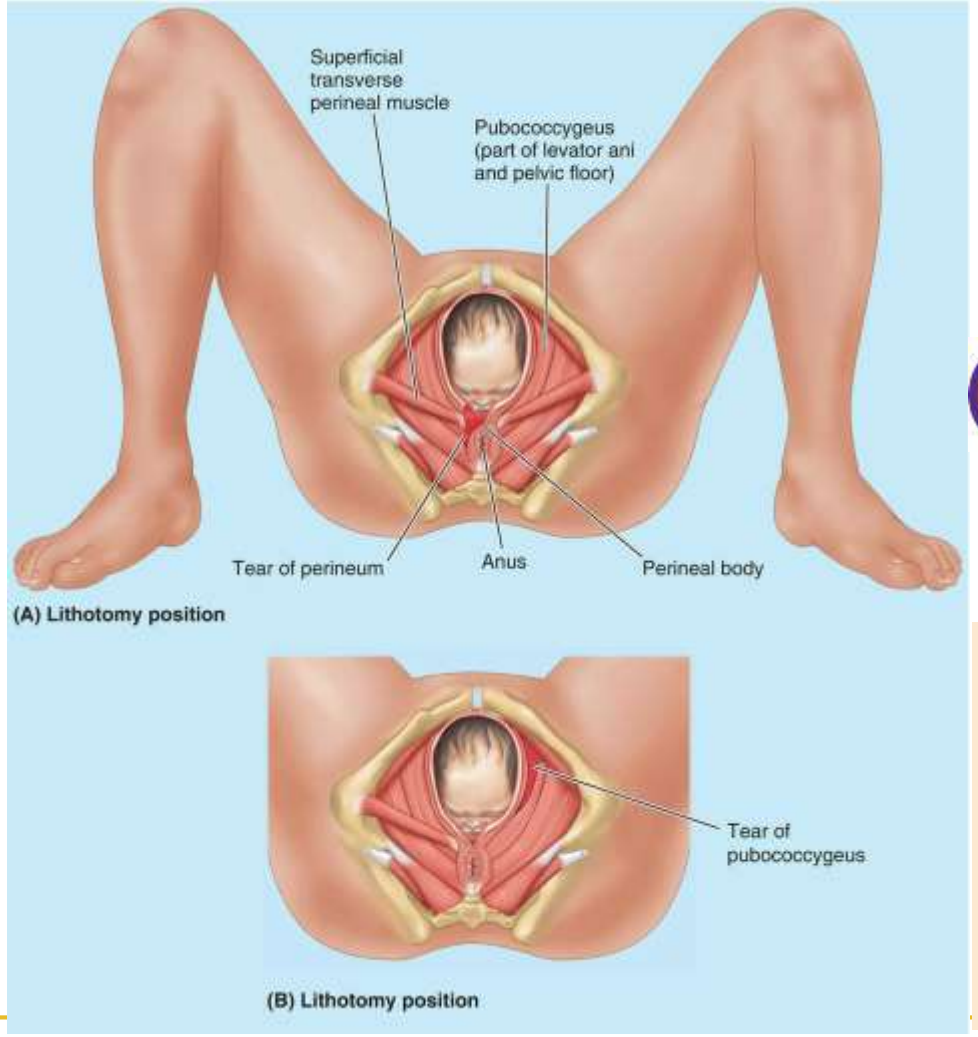
Action of pelvic diaphragm:

1- It forms a **dynamic floor** (tonically contracted most of the time) for **supporting the abdominopelvic viscera** (e.g., the intestines).

2- Active contraction of the puborectalis portion is important in **maintaining fecal continence**. The levator ani must relax to allow urination and defecation.

3- Actively contracted to **increase support of the viscera during periods of increased intra-abdominal pressure** during activities such as forced expiration, coughing, sneezing, vomiting

Clinical Correlates



- The levator ani, may be injured during childbirth
- The **pubococcygeus** and **puborectalis**, the main and most medial parts of the levator ani, are the muscles torn most often

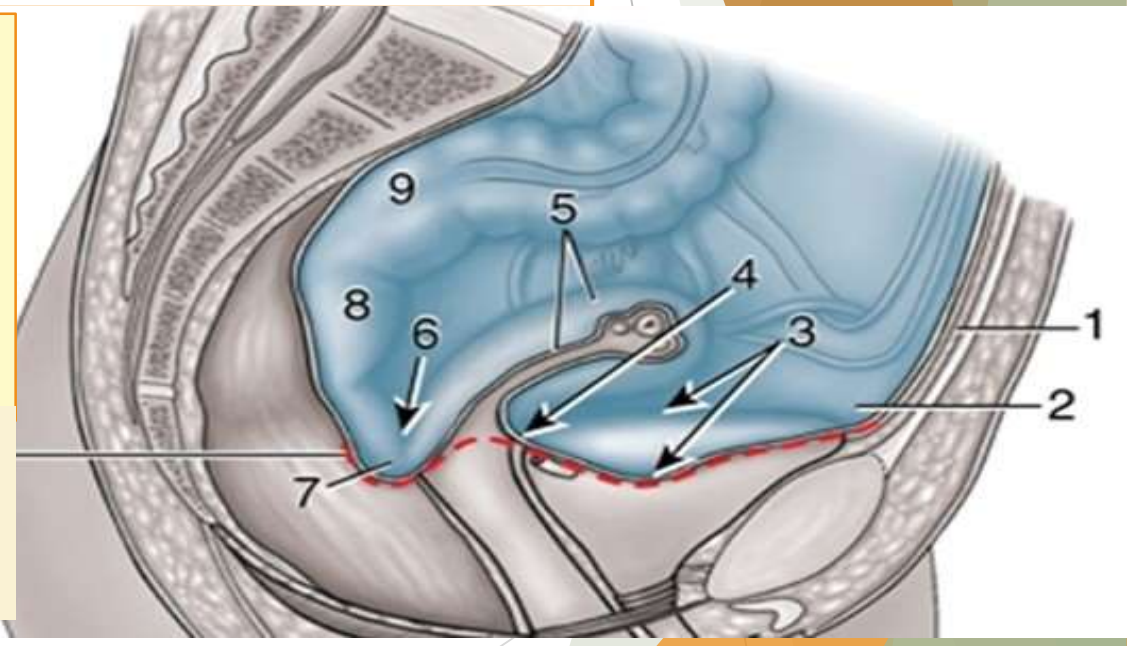
- These parts of the muscle are important because they encircle and **support the urethra, vagina, and anal canal**.
- Weakening of the levator ani and pelvic fascia may cause **urinary stress incontinence**, or lead to the **prolapse of one or more pelvic organs**

