

Systemic Module

UGS

“Anatomy”

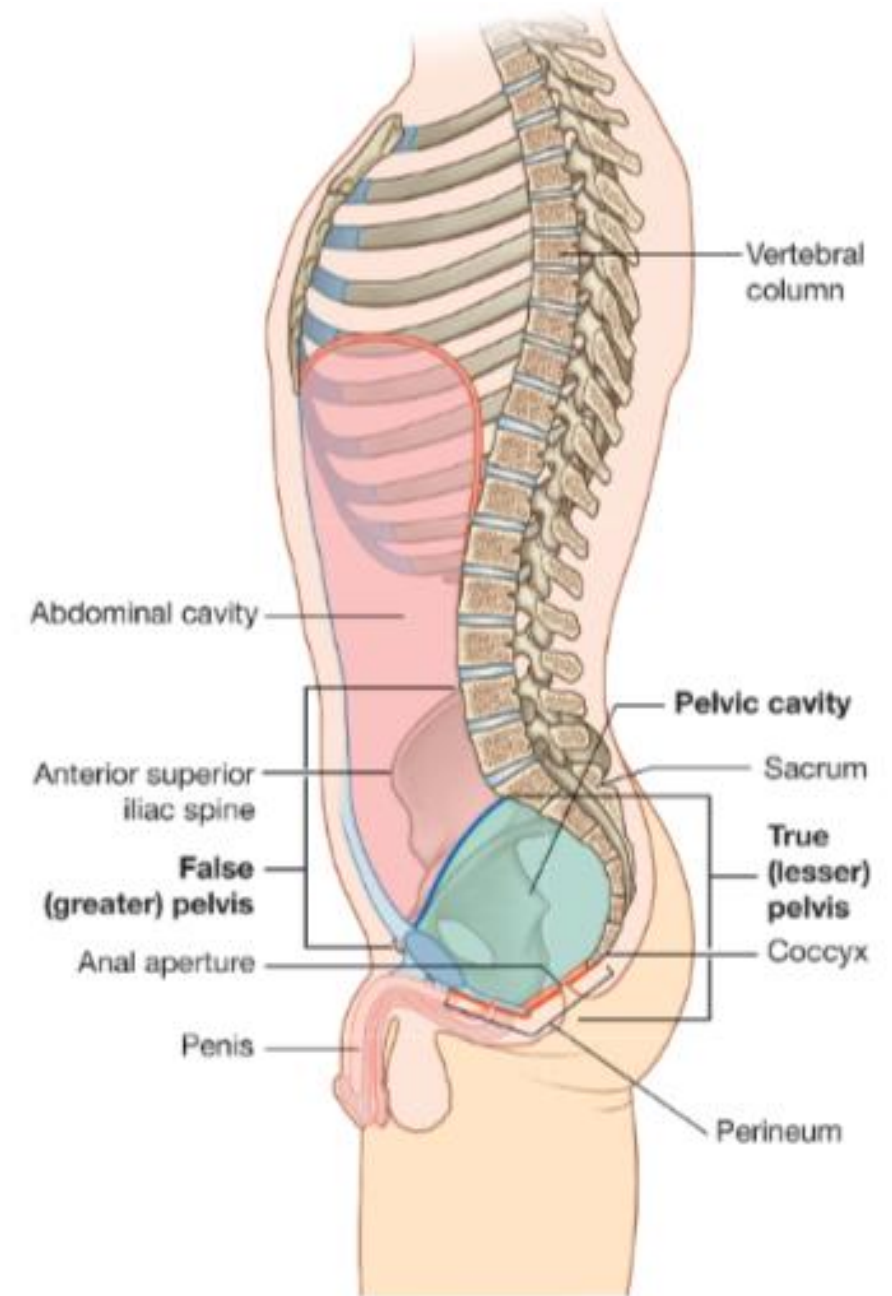
Pelvis and Perineum

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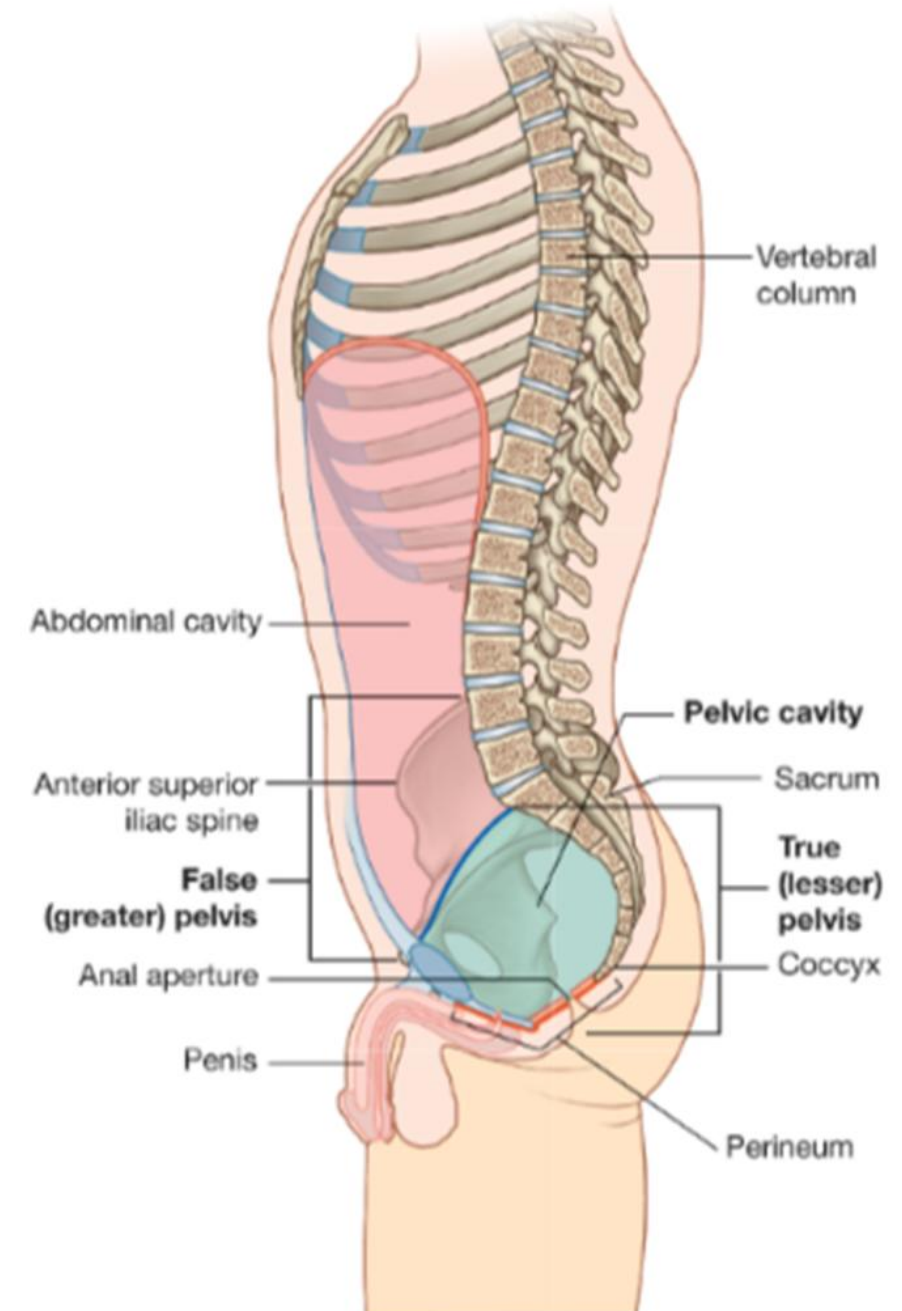
Introduction

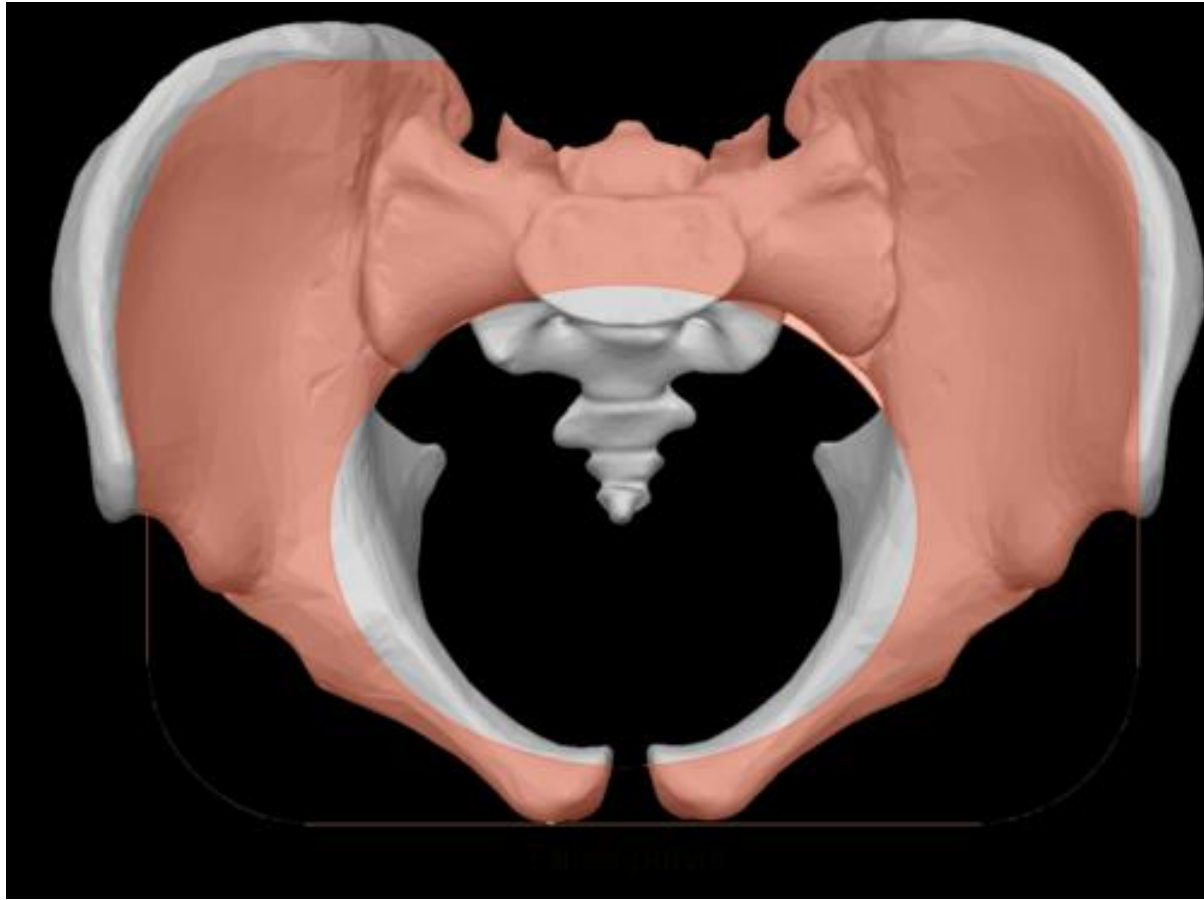
- **Pelvis** means 'basin' is the lower part of trunk, and is the area of transition between the trunk and the lower limbs.
- Anatomically, the pelvis is the part of the body surrounded by the pelvic girdle (bony pelvis).
- The pelvis is divided by the pelvic brim into:
 1. **The false (greater) pelvis:** the portion above the pelvic brim and is part of the abdomen.
 2. **The true (lesser) pelvis:** the portion below the pelvic brim, which encloses the pelvic cavity.



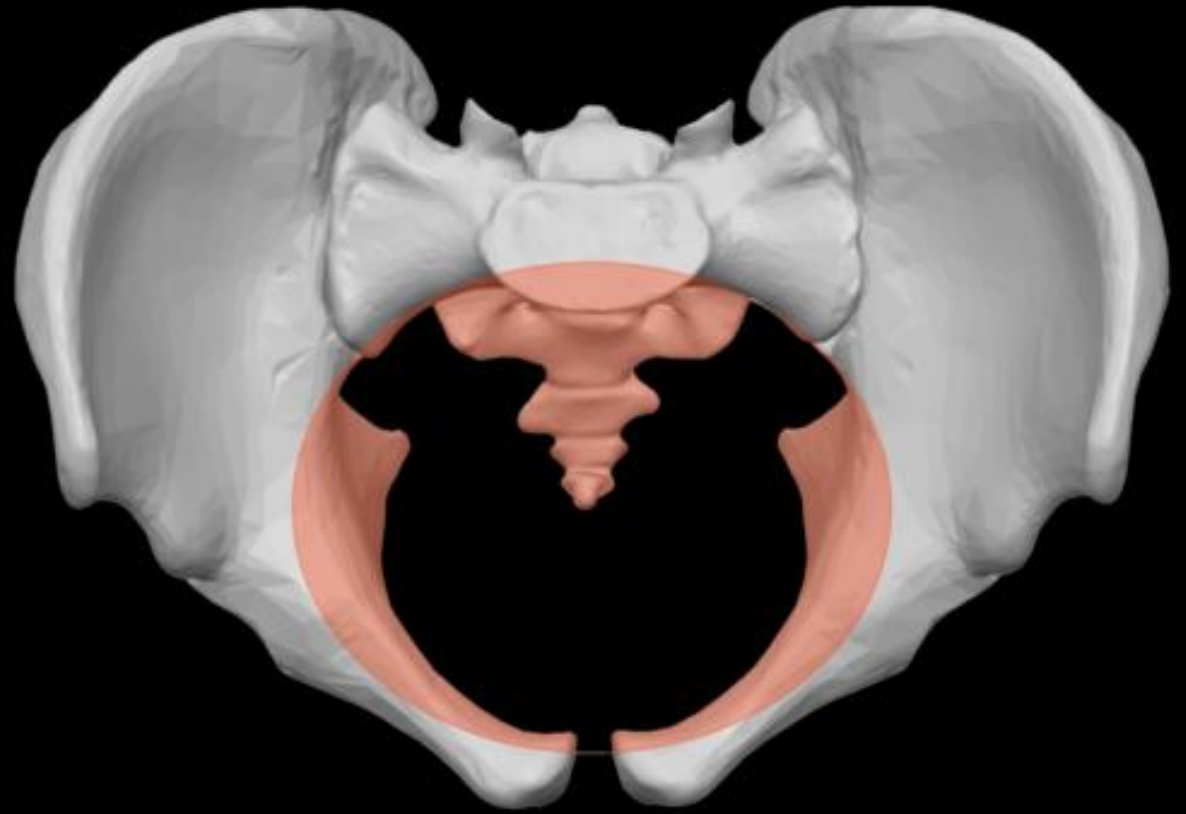
Introduction

- **The pelvic floor** is a fibromuscular structure separating the pelvic cavity above from the perineum below.
- **The perineum** is the area inferior to the floor of the pelvic cavity and between the two thighs.
- **Function:**
 1. The pelvis contain and support *bladder, rectum, anal canal, and reproductive tracts*.
 2. The perineum contains the *external genitalia and external openings of the urinary and gastrointestinal systems*.





