

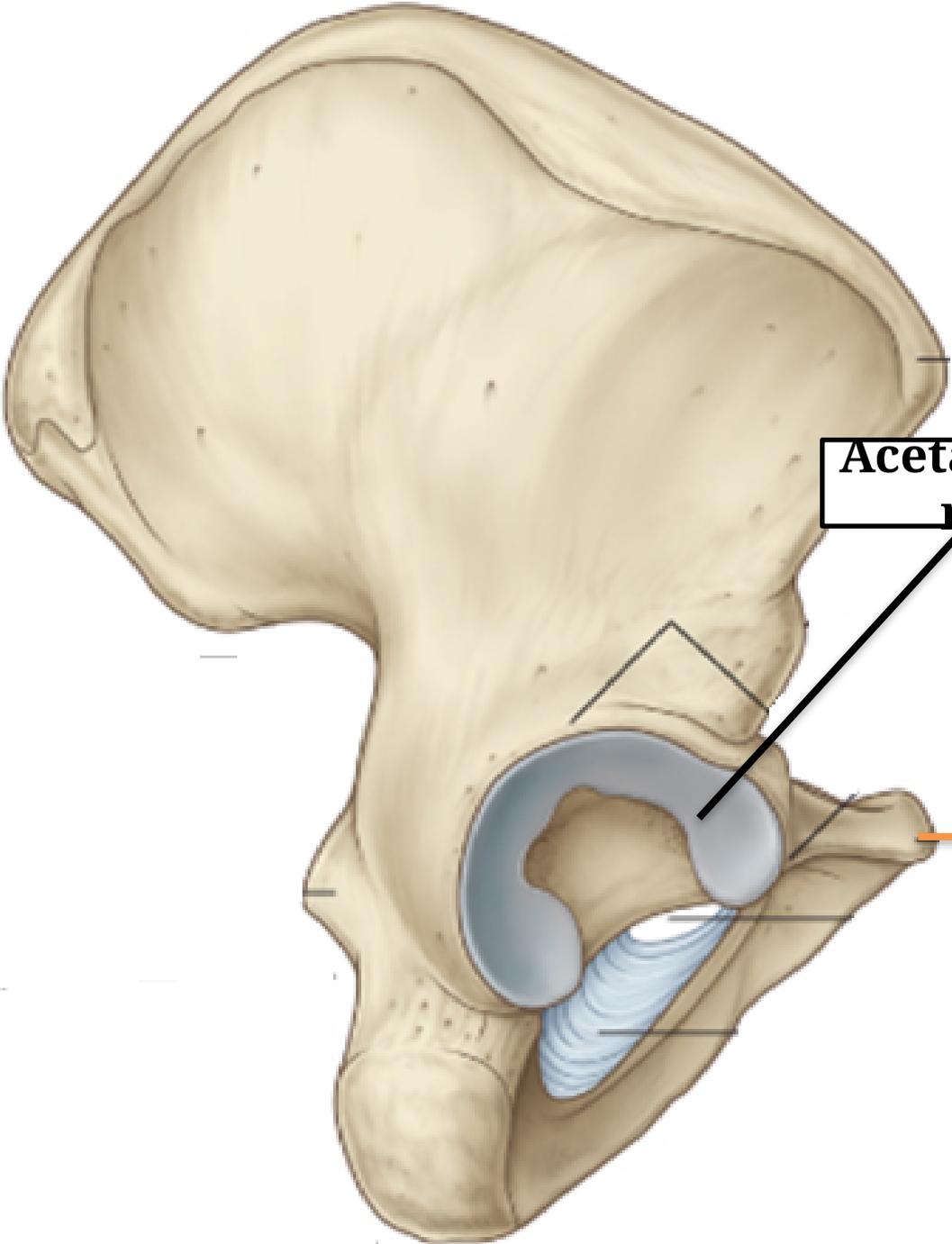
# **UGS Lecture – 4**

## **)2021(**

# **Sex Differences in the Pelvis**

- 1. Distance between pubic tubercle and anterior margin of acetabulum in female is longer than the diameter of acetabulum, whereas it is equal or less than the diameter of acetabulum in male.**
- 2. Greater sciatic notch is wider in female than in male (about  $50.4^\circ$  in male and  $74.4^\circ$  in female).**
- 3. Female obturator foramen is triangular; male foramen is oval in outline.**
- 4. Ischial spine is less inverted in the female than in male.**