Peritoneum and Peritoneal Cavity of Pelvis

- The **parietal peritoneum** lining the abdominal cavity continues inferiorly into the pelvic cavity but does not reach the pelvic floor.
- Instead, it reflects onto the pelvic viscera, remaining separated from the pelvic floor by the **pelvic viscera and the surrounding pelvic fascia**

- Except for the **ovaries** and **uterine tubes**, the pelvic viscera are not completely ensheathed by the peritoneum, Only their superior and superolateral surfaces are covered with peritoneum.

Only the **uterine tubes** (except for their ostia, which are open) are **intraperitoneal** and suspended by a mesentery.

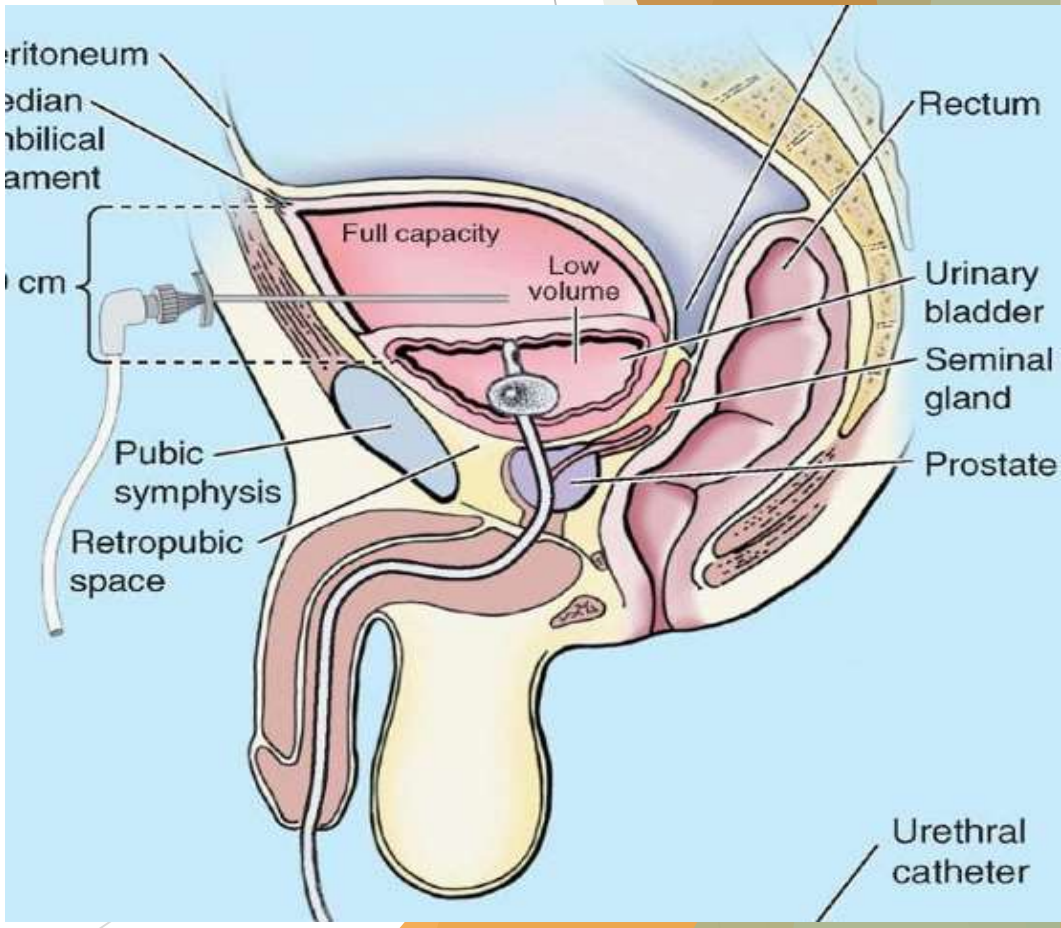


- The **ovaries**, although suspended in the peritoneal cavity by a mesentery, are not covered with peritoneum; instead a **special epithelium of cuboidal cells** (**germinal epithelium**) covers them.

- A **loose areolar (fatty) layer** between the **transversalis fascia** and the **parietal peritoneum** of the **inferior part of the anterior abdominal wall** allows the bladder to expand between these layers as it becomes distended with urine.