False Pelvis



True Pelvis

Reproductive system

Uterine tube

Ovary

Uterus

Vagina

Urinary system

Bladder

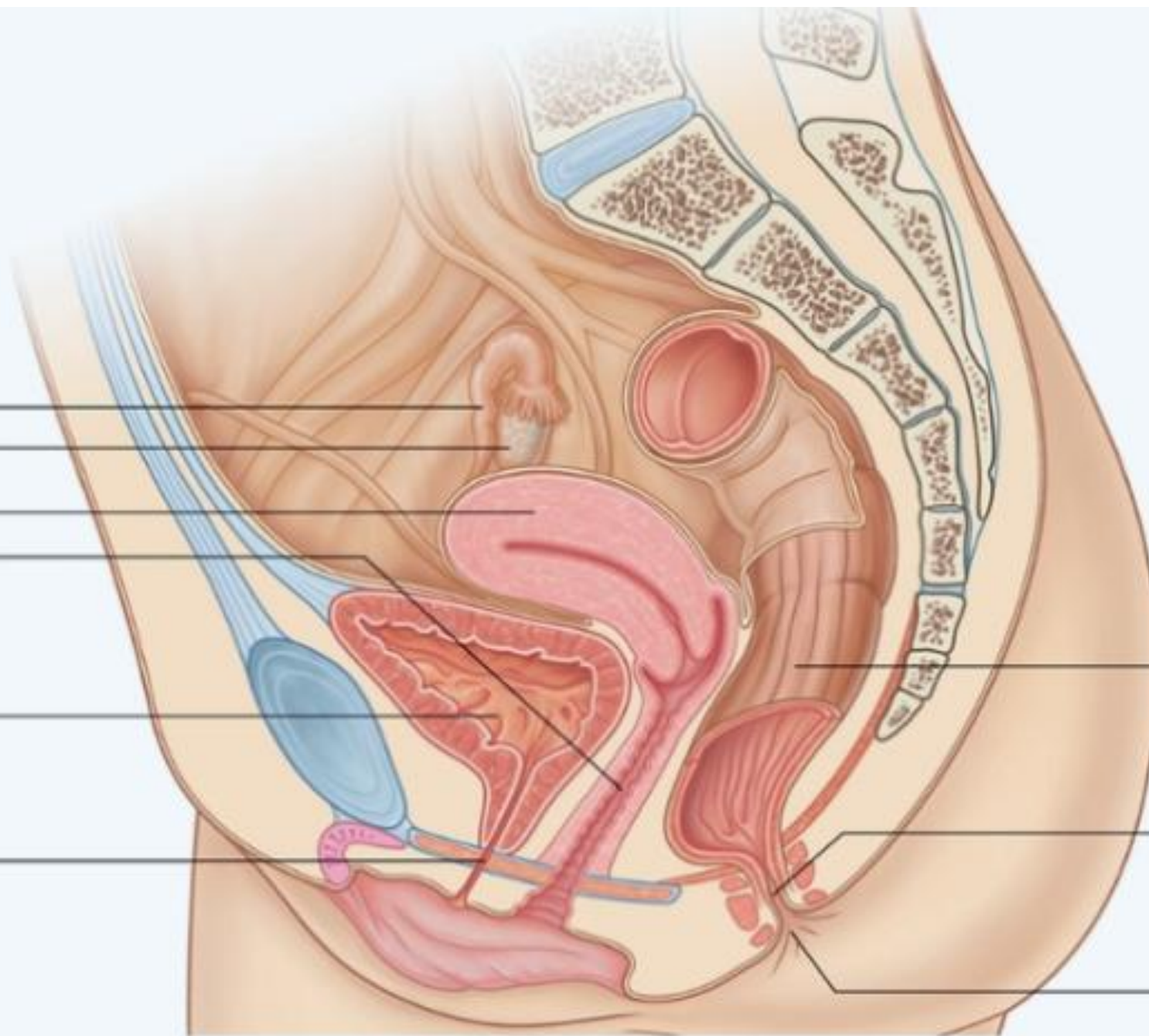
Urethra

Gastrointestinal system

Rectum

Anal canal

Anal aperture



Reproductive system

Seminal vesicle

Ductus deferens

Prostate

Ejaculatory duct

Gastrointestinal system

Rectum

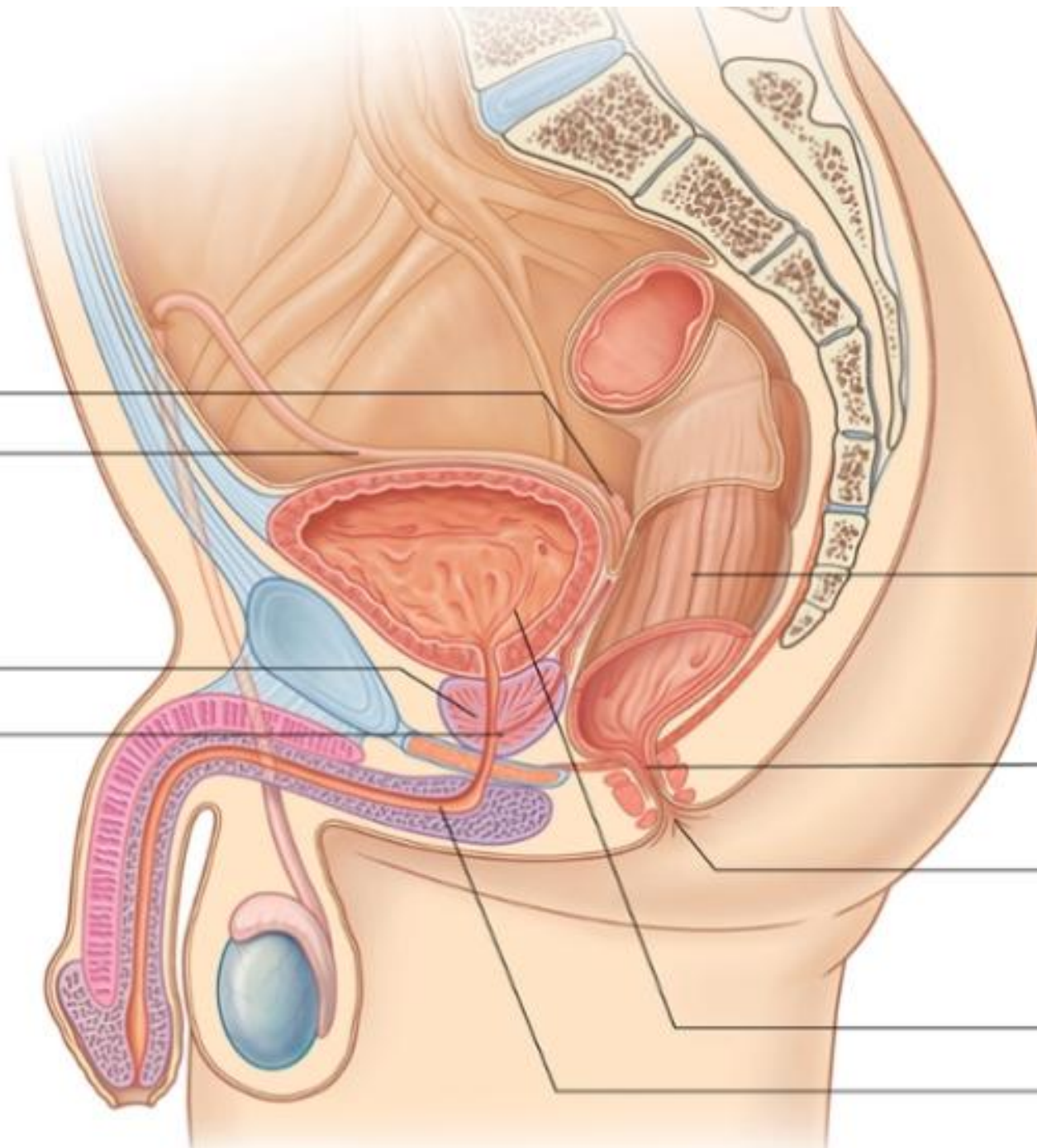
Anal canal

Anal aperture

Urinary system

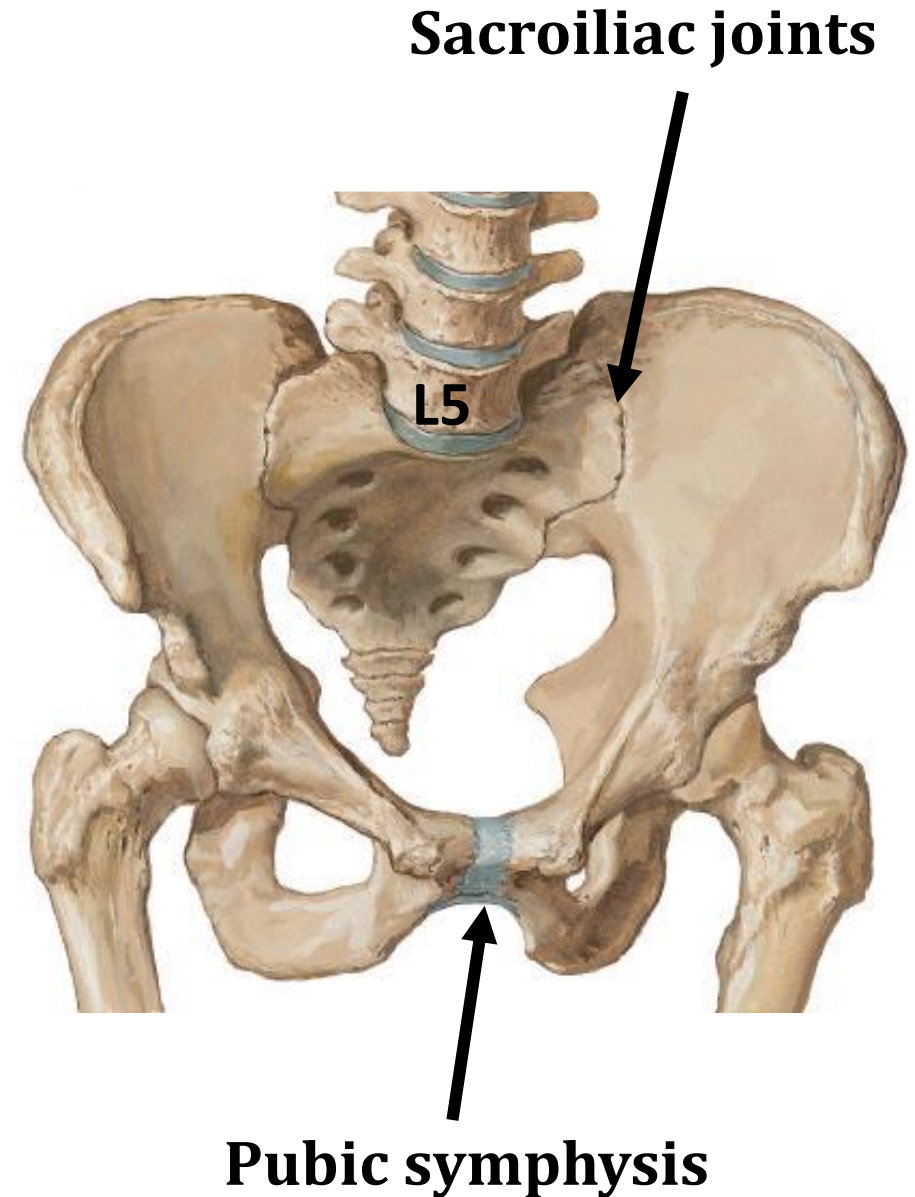
Bladder

Urethra



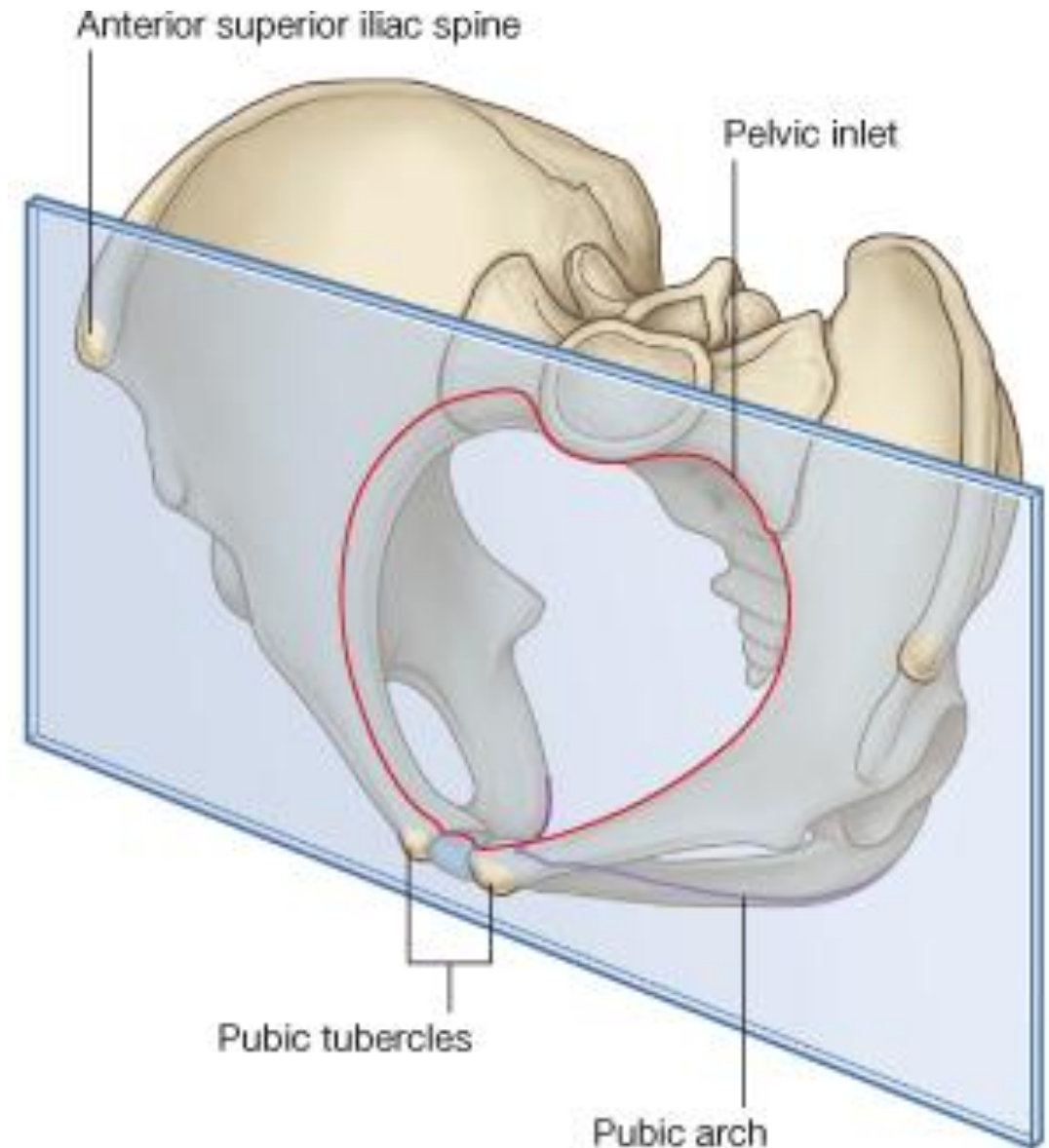
Pelvis Girdle

- The pelvic girdle is a ring of bones that connects the vertebral column to the two femurs.
- It is formed of **right and left hip bones**, the **sacrum**, and the **coccyx**.
- The sacrum articulates superiorly with vertebra L5 at the **lumbosacral joint**.
- The pelvic bones articulate posteriorly with the sacrum at the **sacro-iliac joints** and with each other anteriorly at the **pubic symphysis**.



Orientation

- **In the anatomic position:**
 - The pelvis is oriented so that **the front edge of the top of the *pubic symphysis* and the anterior superior iliac spines lie in the same vertical plane.**
 - The pelvic inlet, is tilted to face anteriorly and superiorly.
 - The bodies of the pubic bones and the ischiopubic arch are positioned in a nearly horizontal plane facing downward.

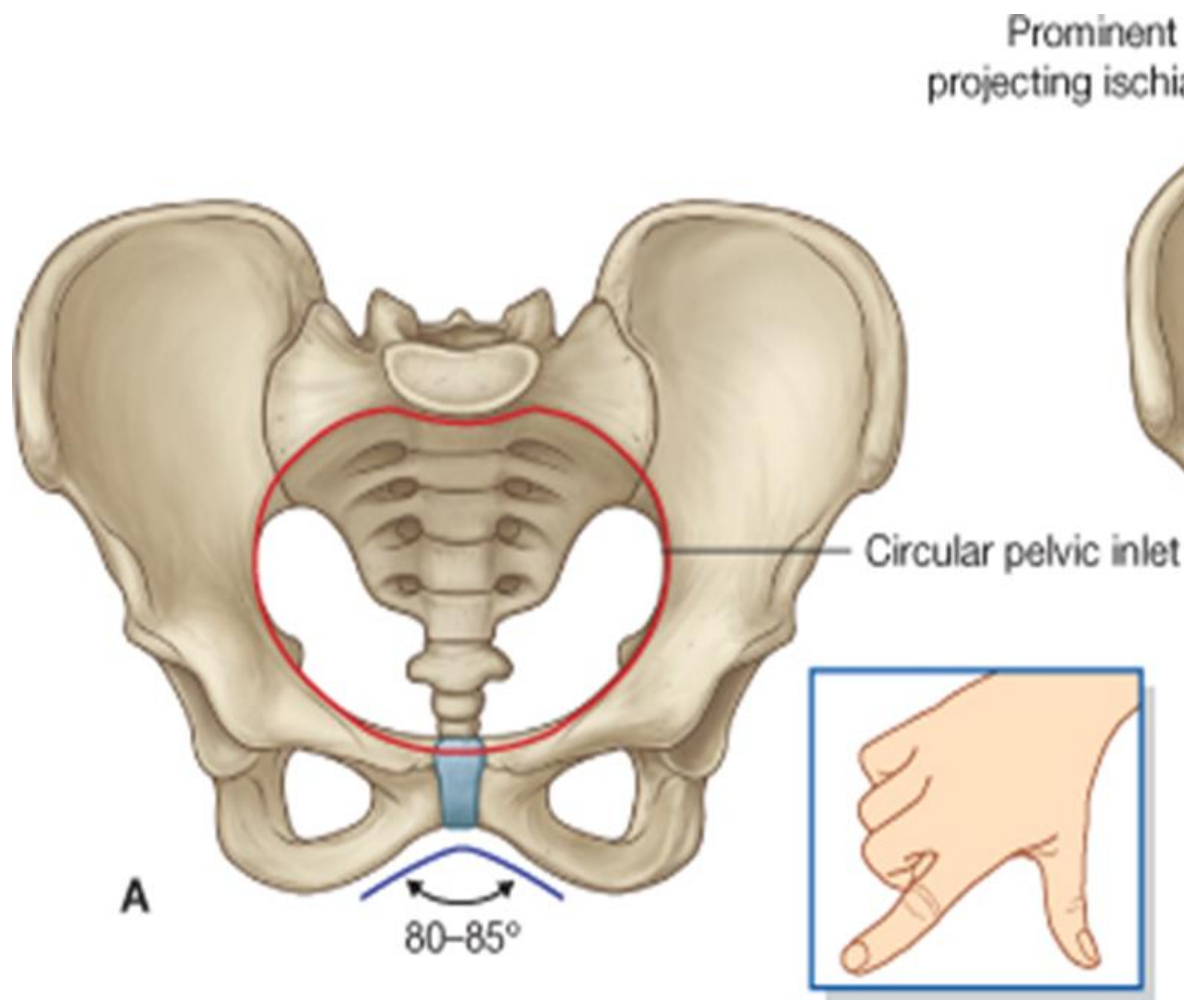


Gender Differences

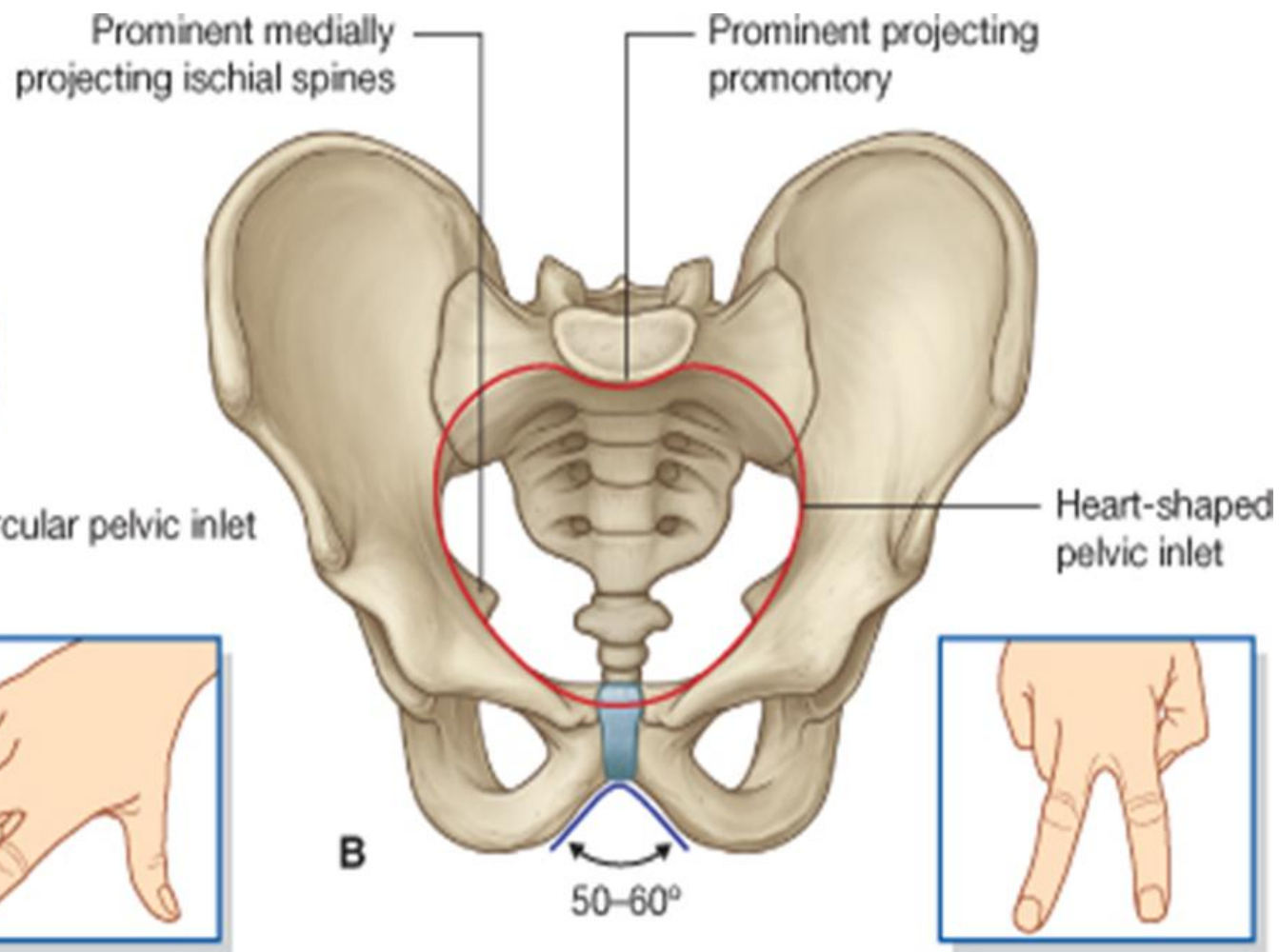
- The pelvises of women and men differ in a number of ways, **many of which have to do with the passing of a baby through a woman's pelvic cavity during childbirth:**
 - The pelvic inlet in women is circular in shape compared with the heart-shaped pelvic inlet in men. The more circular shape is partly caused by the less distinct sacral promontory and broader alae in women.
 - The angle formed by the two arms of the pubic arch is larger in women (80-85°) than it is in men (50-60°).

Cont..

- The ischial spines are generally less inverted (do not project as far medially into the pelvic cavity) in women than in men.
- Greater/ False pelvis is deep in the male, whereas it is shallow in the female.
- Lesser/True pelvis is longer in male, shorter and more cylindrical in female.