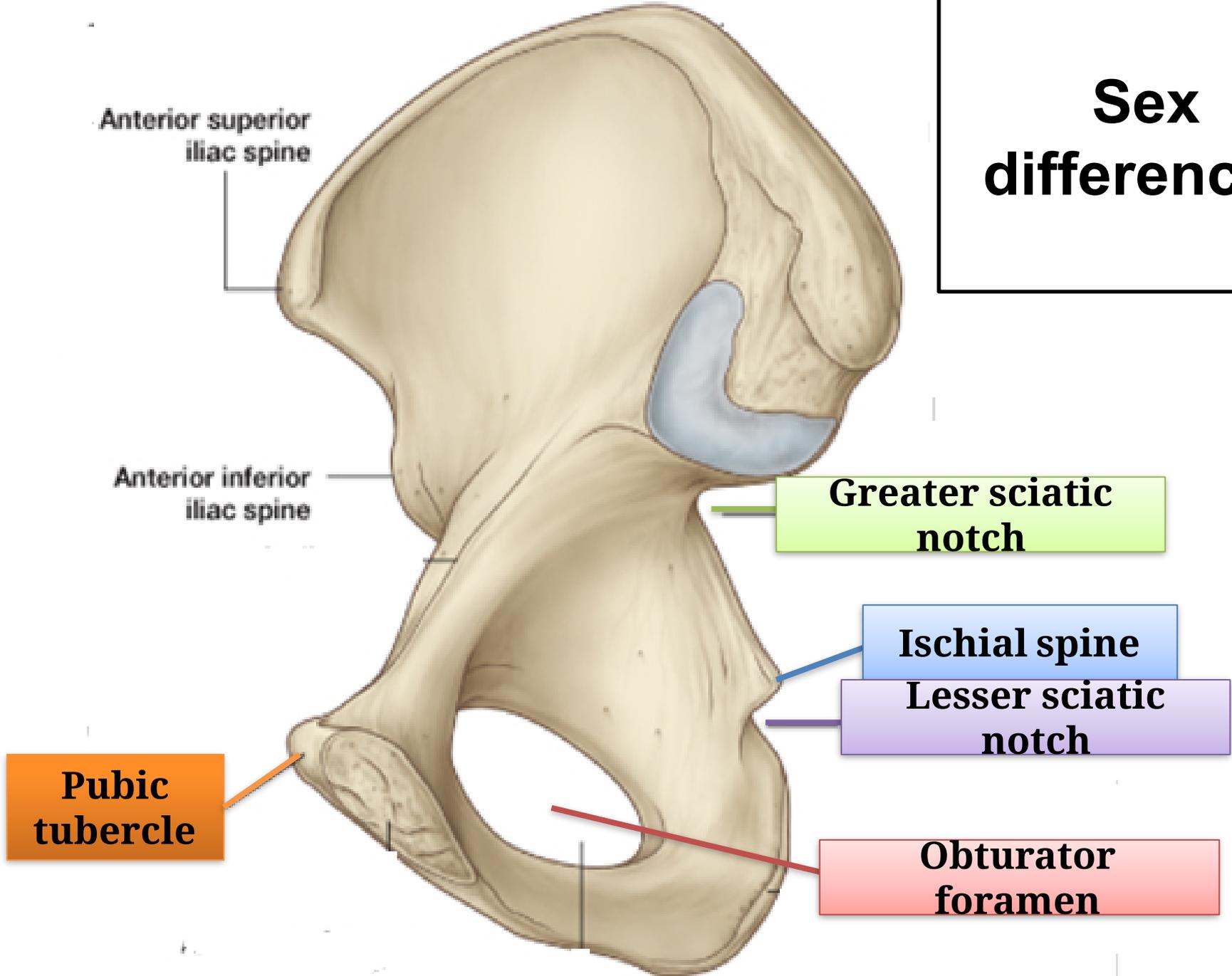
# Sex differences



Acetabulum

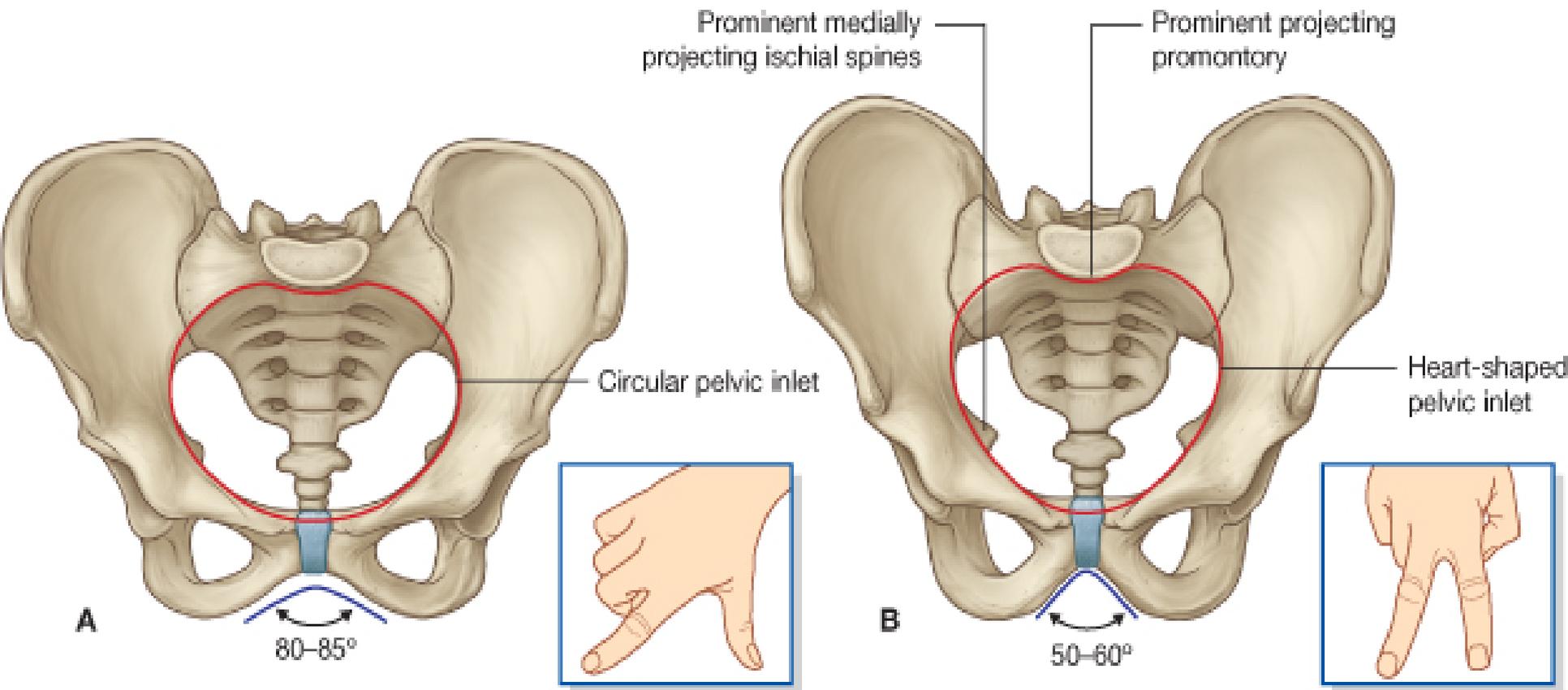
Pubic tubercle

# Sex differences



- 5. In the male, the subpubic angle is between 50 to 60° , whereas in the female it is between 80 to 85° .**
- 5. The high of the body of pubic bone is less in female than in male pelvis.**
- 7. Female pelvic inlet is wider and more curved, being circular shaped as compared with heart shaped inlet of the male.**
- 8. Male pelvic outlet is comparatively smaller than in female.**