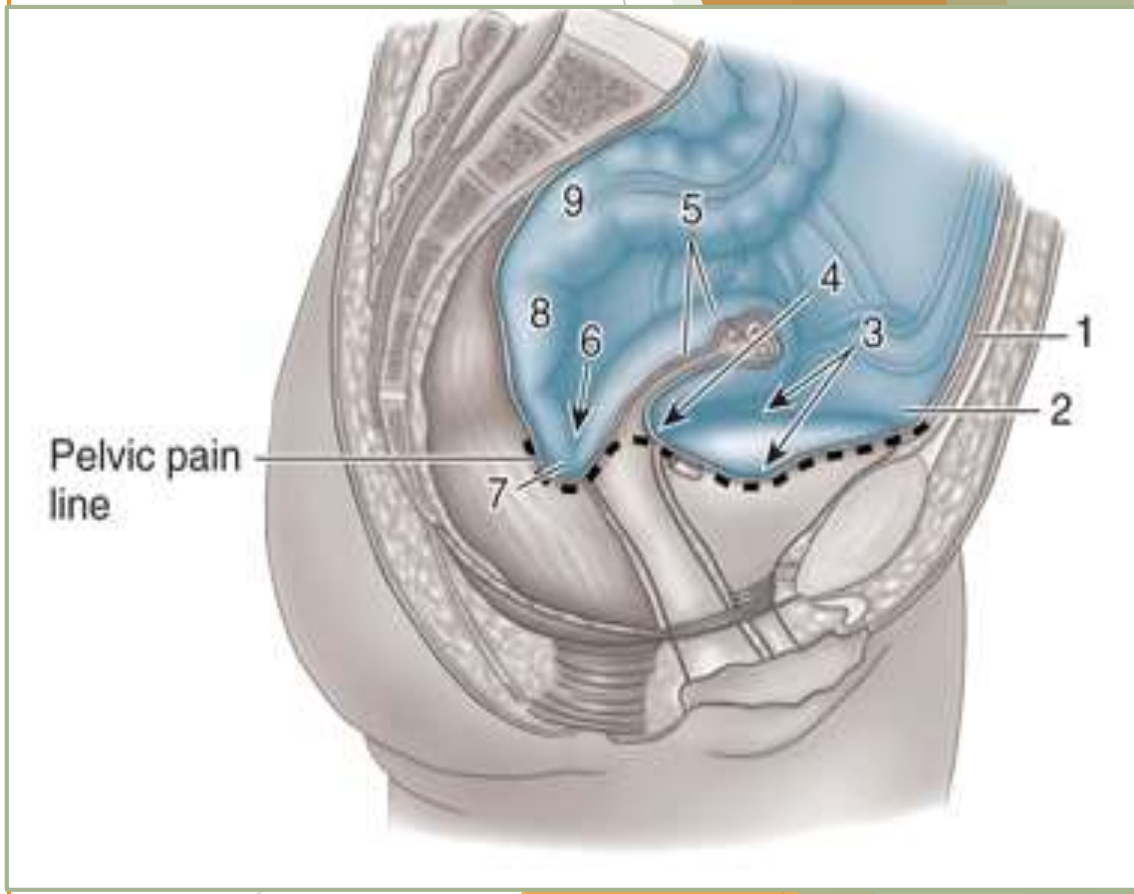
Suprapubic puncture:

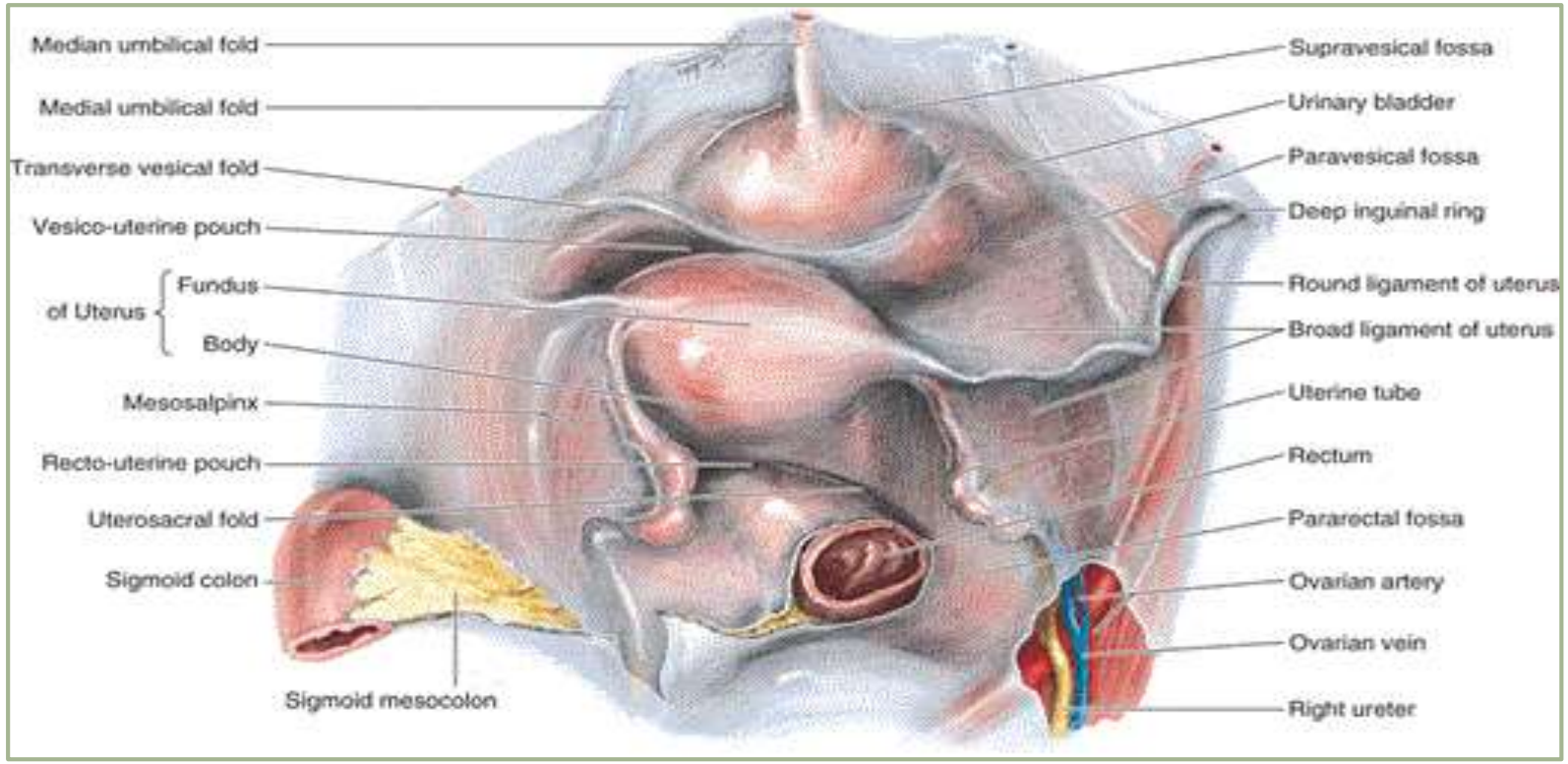
- The **anterior surface** of distended bladder is uncovered by peritoneum
- The bladder of patients with **retention of urine** can be catheterized from this surface without hurting the peritoneum