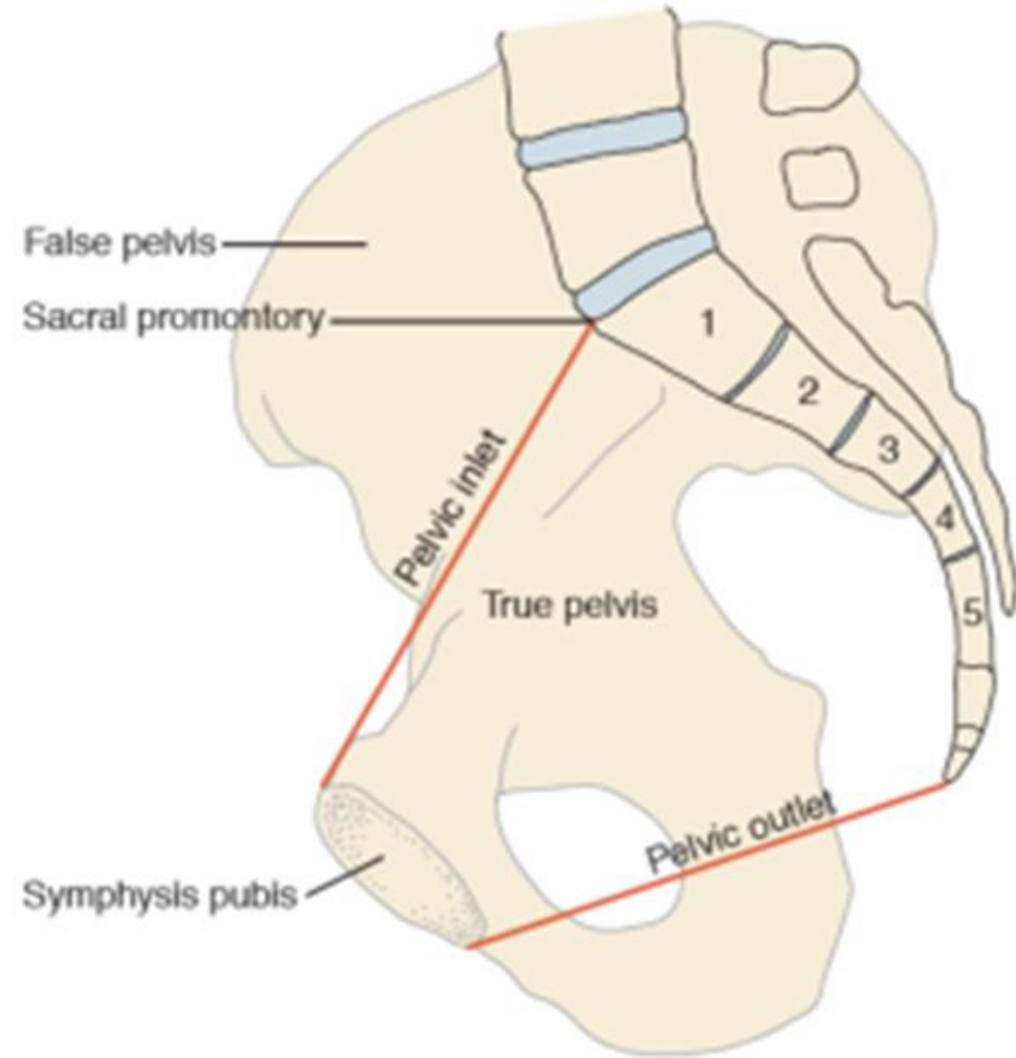
Women



Men

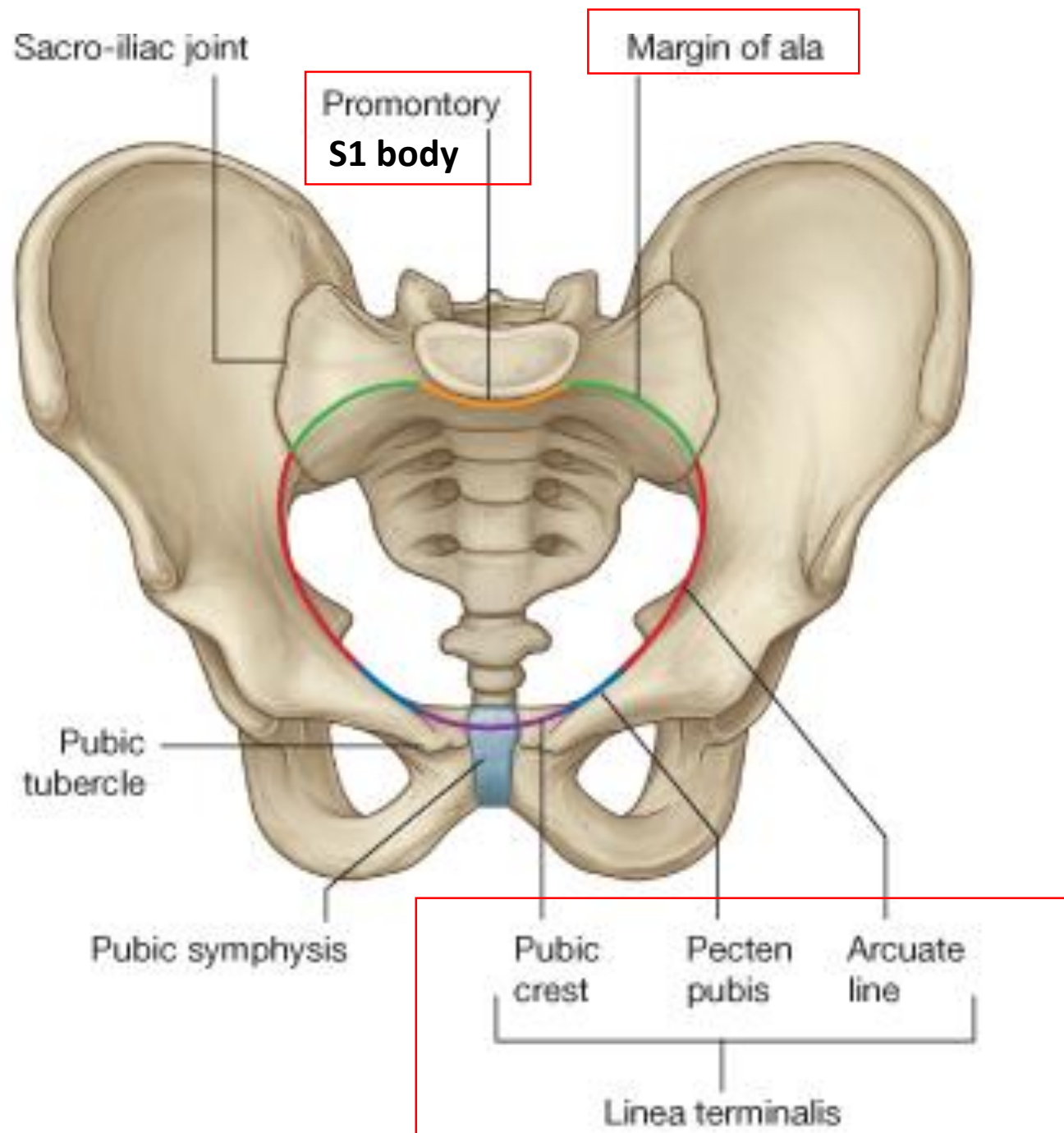
True Pelvis

- Lies inferior to the pelvic brim
- Enclose the pelvic cavity
- It has:
 1. **Inlet** (superior pelvic aperture),
 2. **Outlet** (inferior pelvic aperture).
 3. **Wall**
- The inlet is open while the pelvic floor closes the outlet and separates the pelvic cavity, above, from the perineum, below.



Pelvis Inlet

- The pelvic inlet is opening between the *abdominal cavity* and the *pelvic cavity* (TRUE pelvis) through which structures traverse between the abdomen and pelvic cavity. It is somewhat **heart shaped** and **completely surrounded by bone**.
- Boundaries:
 - **Posteriorly**: The promontory of the sacrum and the margins of the alae of the sacrum.
 - **Anterolaterally**: the **linea terminalis** (i.e. the arcuate line, the pecten pubis or pectineal line, and the pubic crest).
 - **Anteriorly**: the upper border of the pubic symphysis.

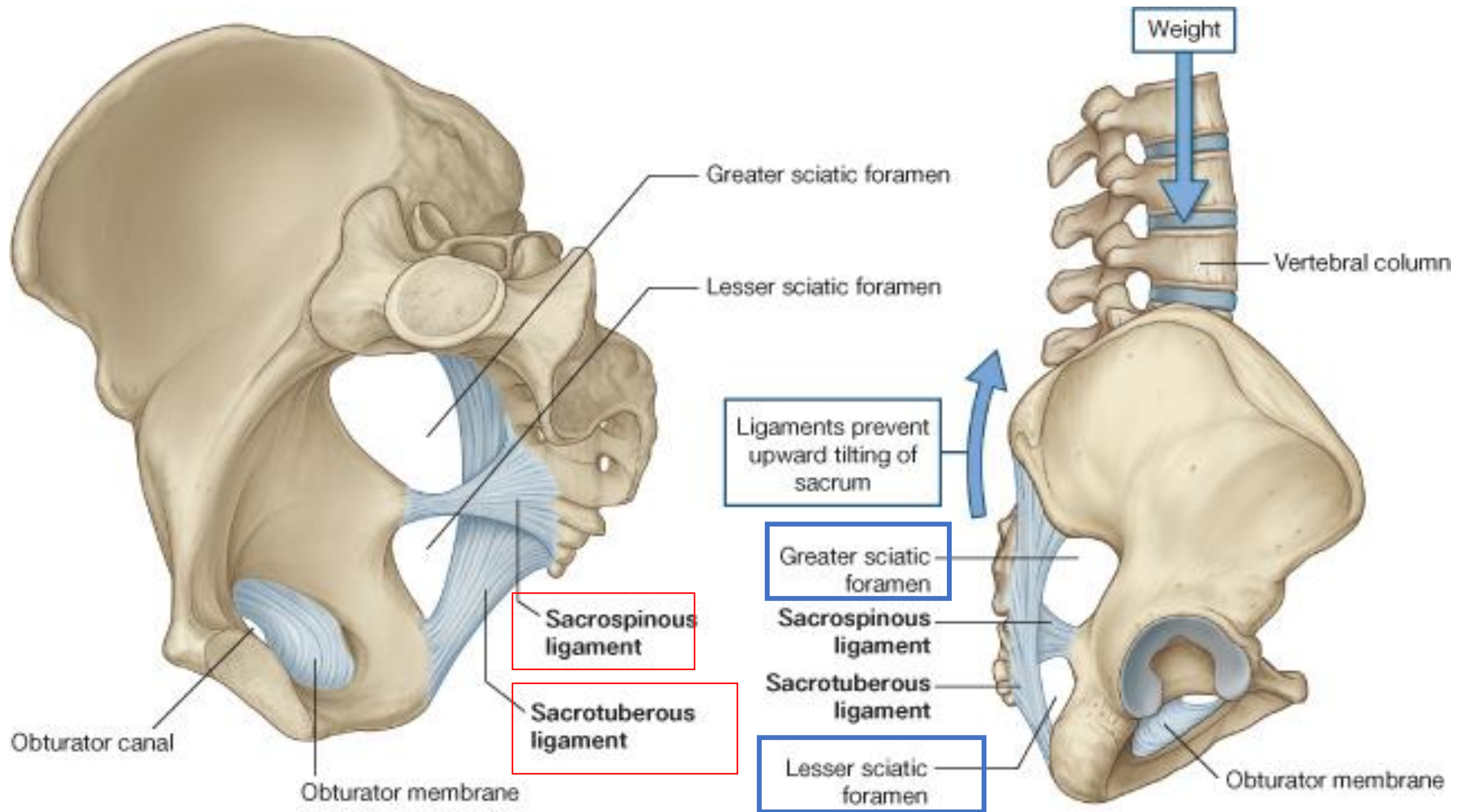


Pelvis Wall

- The walls of the pelvic cavity consist of:
 1. **Sacrum**
 2. **Coccyx**
 3. **Hip bones** (the parts inferior to the linea terminalis)
 4. **Two ligaments**
 5. **Two muscles.**

Ligaments of the Pelvic Wall

- The **sacrospinous** and **sacrotuberous** ligaments are major components of the lateral pelvic walls:
 - 1. The sacrospinous ligament** is triangular in shape, with its apex attached to the ischial spine and its base attached to the margins of the sacrum and the coccyx.
 - 2. The sacrotuberous ligament** is also *triangular in shape* and is superficial to the sacrospinous ligament. Its base has a broad attachment that extends from the posterior superior iliac spine of the pelvic bone, along the dorsal aspect and the lateral margin of the sacrum, and onto the dorsolateral surface of the coccyx. Laterally, the apex of the ligament is attached to the medial margin of the ischial tuberosity.
- These ligaments stabilize the sacrum on the pelvic bones by resisting the upward tilting of the sacrum.
- They also convert the greater and lesser sciatic notches of the pelvic bone into foramina



Muscles of the Pelvic Wall

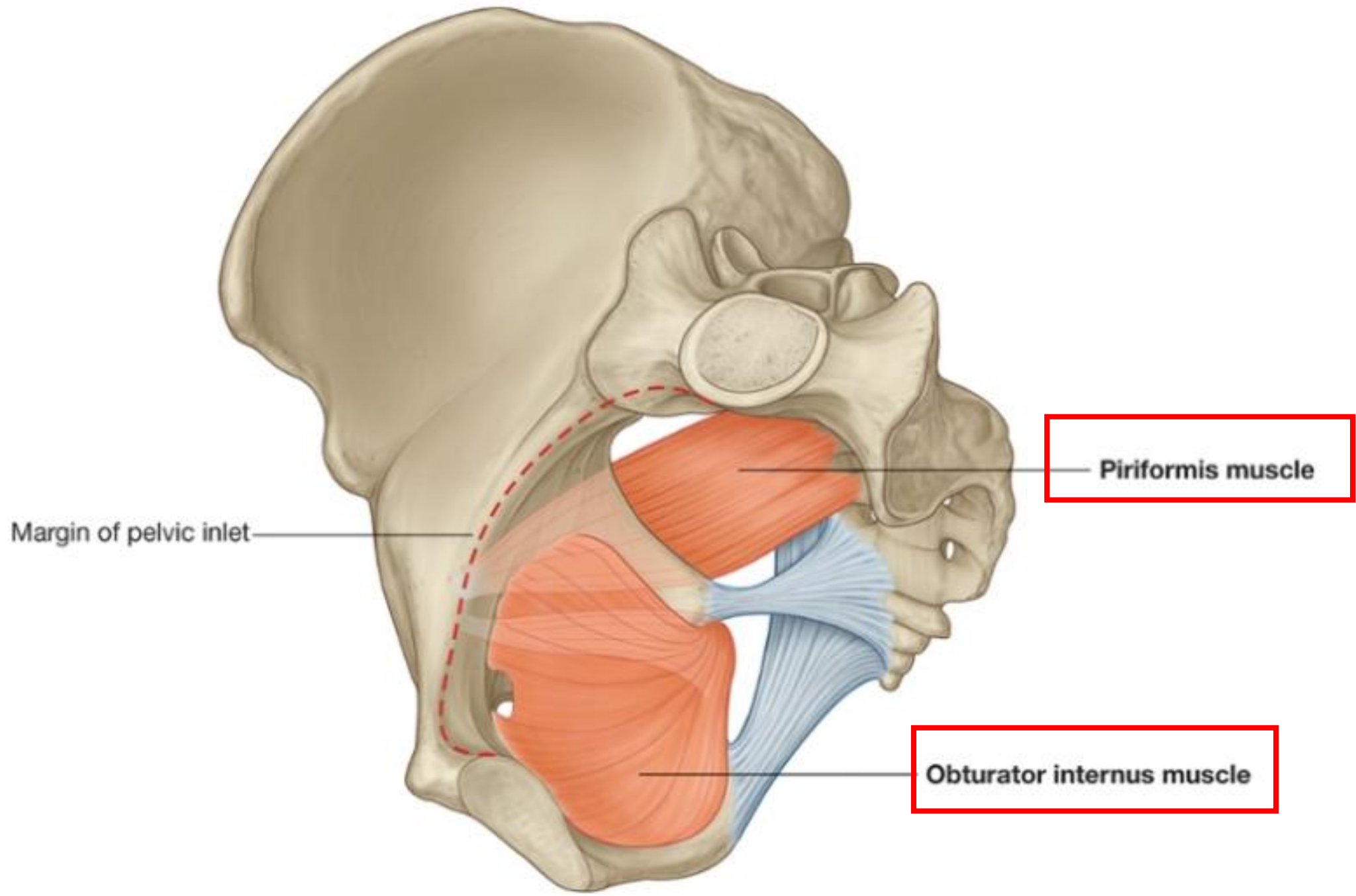
- Two muscles, the **obturator internus** and the **piriformis**, contribute to the lateral walls of the pelvic cavity:

1- Obturator internus:

- Originates from the deep surface of the obturator membrane and from associated regions of the pelvic bone that surround the obturator foramen.
- The muscle fibers of the obturator internus converge to form a tendon that leaves the pelvic cavity through the lesser sciatic foramen, to insert on the greater trochanter of the femur.
- It forms a large part of the anterolateral wall of the pelvic cavity.

2- Piriformis:

- Originates from the anterior surface of sacrum.
- It passes laterally through the greater sciatic foramen, to insert on the greater trochanter of the femur above the insertion of the obturator internus muscle.
- It forms a large part of the posterolateral wall of the pelvic cavity.
- This muscle separates the greater sciatic foramen into two regions, one above the muscle and one below. Vessels and nerves coursing between the pelvic cavity and the gluteal region pass through these two regions.

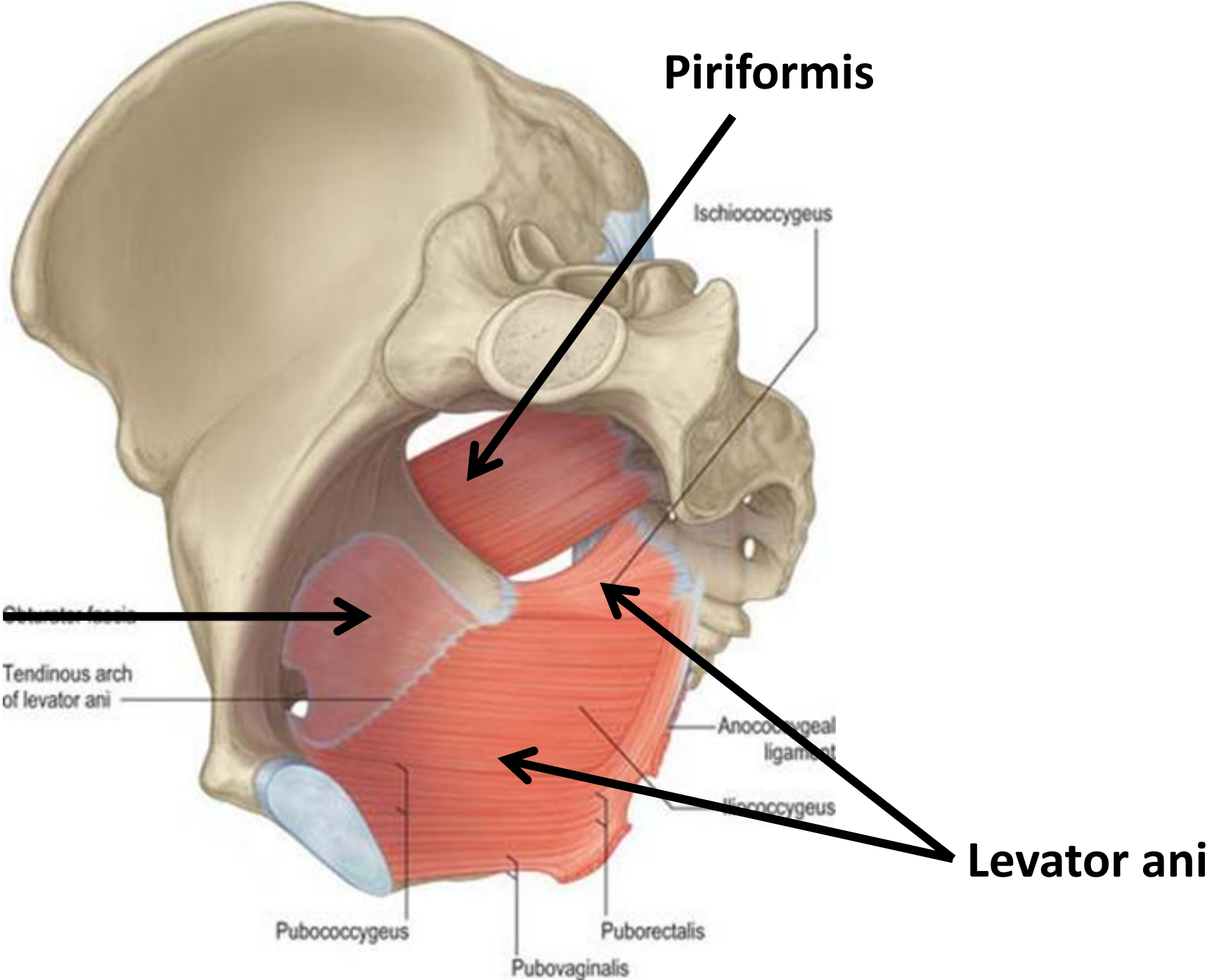


Piriformis muscle

Obturator internus muscle

Margin of pelvic inlet

Obturator Internus



Piriformis

Ischiococcygeus

Anococcygeal
ligament

Iliococcygeus

Levator ani

Pubococcygeus

Puborectalis

Pubovaginalis

Obturator foramen

Tendinous arch
of levator ani

Apertures in the Pelvic Wall

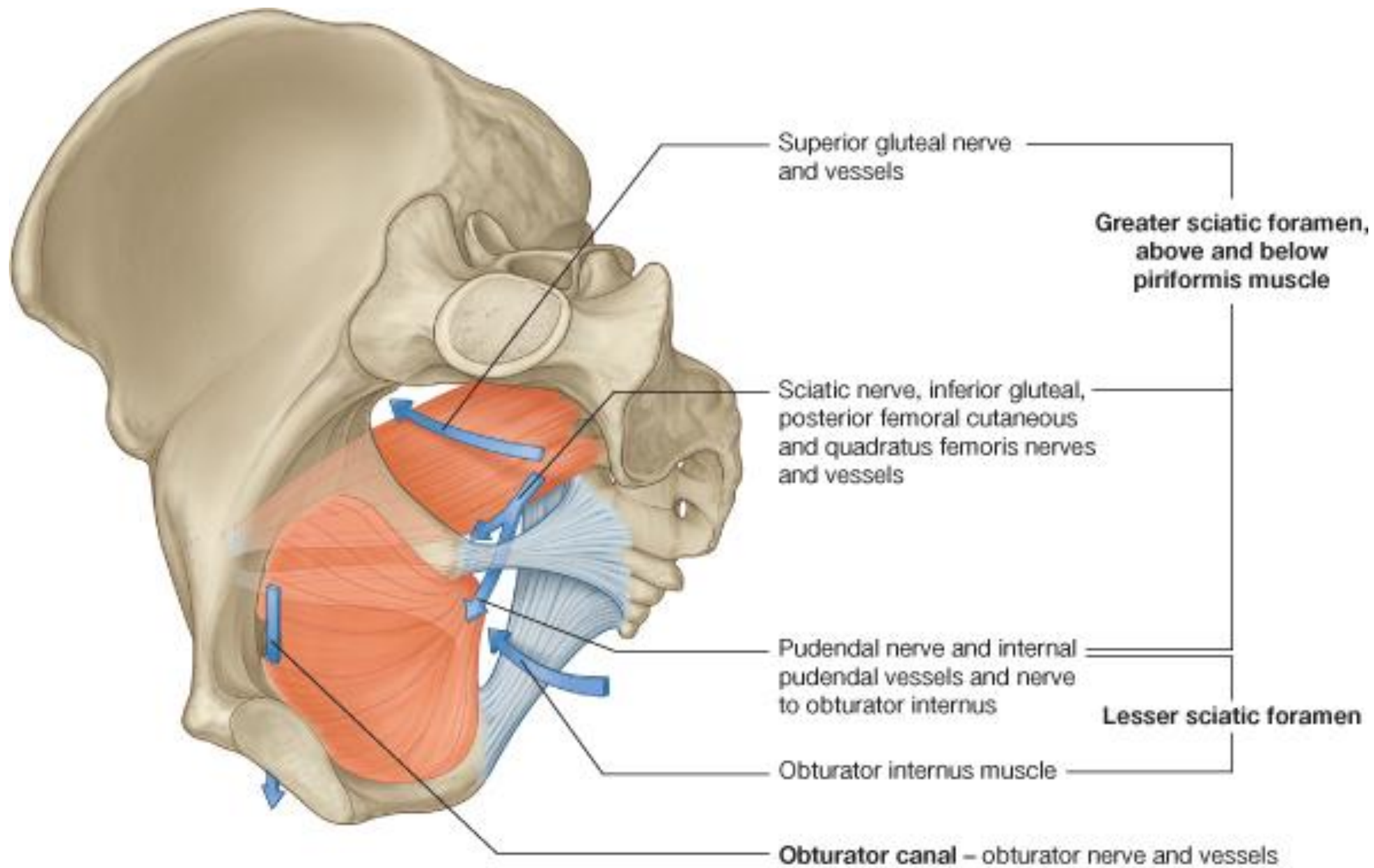
- Each lateral pelvic wall has three major apertures through which structures pass between the pelvic cavity and other regions:

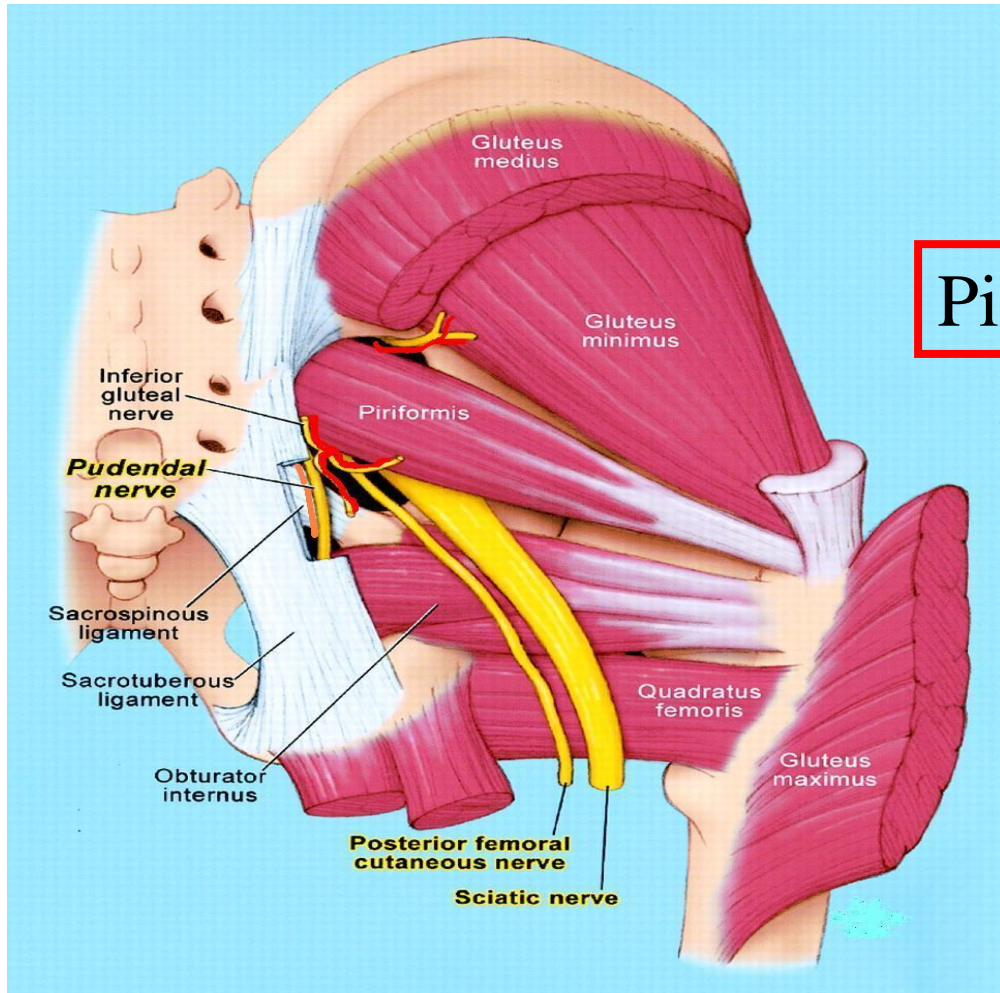
1. The obturator canal: The *obturator nerve and vessels* pass from the pelvic cavity to the thigh through this canal.

2. The greater sciatic foramen:

- ***Above the piriformis:*** the *superior gluteal nerves and vessels*.
- ***Below the piriformis:*** The *inferior gluteal nerves and vessels, the sciatic nerve, the pudendal nerve, the internal pudendal vessels, the posterior femoral cutaneous nerves, and the nerves to the obturator internus and quadratus femoris muscles*.

3. The lesser sciatic foramen: it is positioned below the attachment of the pelvic floor, the *pudendal nerve* and *internal pudendal vessels* pass between the pelvic cavity (above the pelvic floor) and the perineum (below the pelvic floor).





Above the piriformis:

Superior gluteal vessels & nerve

Piriformis: an important landmark

Below the piriformis:

Inferior gluteal vessels & nerve

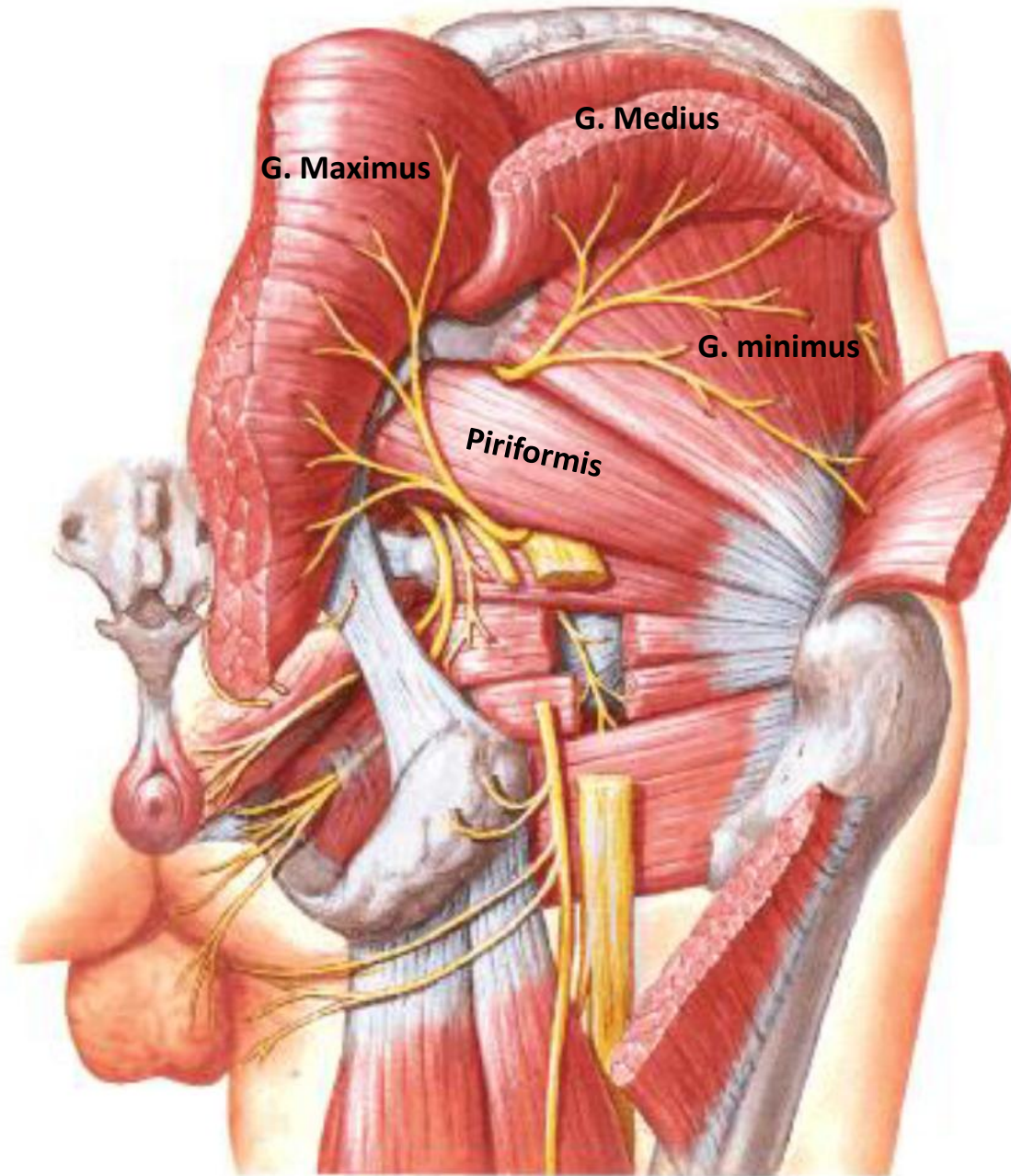
Sciatic nerve

Posterior cutaneous nerve of thigh

Pudendal nerve & Internal pudendal vessels

Nerve to obturator internus

Nerve to quadratus femoris



G. Maximus

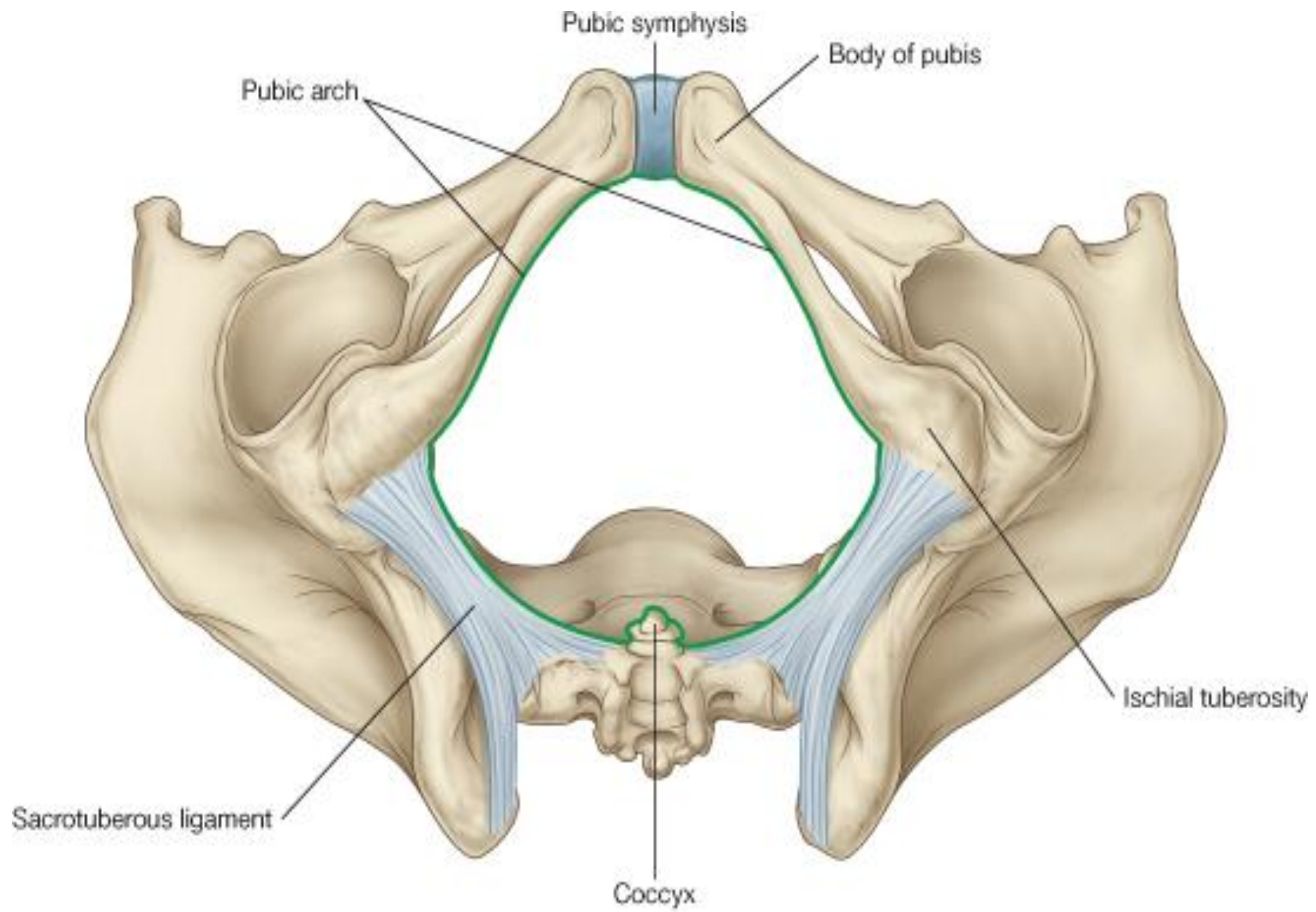
G. Medius

G. minimus

Piriformis

Pelvic Outlet

- The pelvic outlet is **diamond shaped**
- Boundary:
 - **Anteriorly:** pubic symphysis
 - **Anterolaterally:** ischiopubic ramus
 - **Posterolaterally:** sacrotuberous ligament
 - **Posteriorly:** coccyx

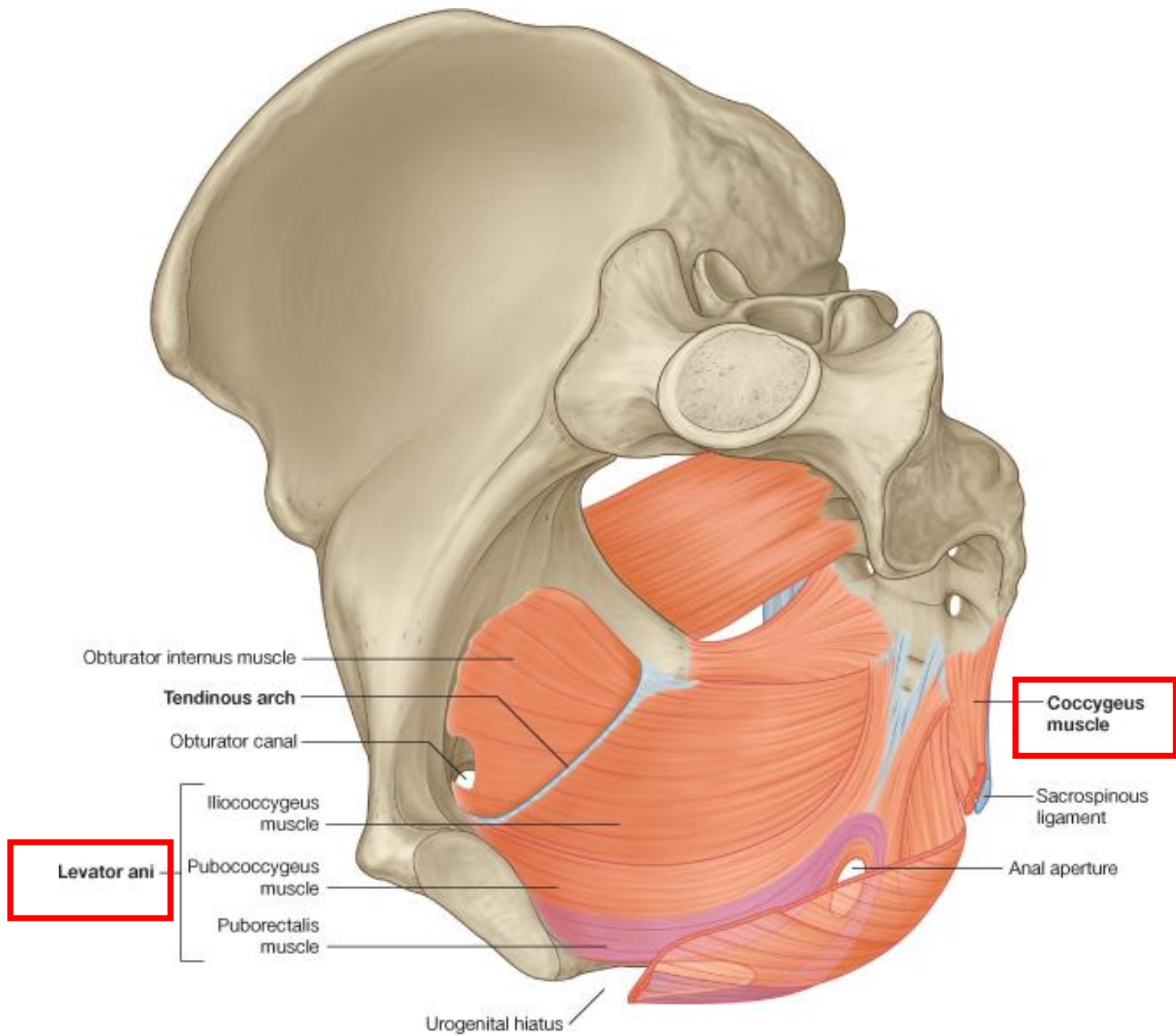


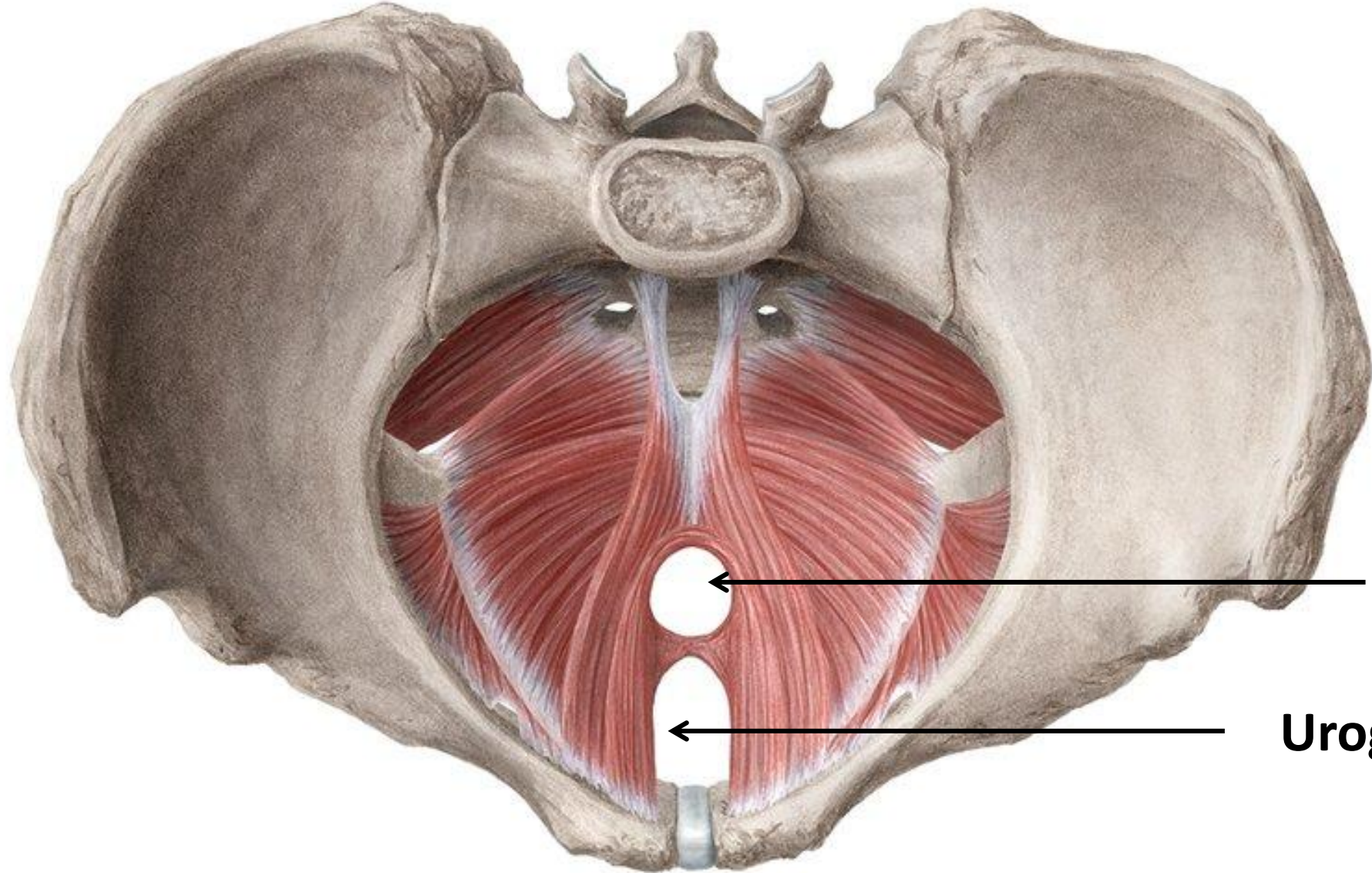
Pelvic Floor

- The pelvic floor is also known as the **pelvic diaphragm**.
- The pelvic floor separates the **pelvic cavity**, above, from the **perineum**, below.
- There are three main components of the pelvic floor:
 1. **Levator ani**
 2. **Coccygeus muscles**
 3. **The fascia coverings these muscles.**

Cont...