Peritoneal reflections in Female

- Descends anterior abdominal wall
- Reflects onto superior surface of bladder, creating **supravesical fossa**
- Covers convex **superior surface of bladder** and slopes down sides of roof to ascend lateral wall of pelvis, creating a **paravesical fossa on each side**
- Reflects from bladder roof onto body of uterus forming **vesicouterine pouch**
- Covers **body and fundus of uterus** and **posterior fornix of vagina**; extends laterally from uterus as double fold or mesentery— **broad ligament** that engulfs uterine tubes and round ligaments of uterus and suspends ovaries



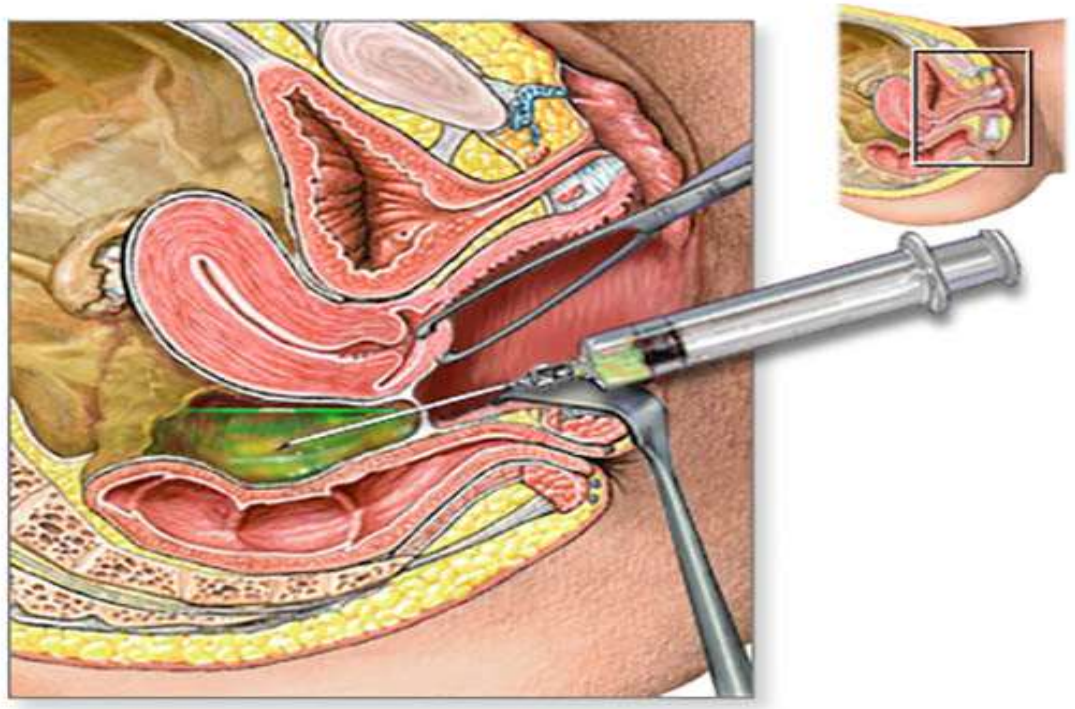


- Reflects from vagina onto rectum, forming **rectouterine pouch**
- Rectouterine pouch extends laterally and posteriorly to form a **pararectal fossa** on each side of rectum
- Ascends rectum; from inferior to superior, rectum is subperitoneal and then retroperitoneal
- Engulfs sigmoid colon beginning at rectosigmoid junction

The **broad ligament of the uterus**, extends between the uterus and the lateral pelvic wall on each side, forming a partition that separates the **paravesical fossae** and **pararectal fossae** of each side.

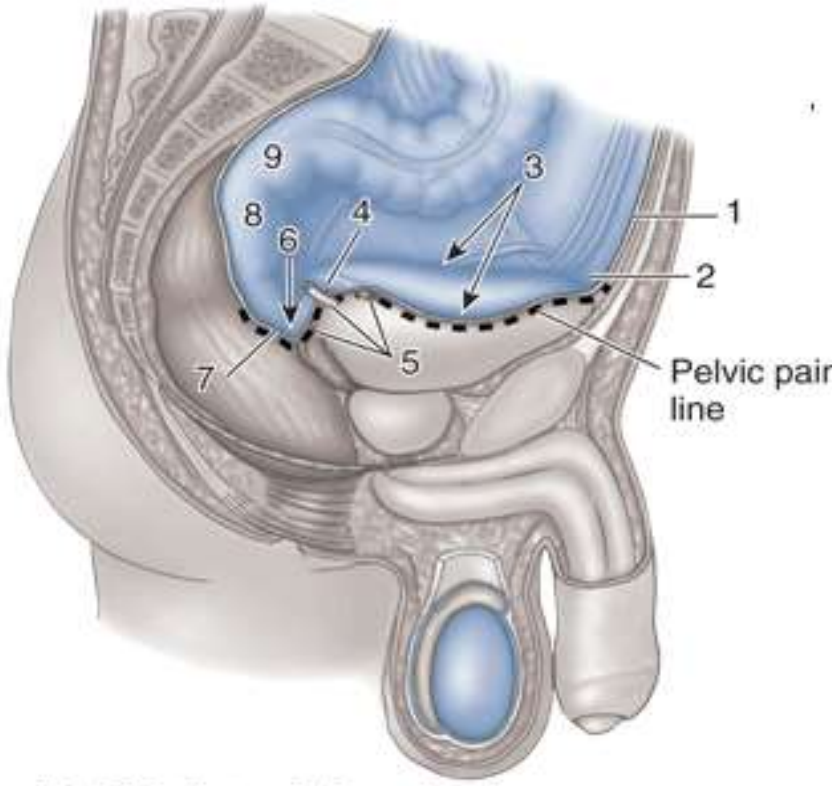
The **rectouterine pouch** is the **lowest portion of the peritoneal cavity**, it can collect fluid and cells from peritoneal cavity

when a ruptured ectopic pregnancy or ovarian cyst is suspected **Culdocentesis** is performed to aspirate fluid from the cul-de-sac of Douglas (rectouterine pouch) by a **needle puncture** of the **posterior vaginal fornix** near the midline between the uterosacral ligaments;



Peritoneal Reflections in male pelvis

- Reflects onto superior surface of bladder, creating **supravesical fossa**
- Covers superior surface (roof) of bladder and slopes down sides of roof to ascend lateral wall of pelvis, creating **paravesical fossae** on each side
- Descends posterior surface of bladder as much as 2 cm
- Laterally it folds over ureters, ductus deferens, and superior ends of seminal glands
- Reflects from bladder and seminal glands onto rectum, forming **Rectovesical pouch**
- **Rectovesical pouch** extends laterally and posteriorly to form **pararectal fossae** on each side of rectum
- Ascends rectum; from inferior to superior, rectum is subperitoneal and then retroperitoneal
- Engulfs sigmoid colon beginning at rectosigmoid junction

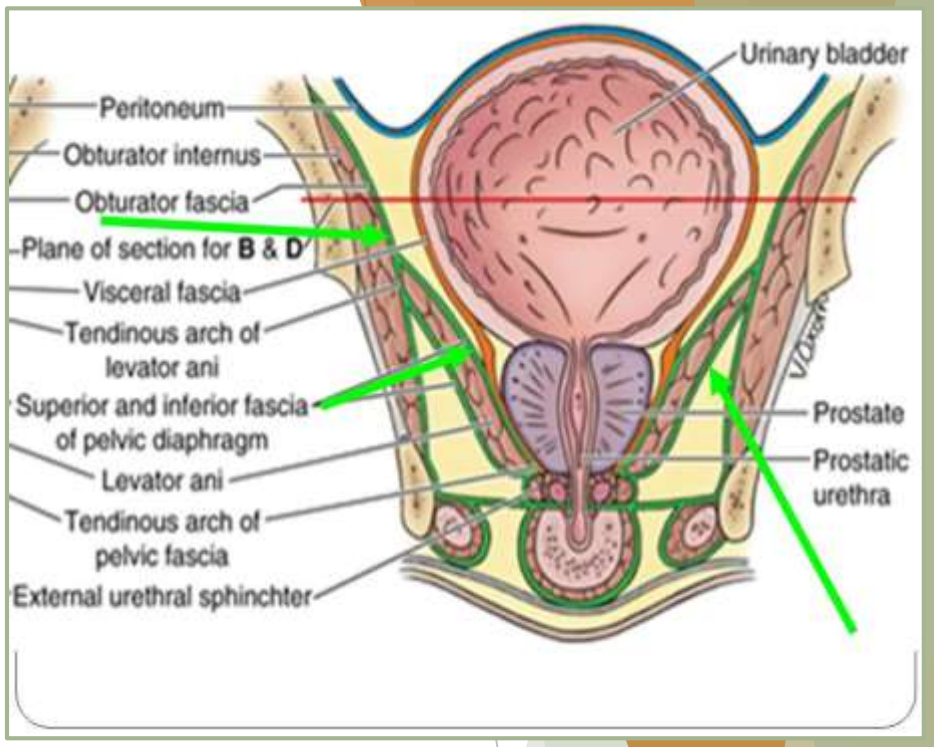


PELVIC FASCIA

- MEMBRANOUS PELVIC FASCIA
  - PARIETAL
  - VISCERAL
- ENDOPELVIC FASCIA
  - LOOSE
  - CONDENSED

Parietal pelvic fascia

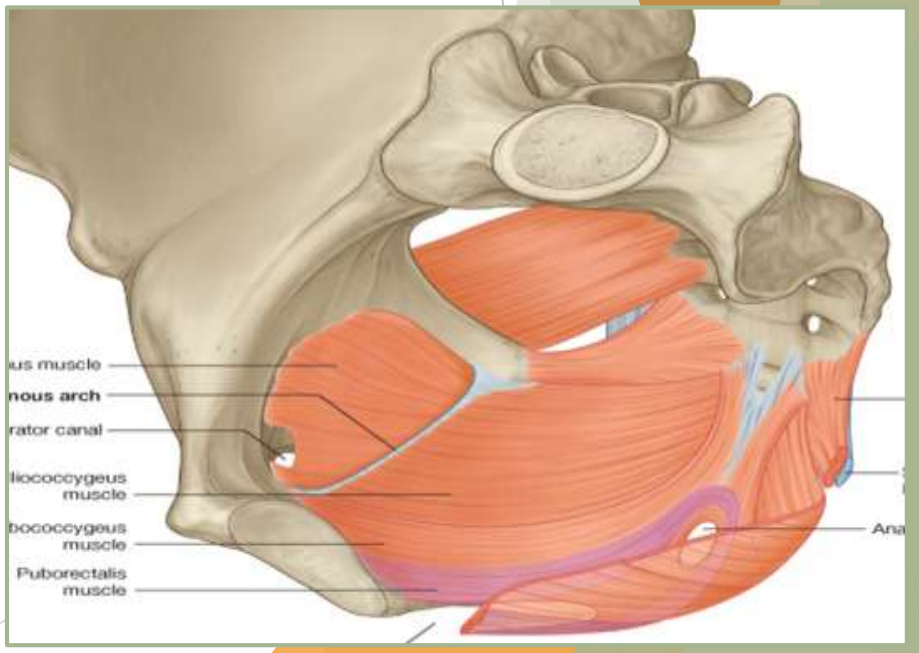
- is a membranous layer **lining the internal aspect of the muscles** forming the walls and floor of the pelvis.
- covers the pelvic surfaces of the obturator internus, piriformis, coccygeus, levator ani, and part of the urethral sphincter .
- The name given to the fascia is derived from the muscle it encloses (e.g., obturator fascia).
- This layer is continuous superiorly with the transversalis and iliopsoas fascias.