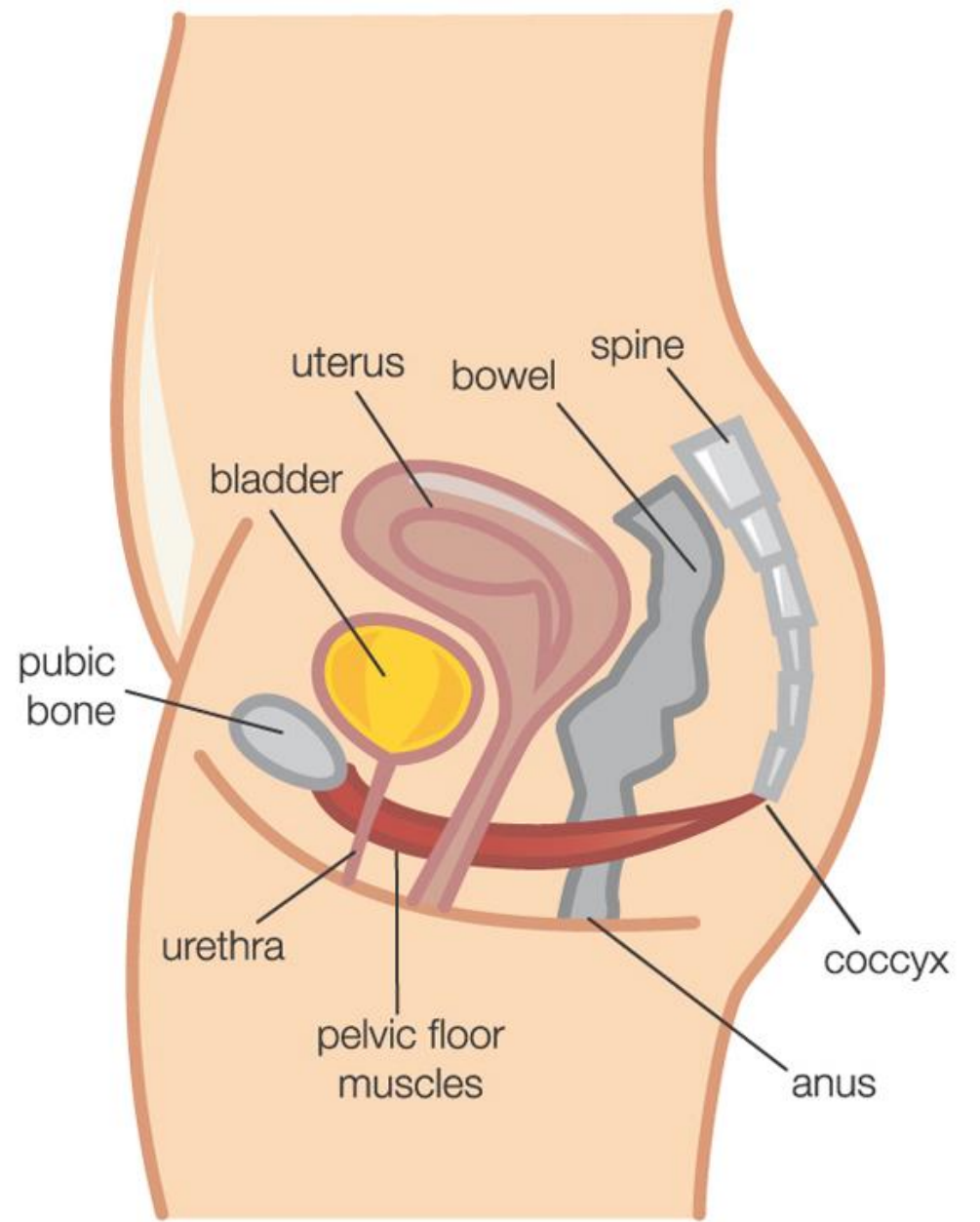
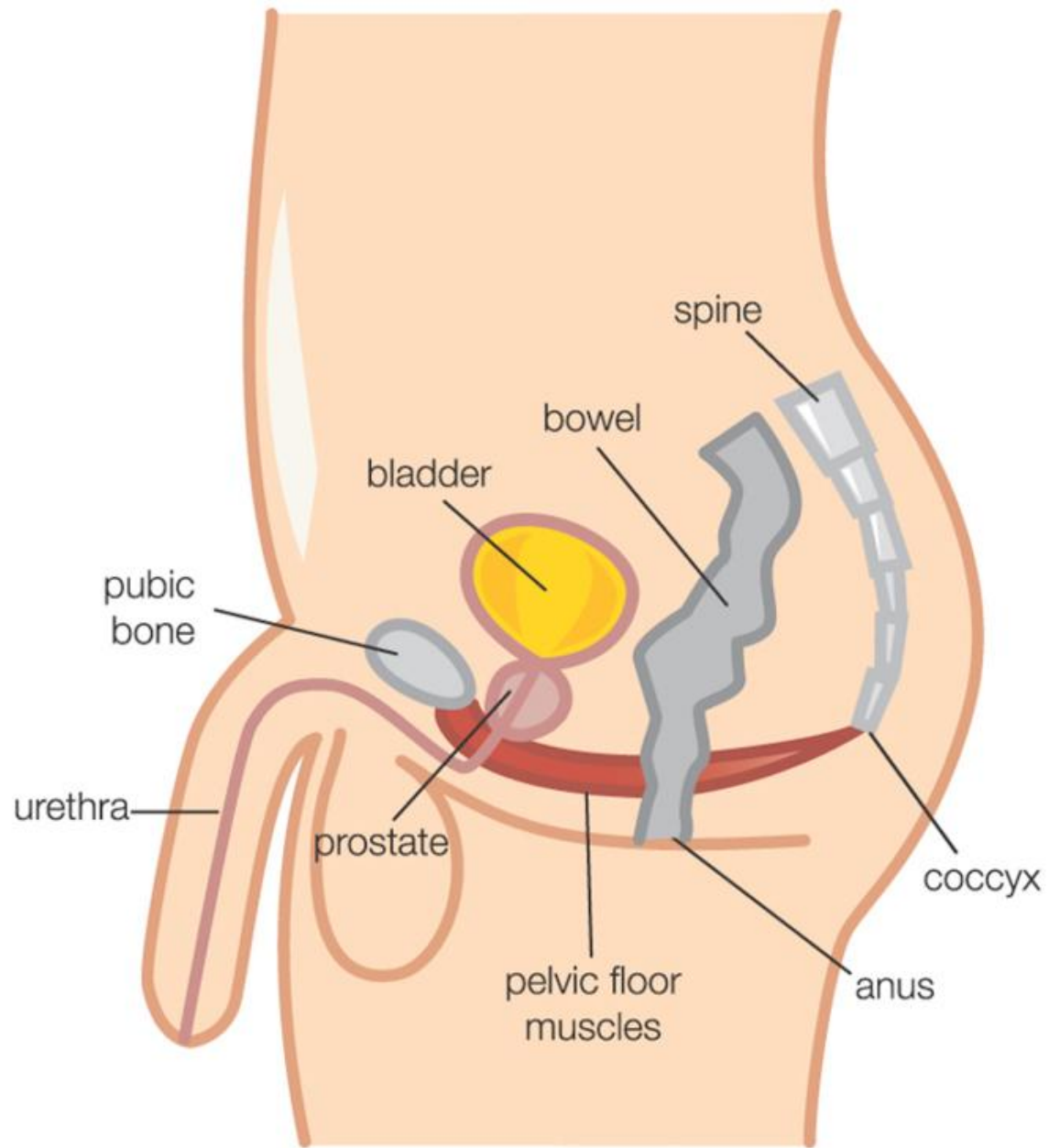
- In order to allow for urination and defecation, there are a **two gaps** in the pelvic floor:
 1. **Urogenital hiatus** – an anteriorly situated gap, which allows passage of the *urethra* (and the *vagina* in females).
 2. **Rectal hiatus** – a centrally positioned gap, which allows passage of the *anal canal*.





Rectal hiatus

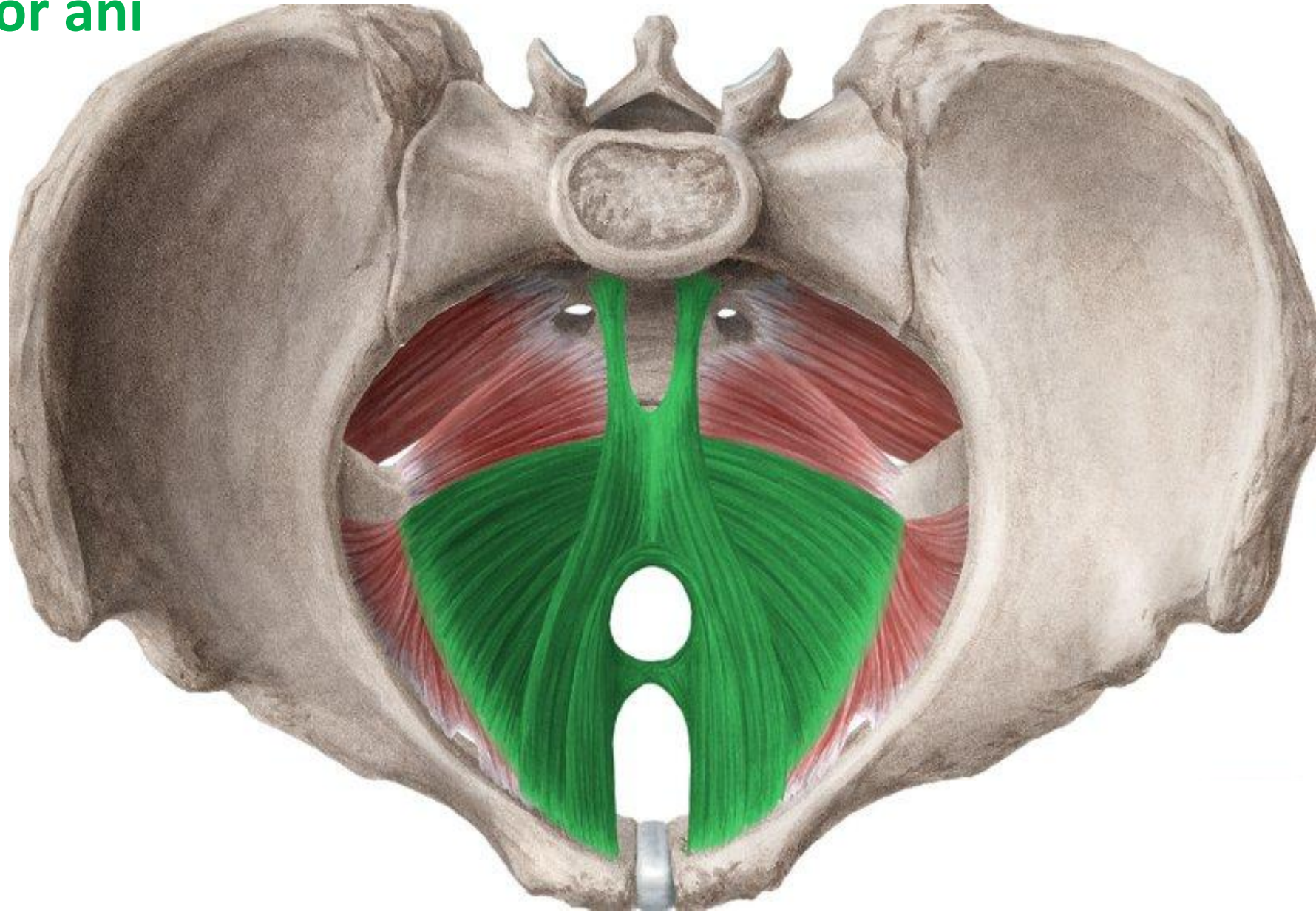
Urogenital hiatus



Levator ani

- Consists of three parts: the **puborectalis**, the **pubococcygeus** and the **iliococcygeus**.
- Collectively they run from the **body of the pubis**, the **tendinous arch** of the obturator fascia and the **ischial spine** TO the **perineal body**, the **coccyx**, the **anococcygeal ligament**, the **walls of the prostate or vagina**, the **rectum** and the **anal canal**.
- They are innervated directly by branches from **the anterior ramus of S4** and by branches of **the pudendal nerve (S2 to S4)**.
- The levator ani muscles help support the pelvic viscera and maintain closure of the rectum and vagina.

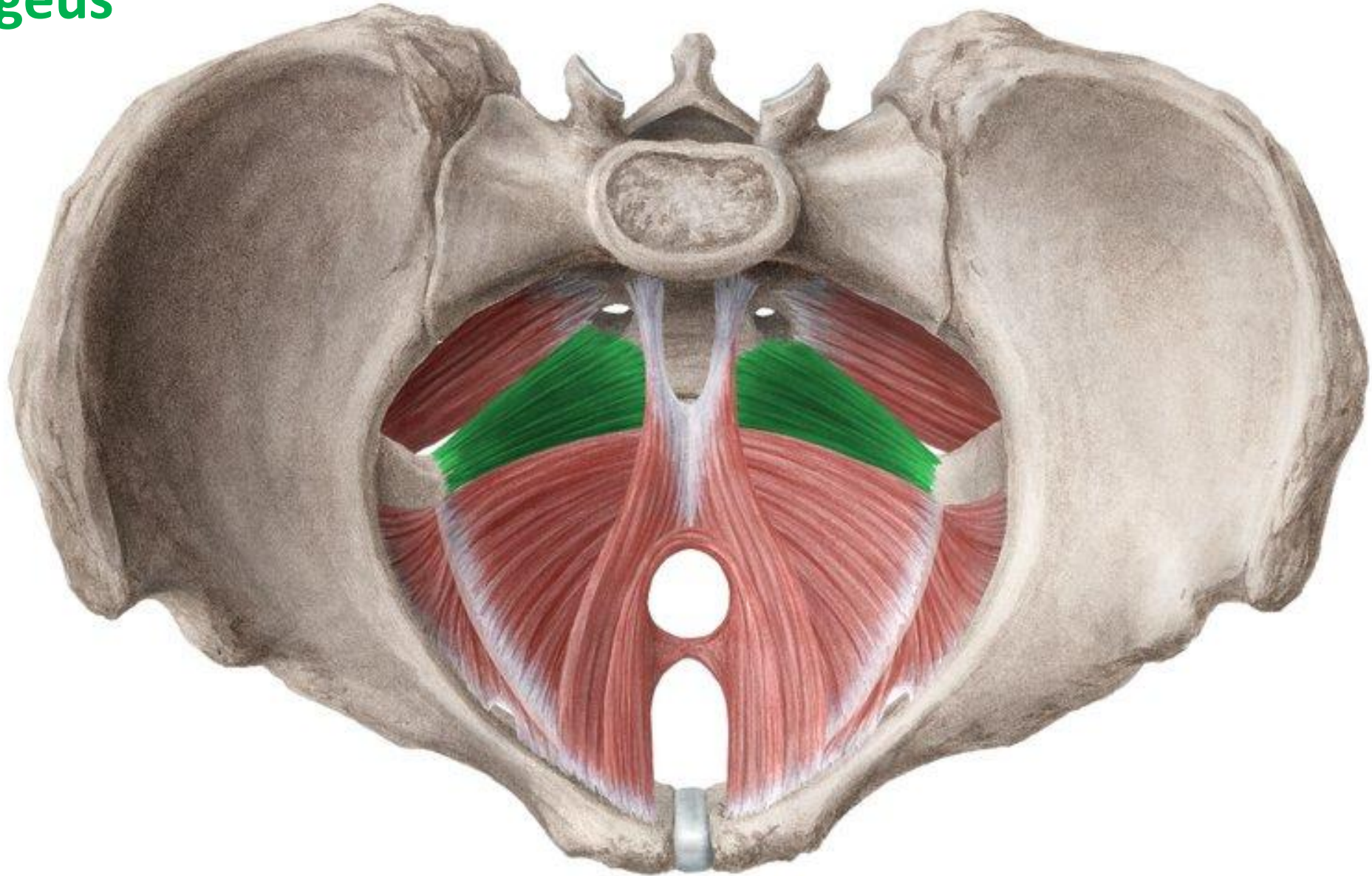
Levator ani



Coccygeus

- The two coccygeus muscles complete the posterior part of the pelvic diaphragm.
- They are attached, the **ischial spines** and to **the lateral margins of the coccyx and adjacent margins of the sacrum.**
- Innervated by branches from the **anterior rami of S4 and S5.**
- Participate in supporting the posterior aspect of the pelvic floor.

Coccygeus



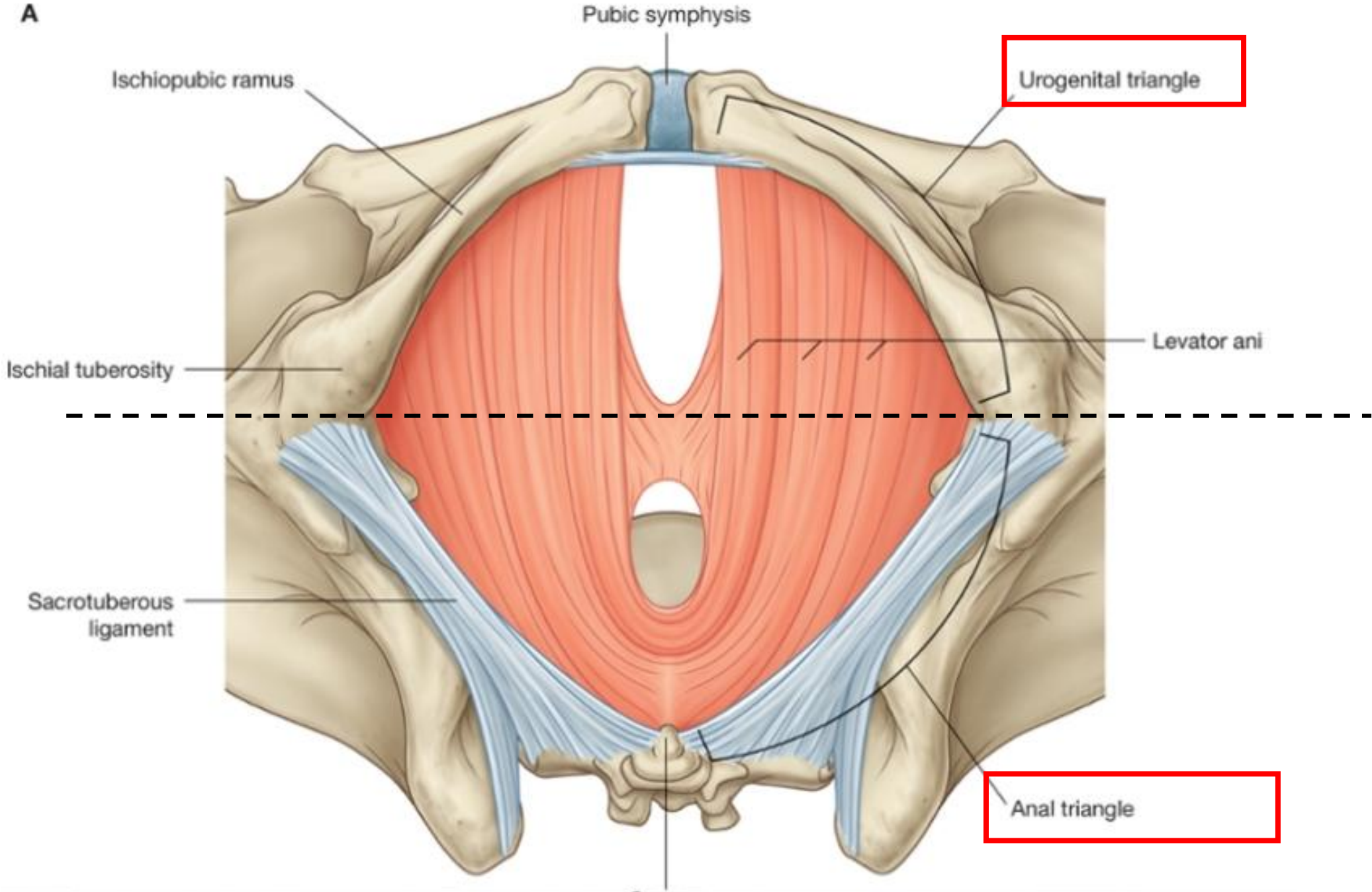
Perineum

- The perineum is a diamond-shaped region positioned inferiorly to the pelvic floor between the thighs.
- The margin of the perineum is marked by:
 - **Anteriorly: pubic symphysis**
 - **Anterolaterally: ischiopubic ramus**
 - **Posterolaterally: sacrotuberous ligament**
 - **Posteriorly: coccyx**
- The roof of the perineum is formed mainly by the levator ani muscles (pelvic floor).
- The **pudendal nerve** (S2 to S4) and the **internal pudendal artery** are the major nerve and artery of the region.

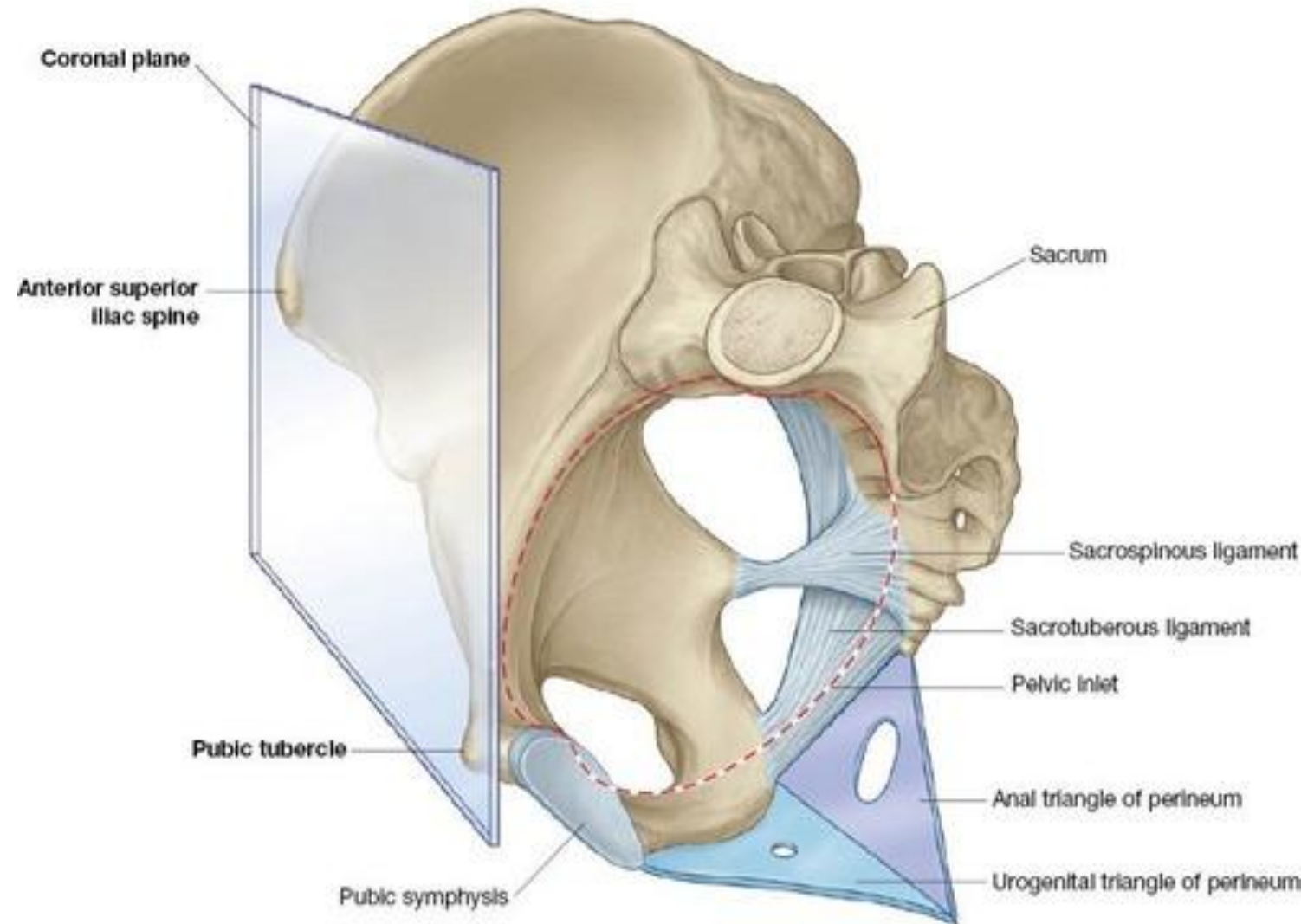
Perineum

- An imaginary line between the ischial tuberosities divides the perineum into two triangular regions:
 - A. Anteriorly,** the **urogenital triangle** contains **the roots of the external genitalia** and, in women, the **openings of the urethra and the vagina**. In men, the **distal part of the urethra** is enclosed by erectile tissues and opens at the end of the penis.
 - B. Posteriorly,** the **anal triangle** contains the **anus** and the **external anal sphincter**.

A



- The **urogenital triangle** of the perineum is the anterior half of the perineum and is **oriented in the horizontal plane**.
- The **anal triangle** is the posterior half of the perineum and is **oriented posteroinferiorly**.



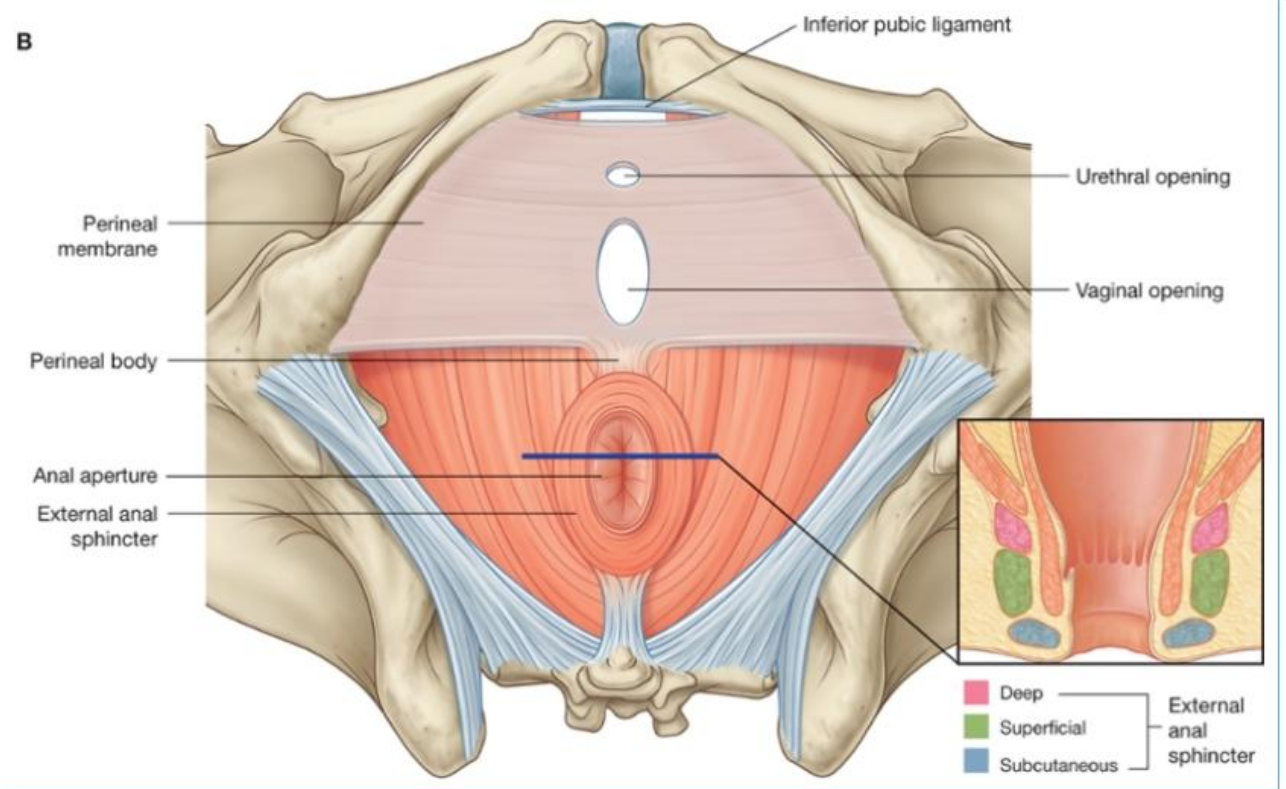
Anal Triangle

- The anal triangle is the posterior half of the perineum.
- It is bounded by the **coccyx**, **sacrospinous ligaments**, and a **theoretical line between the ischial tuberosities**.
- The main contents of the anal triangle are:
 - 1. Anal aperture:** the opening of the anus.
 - 2. External anal sphincter muscle:** voluntary muscle responsible for opening and closing the anus.
 - 3. Ischio-anal fossae (x2):** spaces located laterally to the anus.

External Anal Sphincter

- The major muscle in the anal triangle is the external anal sphincter, which:

- Surrounds the anal canal.
- Formed by skeletal muscle and consists of three parts: **deep**, **superficial**, and **subcutaneous**.
- Innervated by **inferior rectal branches of the pudendal nerve**.

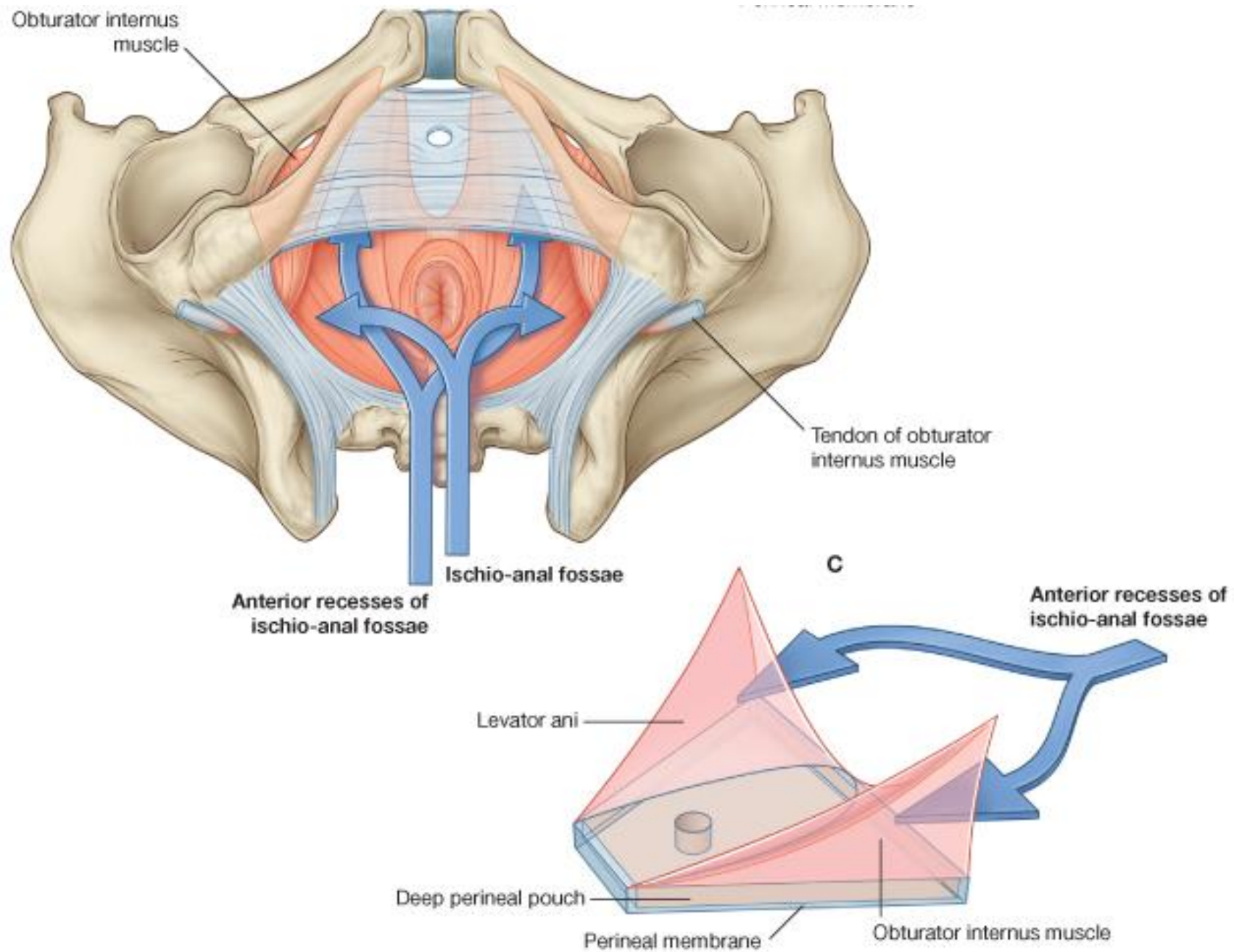


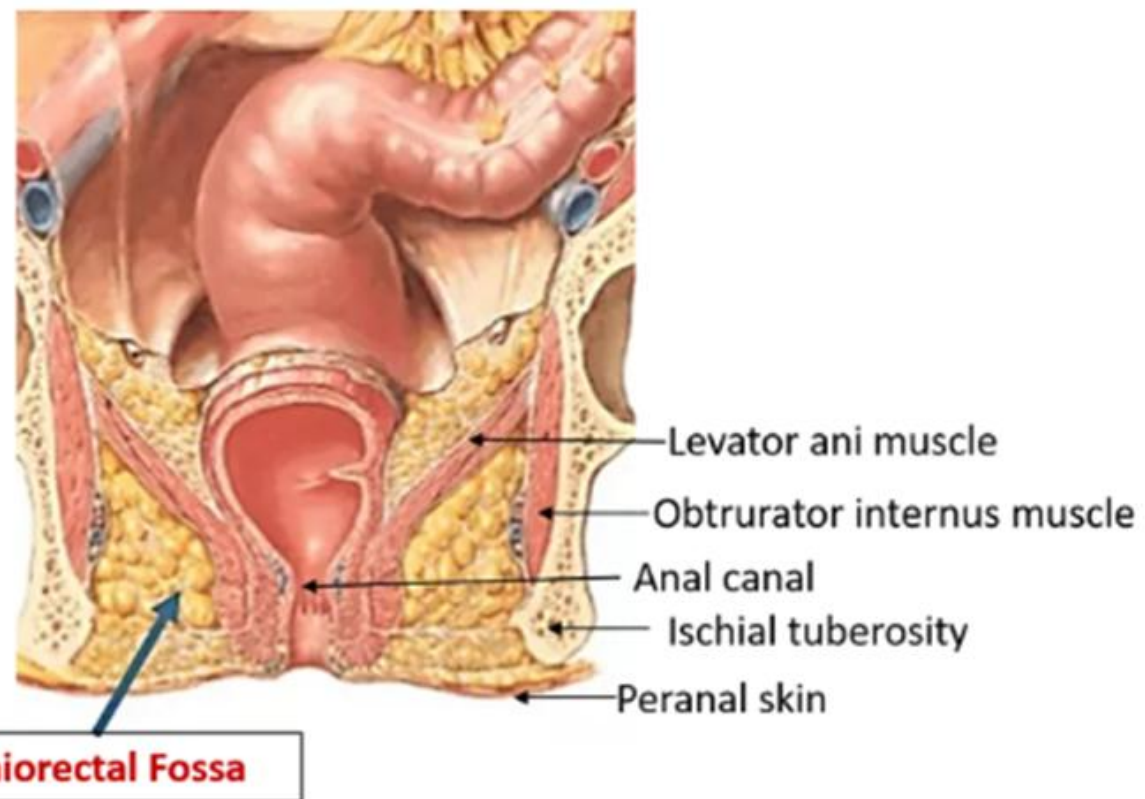
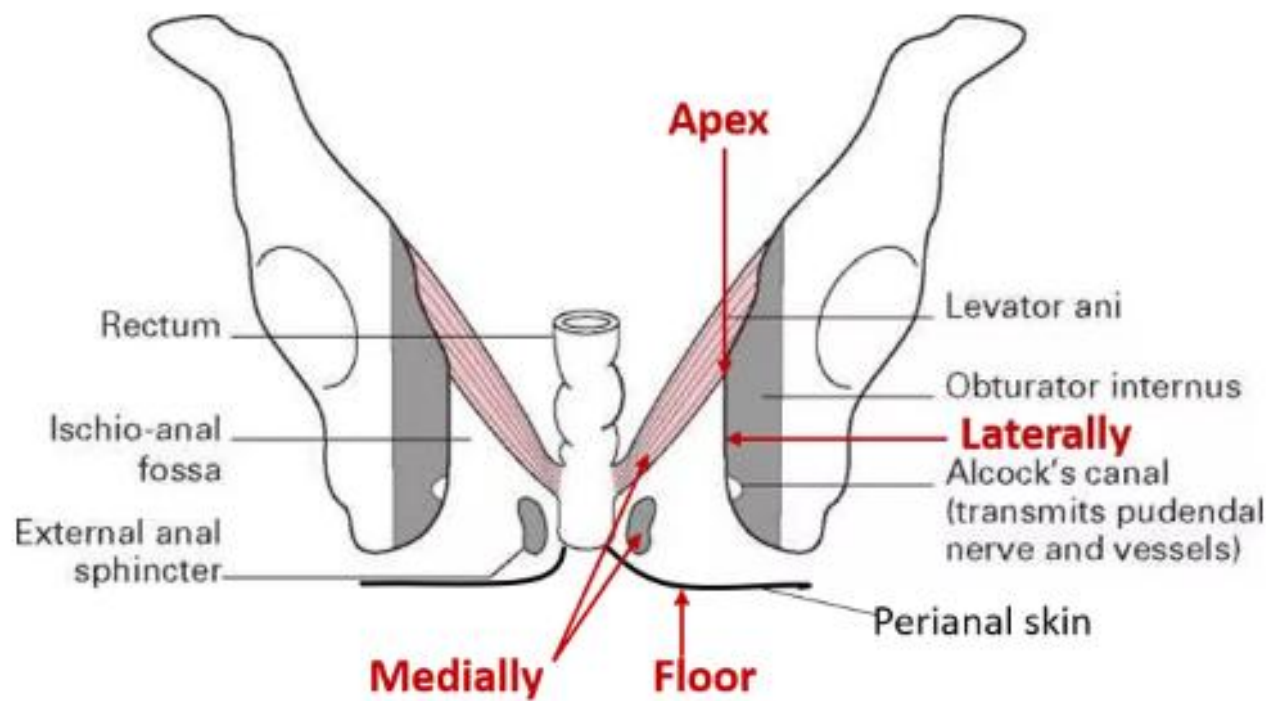
Ischio-anal Fossae and their Anterior Recesses

- The spaces Located in the lateral part of anal triangle on each side of anal canal.
- They are pyramids shaped, with apex directed upwards and base directed downwards.
- They are fat filled spaces that help in the dilatation of anal canal during defecation.
- They are 5 cm long, 5 cm wide, 5 cm deep.
- The ischio-anal fossae of the anal triangle are continuous anteriorly with recesses that project into the urogenital triangle superior to the deep perineal pouch (anterior recess).