Visceral pelvic fascia

- the membranous fascia that directly ensheathes the pelvic organs.

- The **parietal** and **visceral layers** become continuous **where the organs penetrate the pelvic floor.**
- Here the parietal fascia thickens, forming the **tendinous arch of pelvic fascia.**



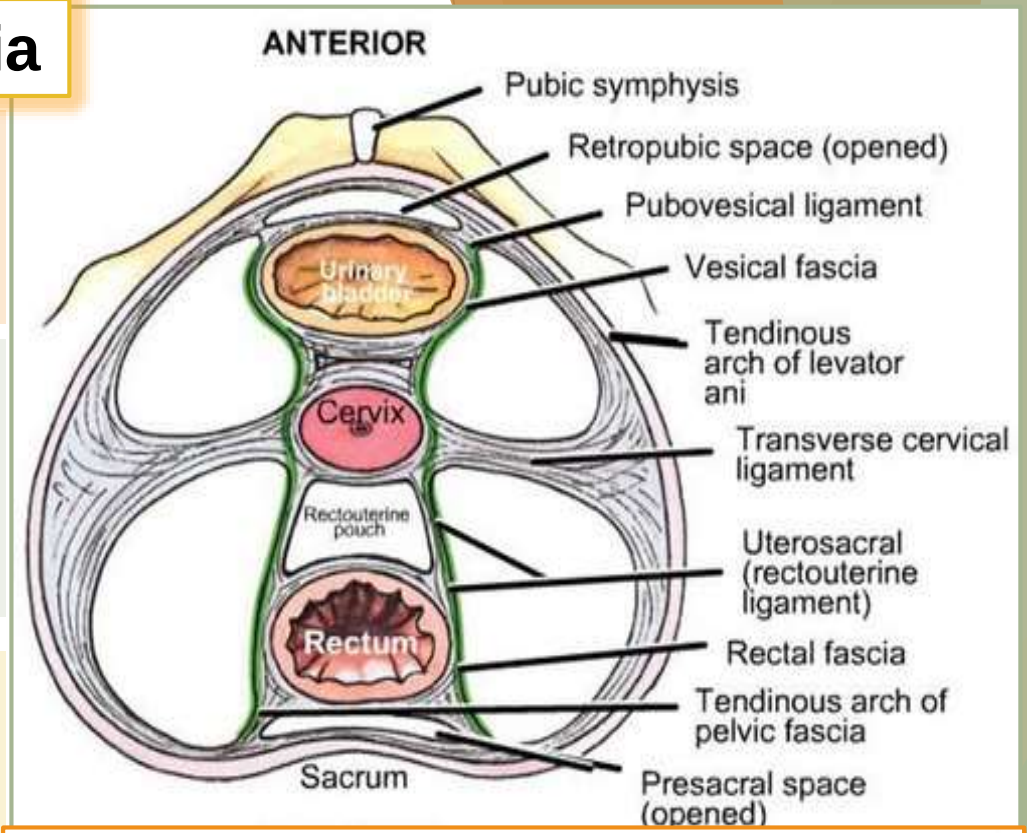
Tendinous arch of pelvic fascia

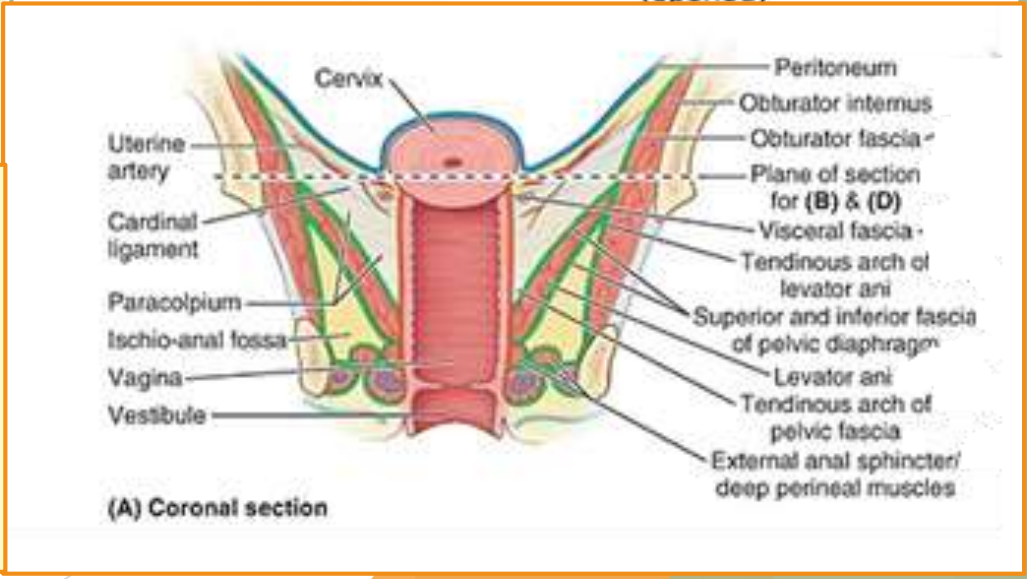
- running from the pubis to the sacrum along the pelvic floor adjacent to the viscera.