Boundaries of Ischio-anal Fossae :

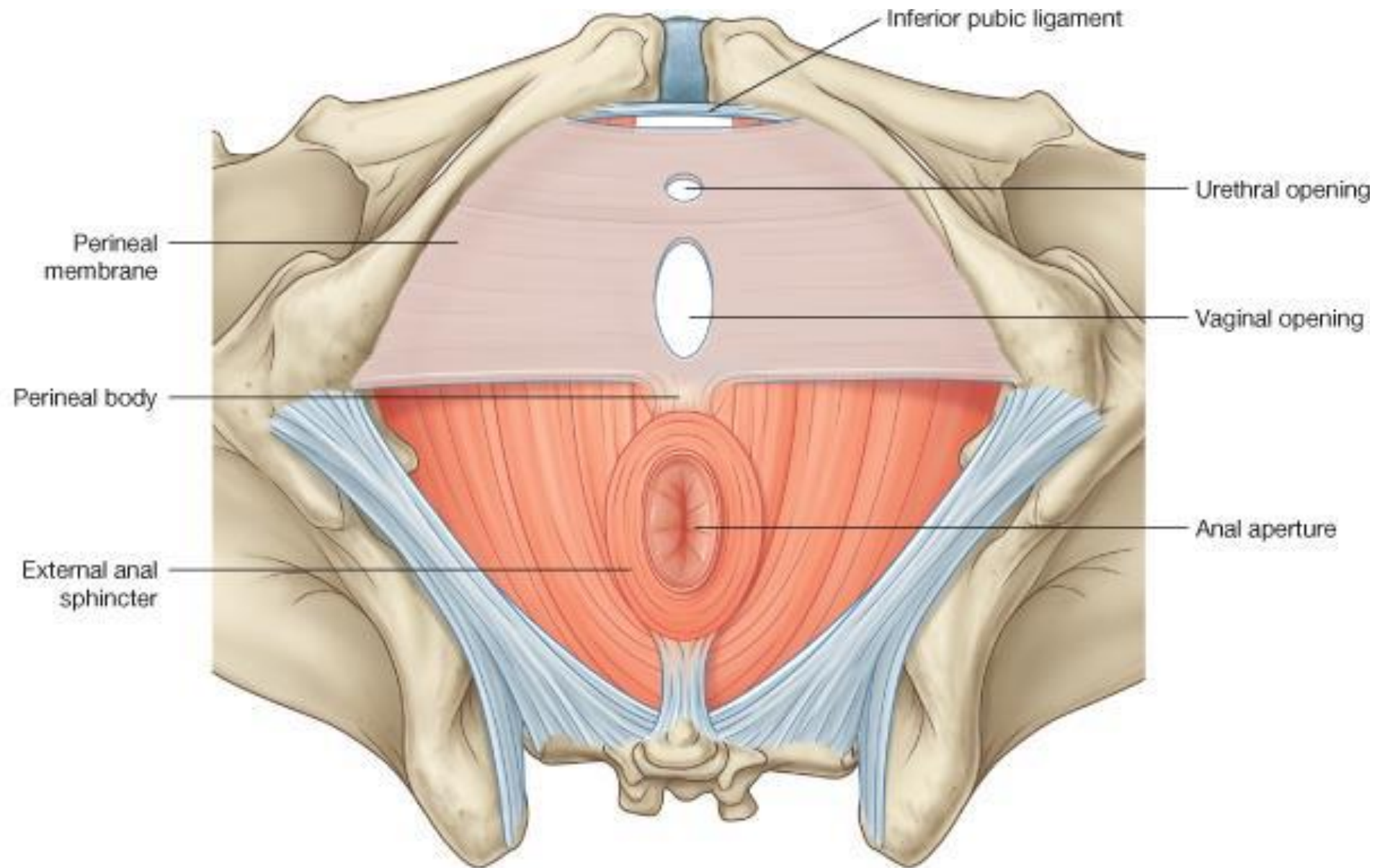
- **Anteriorly:** posterior border of perineal membrane
- **Posteriorly:** lower border of gluteus maximus and sacrotuberous ligament.
- **Medially:** levator ani above and external anal sphincter below.
- **Laterally:** obturator internus with its fascia above and ischial tuberosity below
- **Inferiorly:** is the floor- perineal skin
- **Superiorly:** is the roof- where the fascias of perineal surface of levator ani meet the fascia of obturator internus





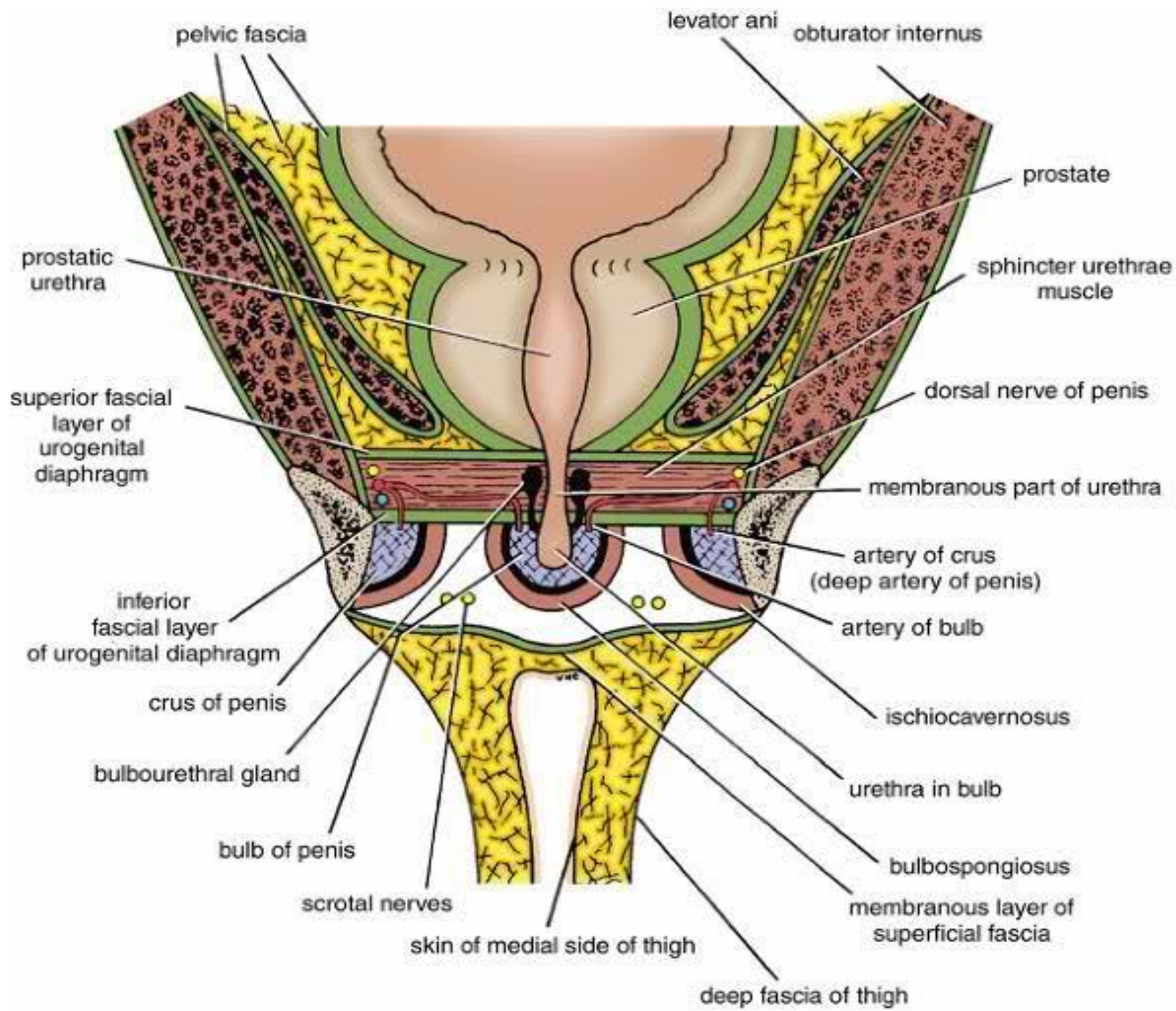
Urogenital Triangle

- The urogenital triangle is the anterior half of the perineum.
- It is bounded by the **pubic symphysis, ischiopubic rami**, and a **theoretical line between the two ischial tuberosities**.
- The triangle is associated with the structures of the urogenital system – **the external genitalia and urethra**.
- The urogenital triangle has an additional layer of strong deep fascia; the **perineal membrane**. This membrane has pouches on its superior and inferior surfaces; **Deep and superficial perineal pouches**

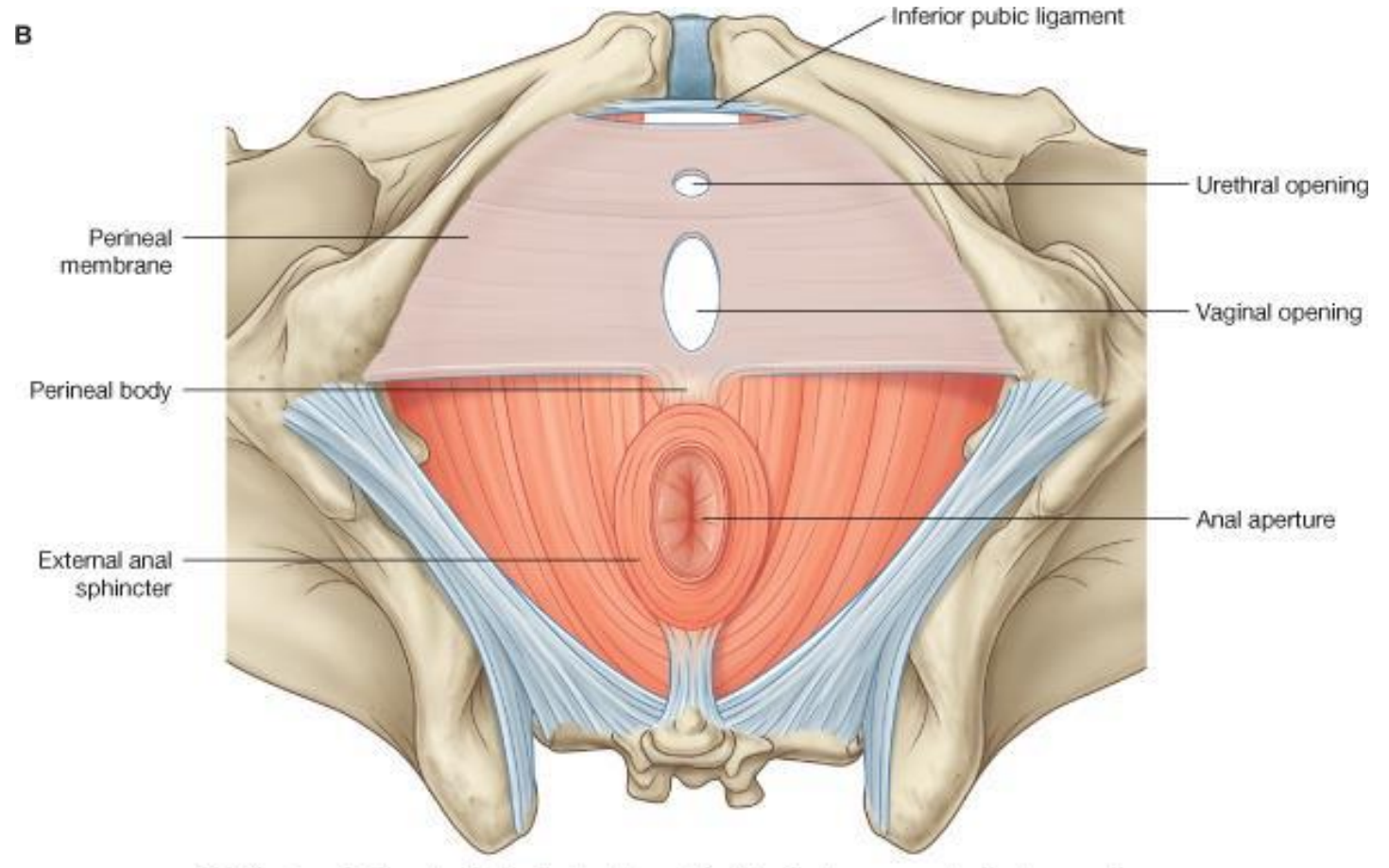


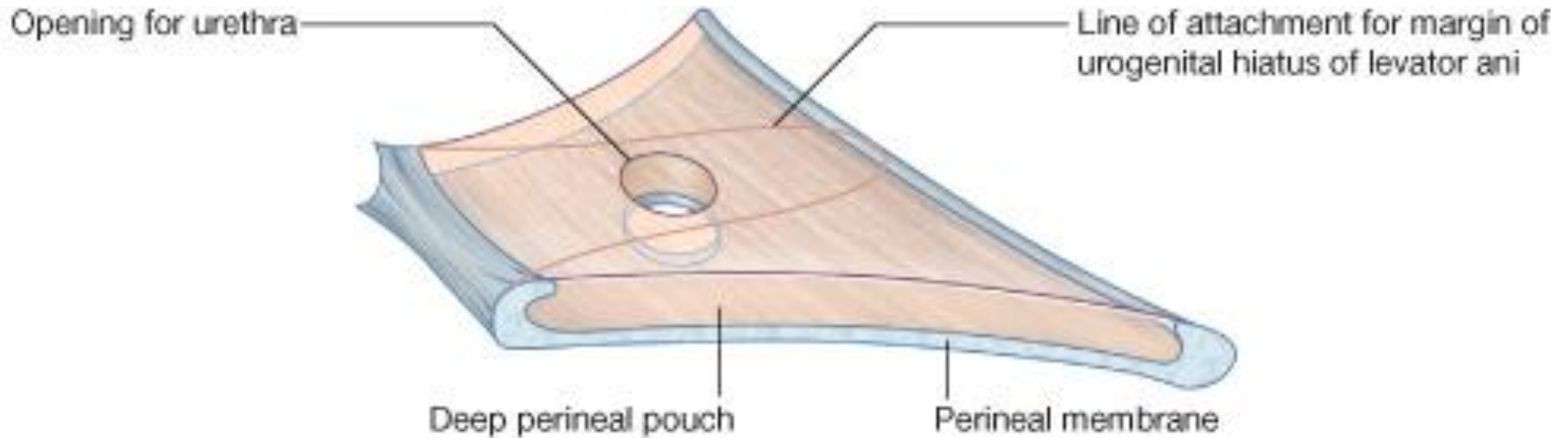
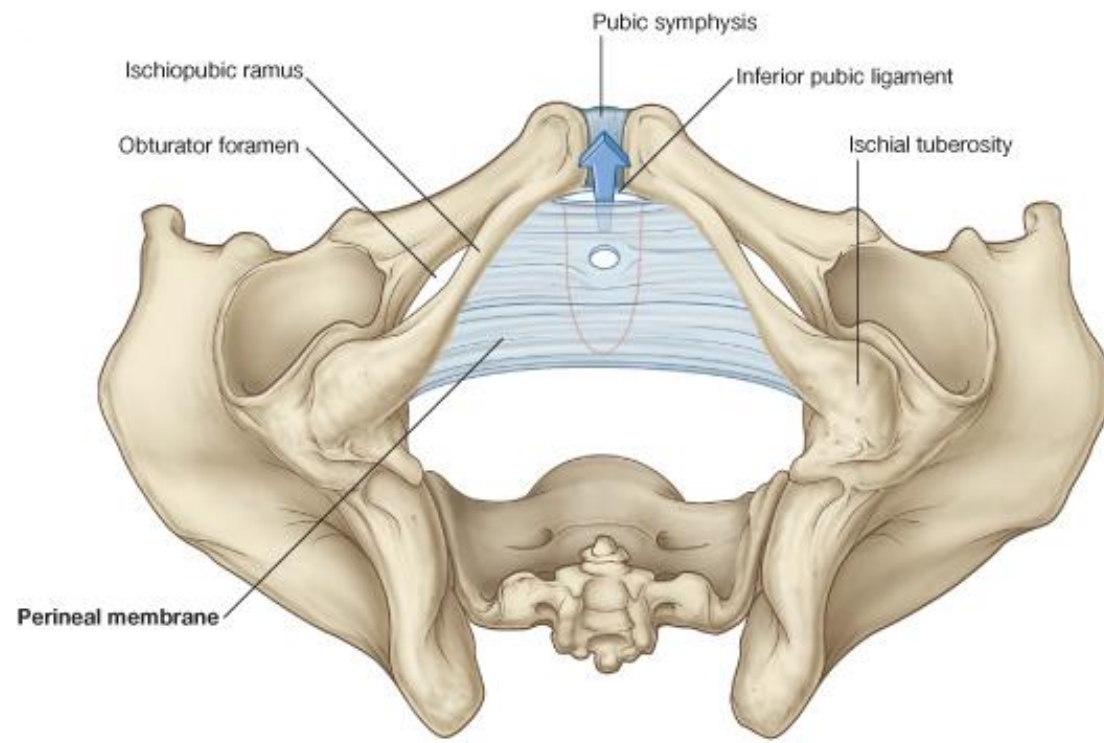
The Perineal Membrane and Deep Perineal Pouch

- The perineal membrane is a thick fibrous sheet that fills the urogenital triangle.
- Attached laterally to the pubic arch and has a free posterior border, which is anchored in the midline to the perineal body.
- Immediately superior to the perineal membrane is a thin region termed the **deep perineal pouch**, containing a layer of skeletal muscle and neurovascular tissues.
- The perineal membrane and adjacent pubic arch provide attachment for **the roots of the external genitalia and the muscles associated with them.**

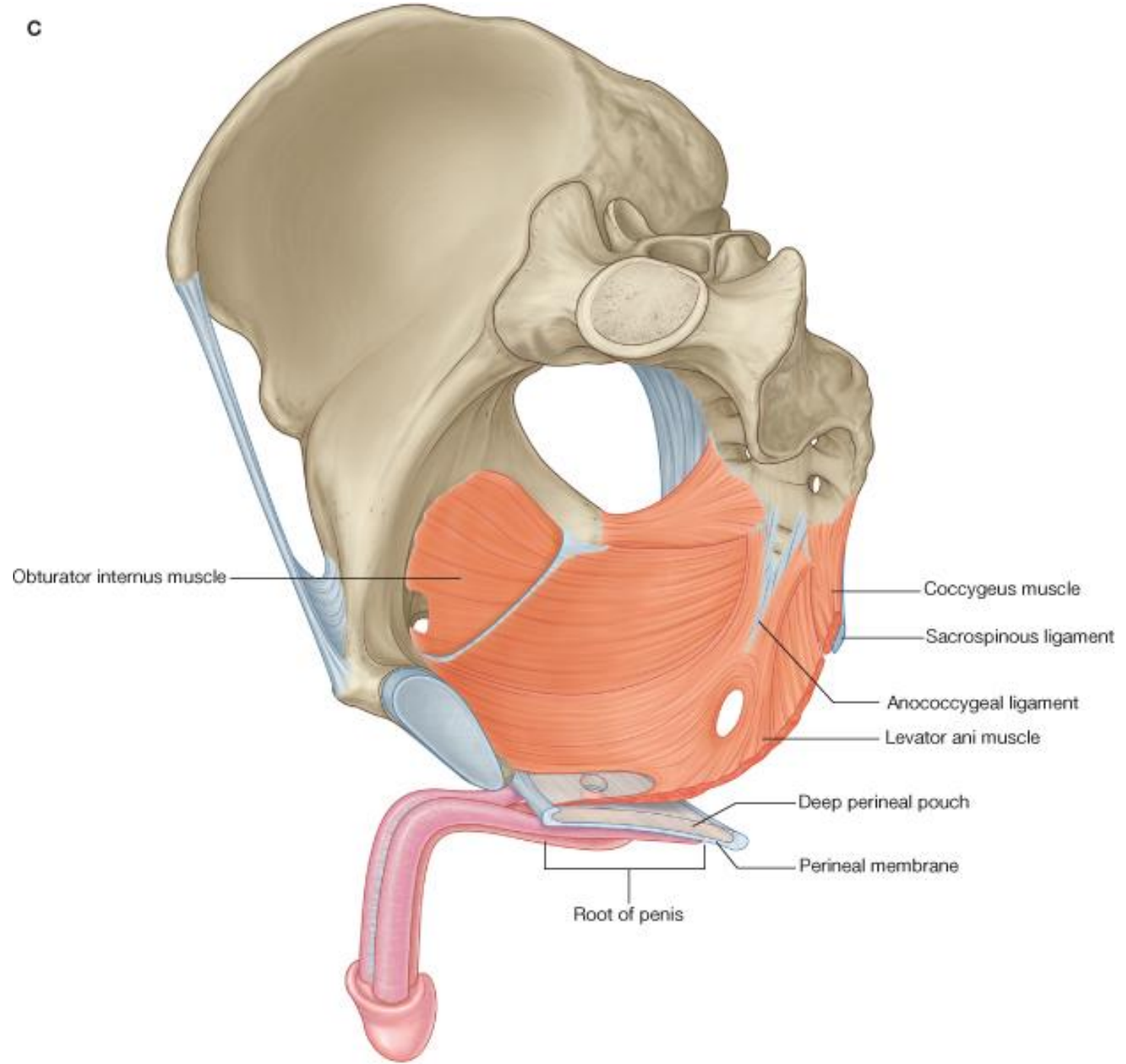


- The **urethra** penetrates vertically through a circular hiatus in the perineal membrane as it passes from the pelvic cavity, above, to the perineum, below.
- In women, the **vagina** also passes through a hiatus in the perineal membrane just posterior to the urethral hiatus



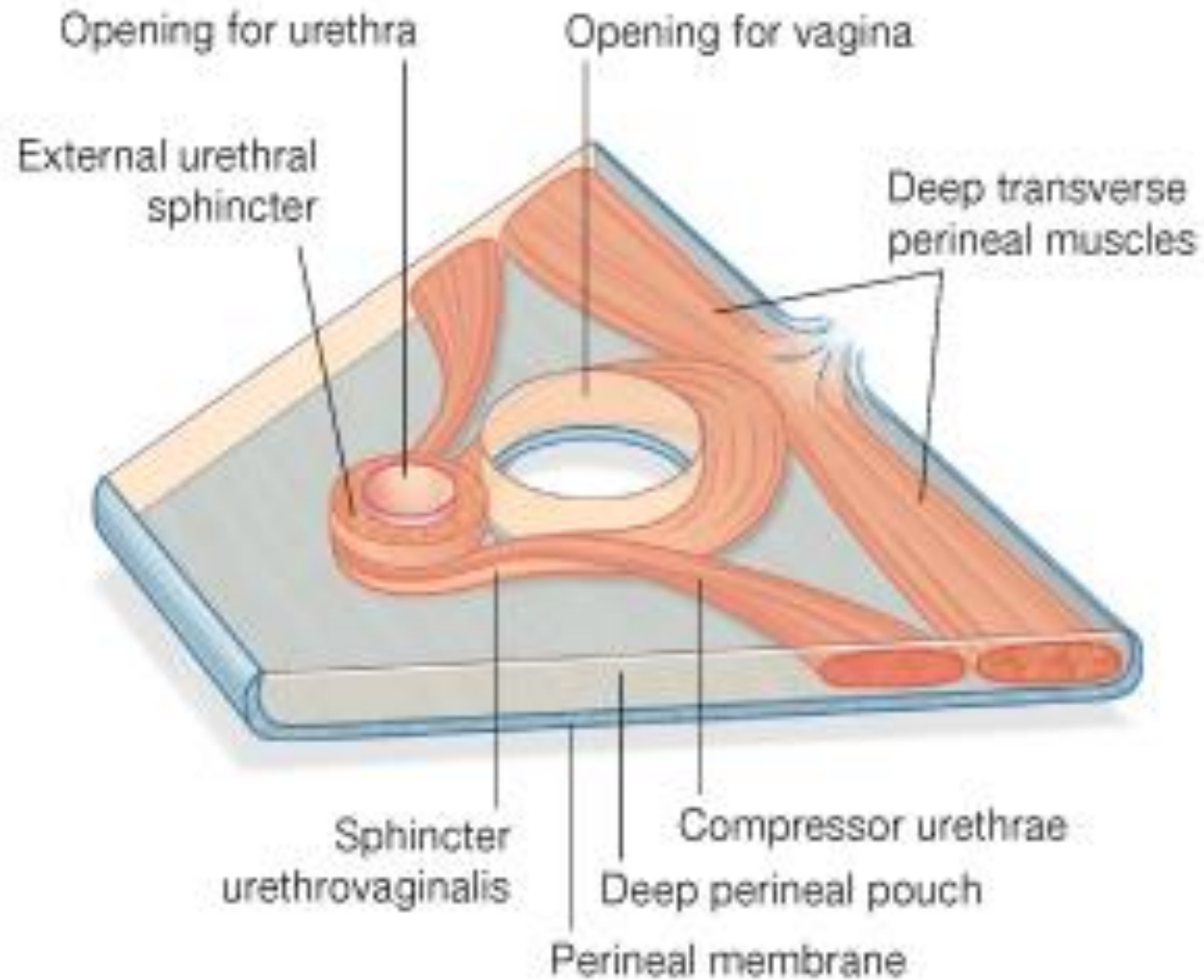


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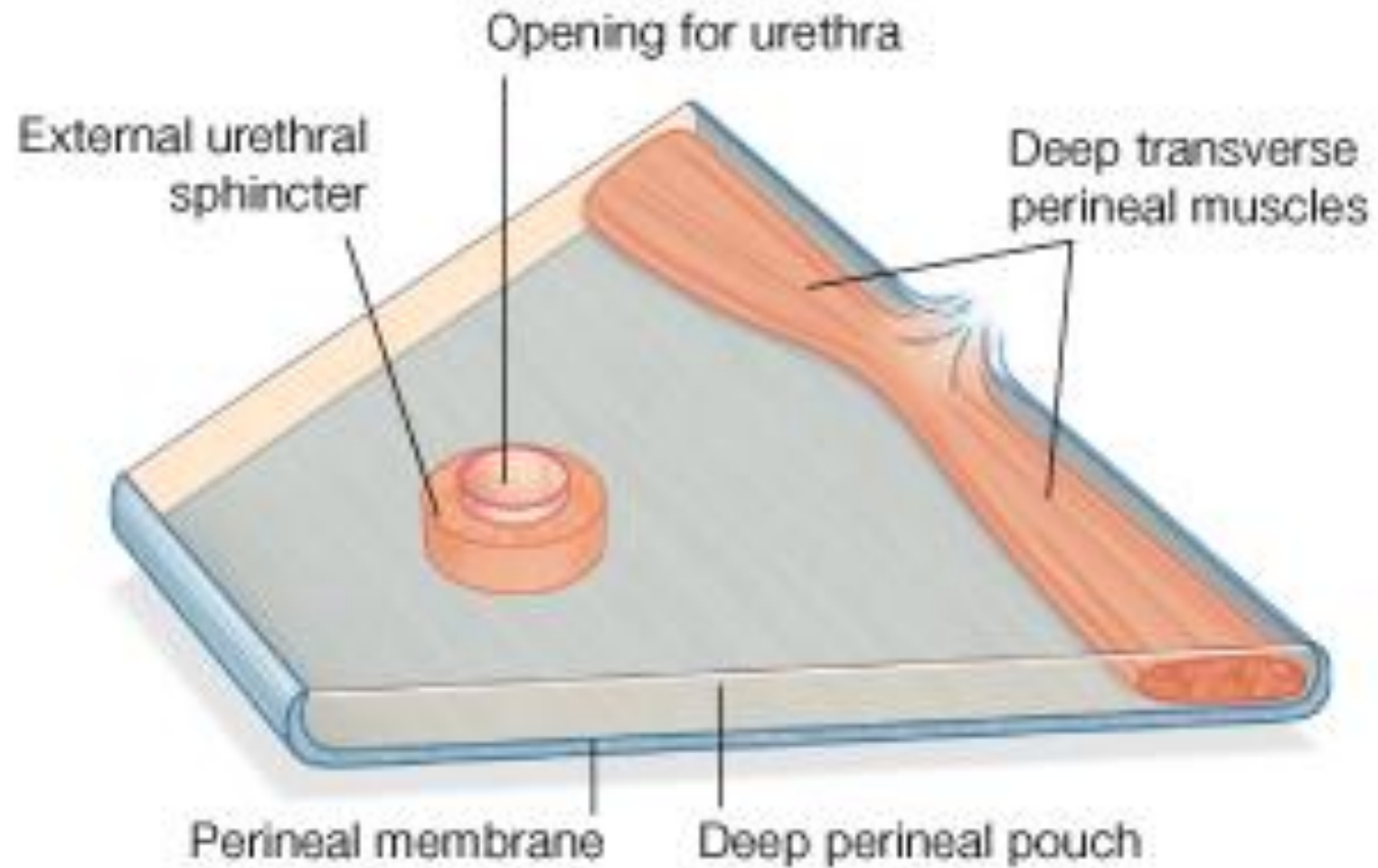


Muscles within the deep perineal pouch:

- The **External urethral sphincter**: surround the urethra.
- In women: Two additional groups of muscle fibers are associated with the urethra and vagina in women:
 1. The **sphincter urethrovaginalis**, which surrounds the urethra and vagina as a unit.
 2. The **compressor urethrae**, on each side, which originate from the ischiopubic rami and meet anterior to the urethra.
- In both men and women, a **deep transverse perineal muscle** on each side *parallels the free margin of the perineal membrane and joins with its partner at the midline.* These muscles are thought to stabilize the position of the perineal body, which is a midline structure along the posterior edge of the perineal membrane.



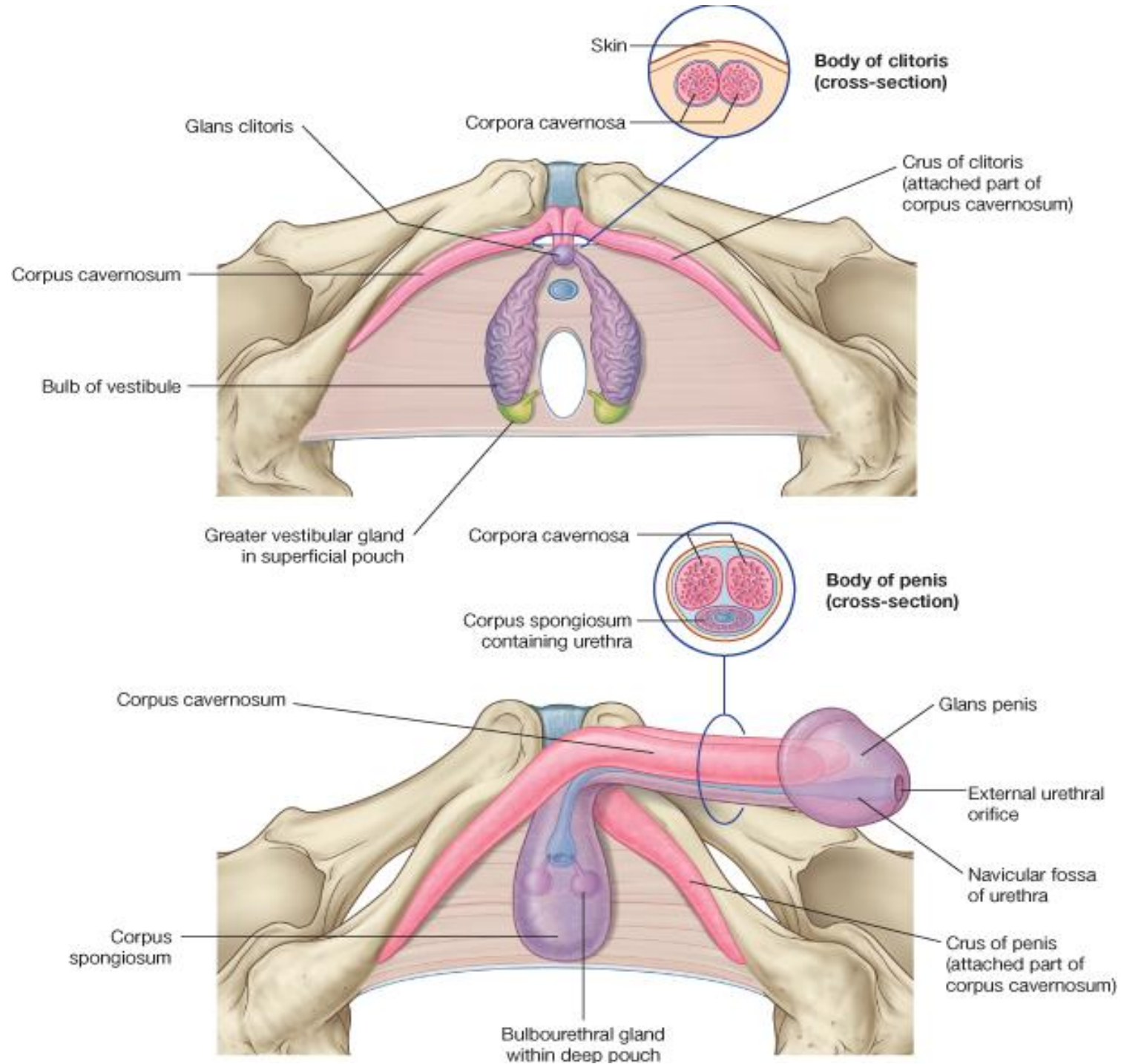
Muscles in the deep perineal pouch. In Women.

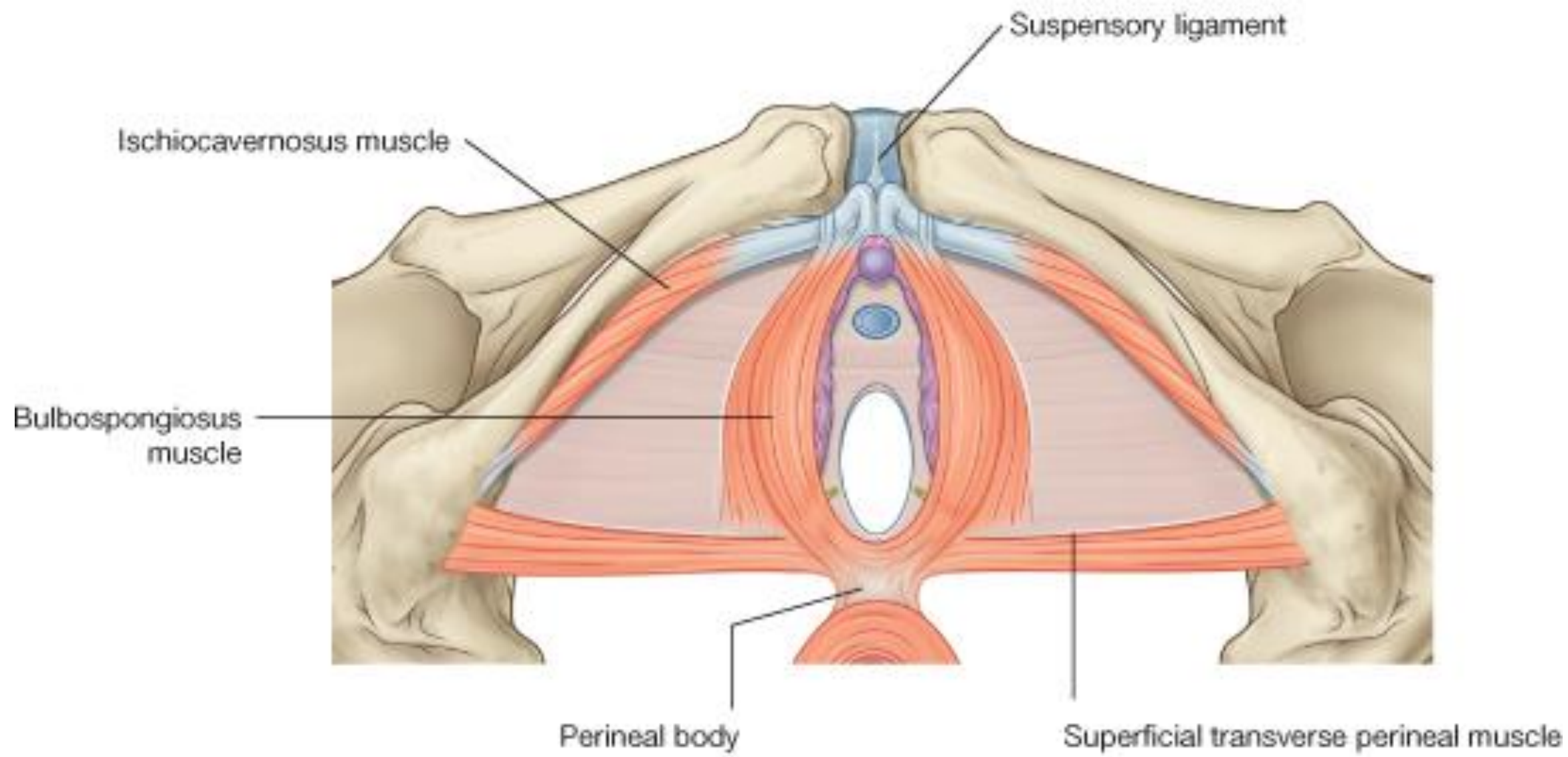


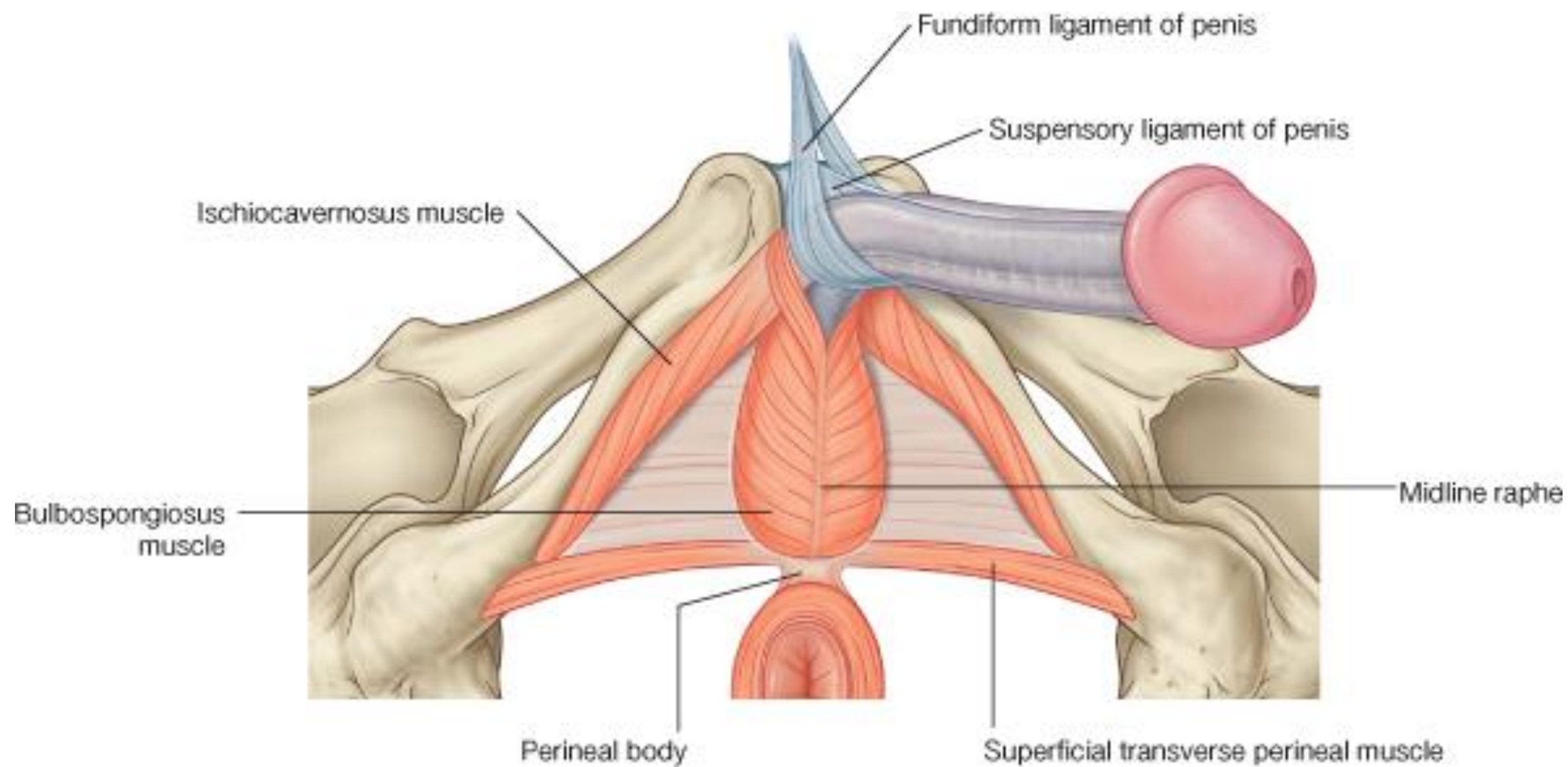
Muscles in the deep perineal pouch. In men.

The Superficial Perineal Pouch

- Between the perineal membrane and the membranous layer of superficial fascia is the superficial perineal pouch.
- The principal structures in this pouch are the erectile tissues of the penis and clitoris and associated skeletal muscles.
 - **Erectile tissue:**
 1. **Corpora cavernosa**
 2. **Bulbs of vestibule**
 3. **Corpus spongiosum**
 - **Muscles:**
 1. **Ischiocavernosus**
 2. **Bulbospongiosus**
 3. **Superficial transverse perineal muscles**







Thank You

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