- The most **posterior part** of the band runs as the **sacrogenital ligaments** from the sacrum around the side of the rectum to attach to the prostate in the male or the vagina in the female.

- The most **anterior part** of this tendinous arch
- ✓ (**puboprostatic ligament** in males connects the prostate to the pubis
- ✓ **pubovesical ligament** in females connects the fundus (base) of the bladder to the pubis in the female.

- In **females**, the lateral connection of the visceral fascia of the vagina with the tendinous arch of the pelvic fascia is the **paracolpium**
- The paracolpia suspend the vagina between the tendinous arches, assisting the vagina in bearing the weight of the fundus of the bladder





ENDOPELVIC FASCIA

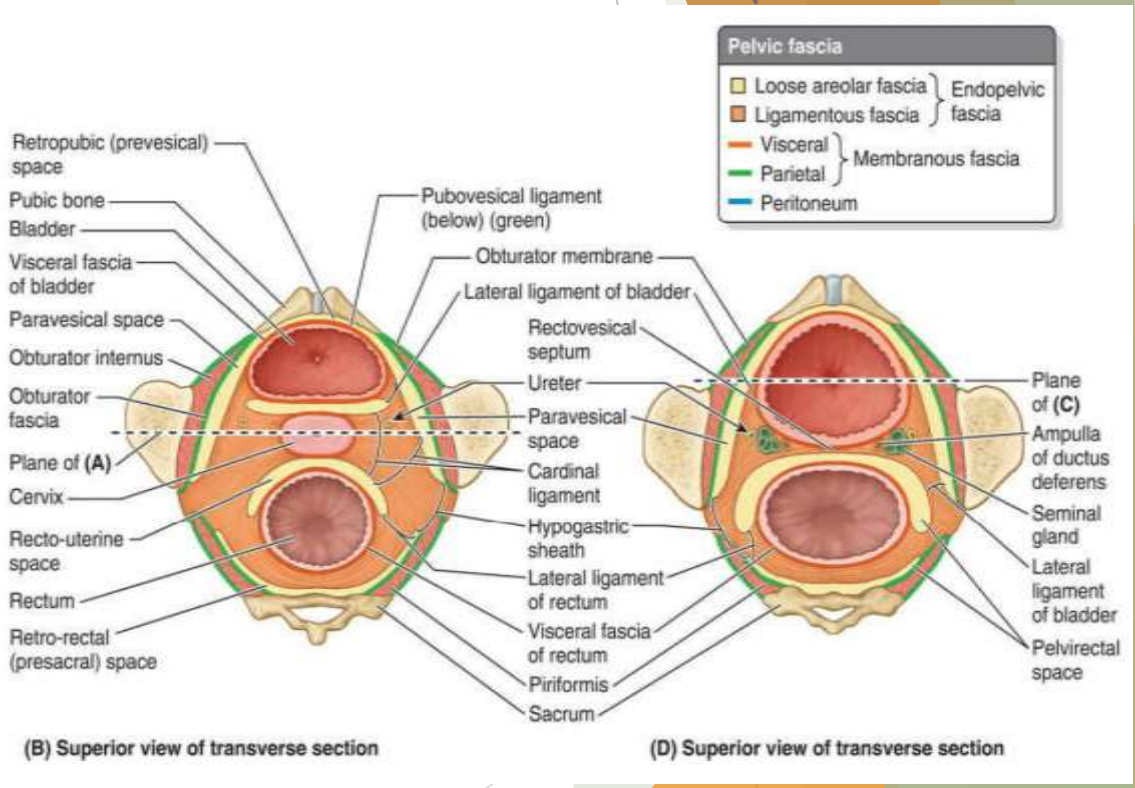
- abundant connective tissue remaining between the parietal and visceral membranous layers

- Loose areolar (fatty) tissue
- Condensed endopelvic fascia (ligamentous fascia)

Loose areolar tissue

- **potential spaces(**consisting only of a layer of loose fatty tissue), that accommodates **urinary bladder** & **rectal ampulla** as they fill

✓ **Retropubic** (**prevesical**) extended posterolaterally as **paravesical space**
✓ **Retrorectal** (**presacral**) **space**

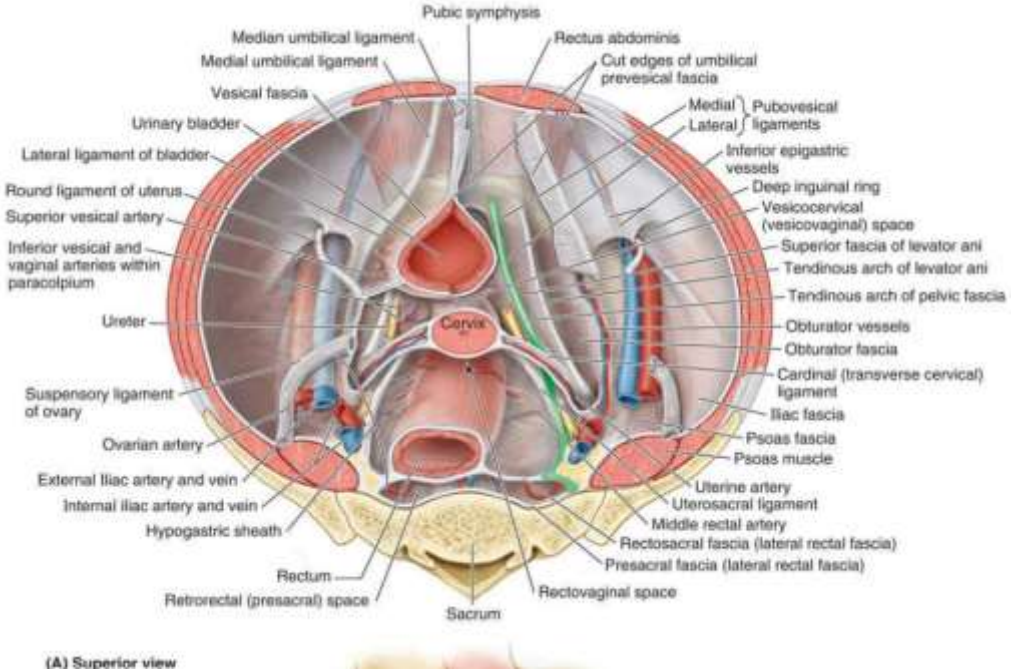


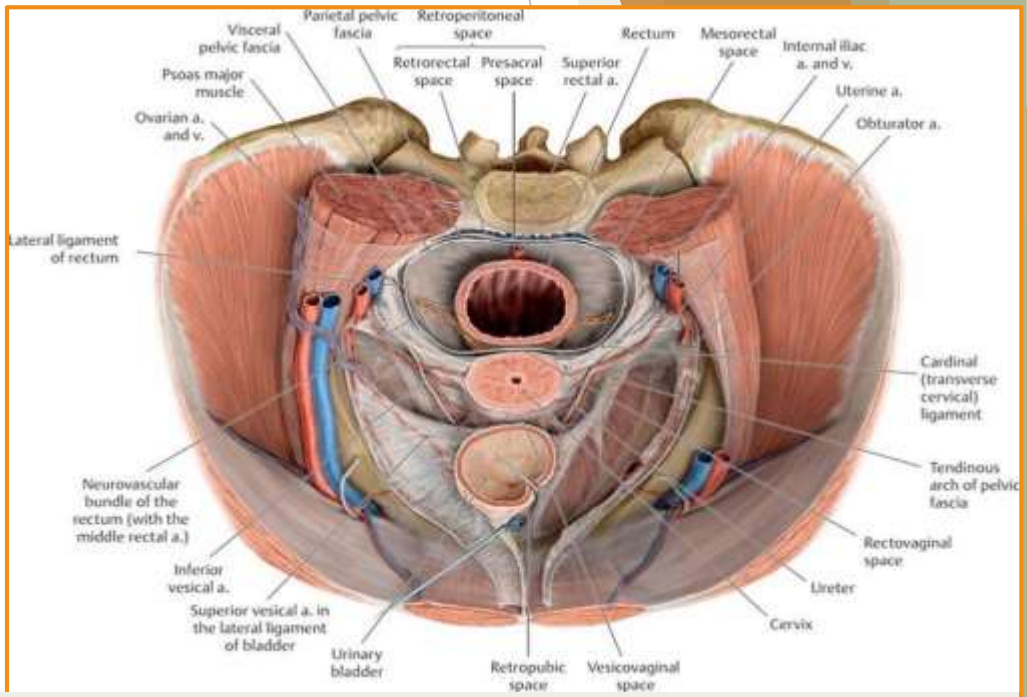
Condensed endopelvic fascia

This part of the endopelvic fascia containing an **abundance of collagen and elastic fibers** and a **scattering of smooth muscle fibers**.

The hypogastric sheath

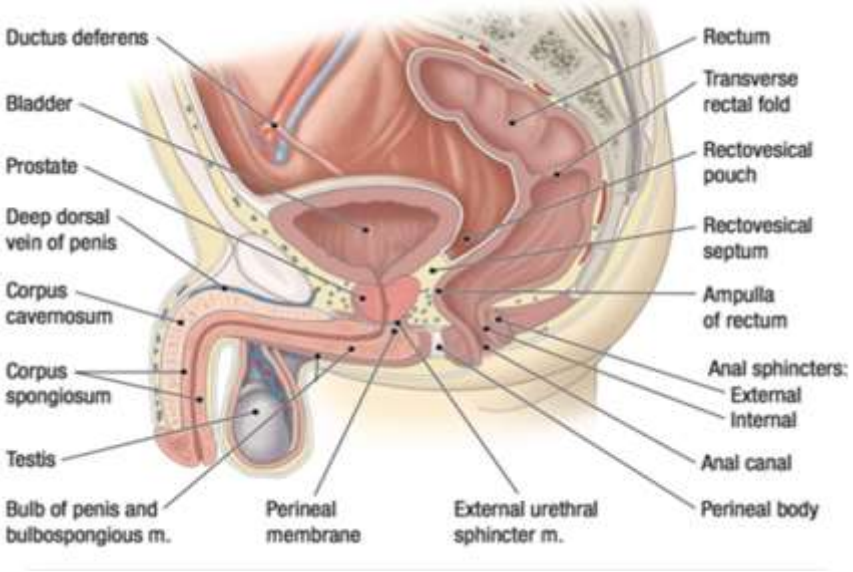
- Is a thick band of **condensed pelvic fascia**.
- is a barrier separating the retropubic & presacral spaces .
- gives passage to essentially all the vessels and nerves passing from the lateral wall of the pelvis to the pelvic viscera, along with the ureters and, in the male, the ductus deferens.





- The **Anterior lamina:** The **lateral ligament of the bladder,** passing to the bladder, conveying the **superior vesical arteries and veins.**
- The **posterior lamina** passes to the rectum, conveying the **middle rectal artery and vein**

Middle lamina



- ✓ in the male, forming the **rectovesical septum** between the **posterior surface of the bladder and the prostate** anteriorly and the **rectum** posteriorly

- ✓ In the female, the middle lamina passes medially to the cervix and vagina as the **cardinal ligament** (transverse cervical) at the base of the broad ligament

- ✓ the uterine artery runs transversely toward the cervix while the ureters course immediately inferior to them as they pass on each side of the cervix toward the bladder.