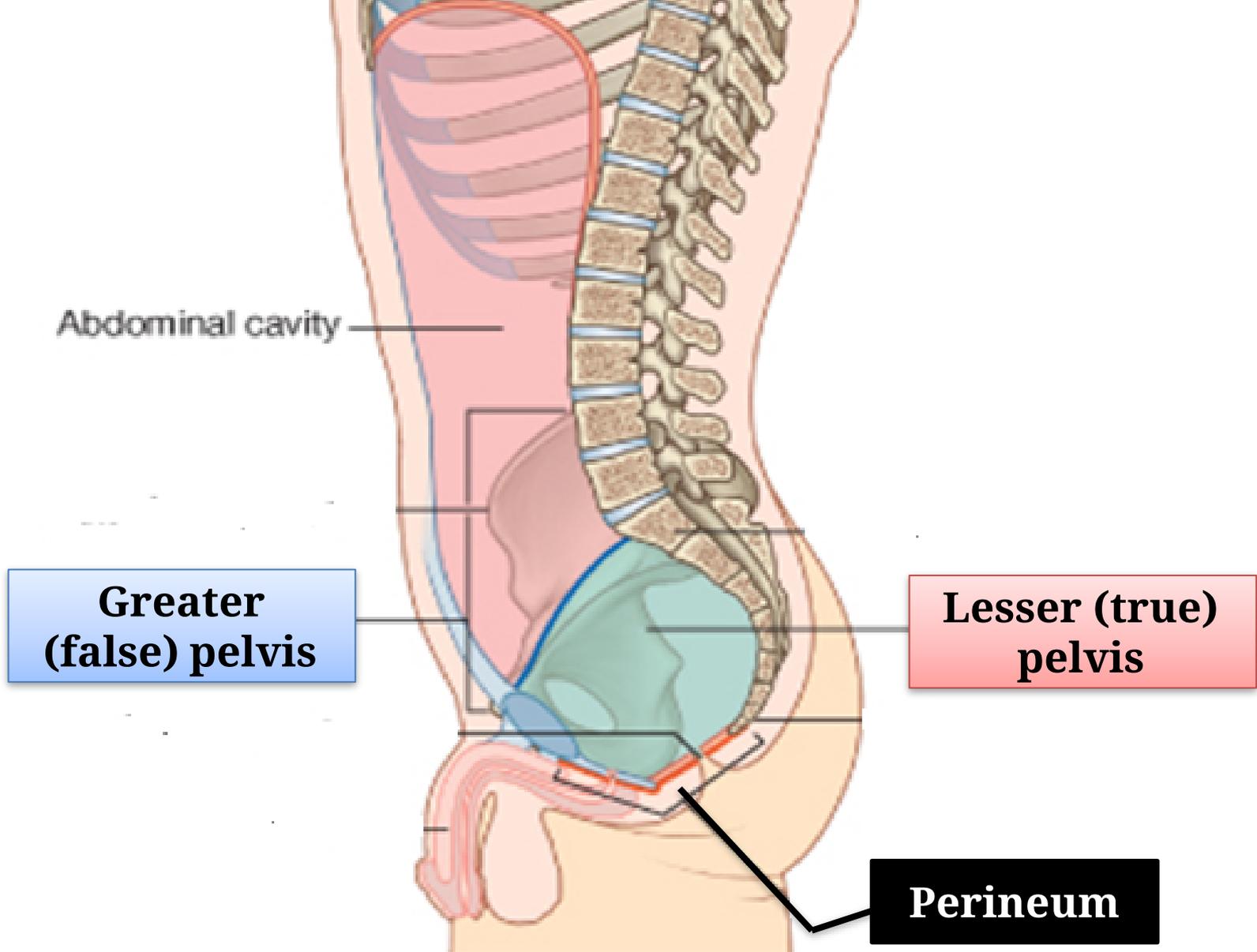
- 9. Greater pelvis is deep in the male, whereas it is shallow in the female.**
- 10. Lesser pelvis is longer and conical in male, shorter and more cylindrical in female.**
- 11. The male ilium is vertical; female ilium is tilted backwards.**
- 12. Ala of sacrum is the same width as the body of S1 vertebra in female; in male the ala is narrower than the body.**
- 13. Female sacrum is shorter, wider and less curved in its upper part than the male.**



## Sex differences

A. Female pelvis; B. Male pelvis

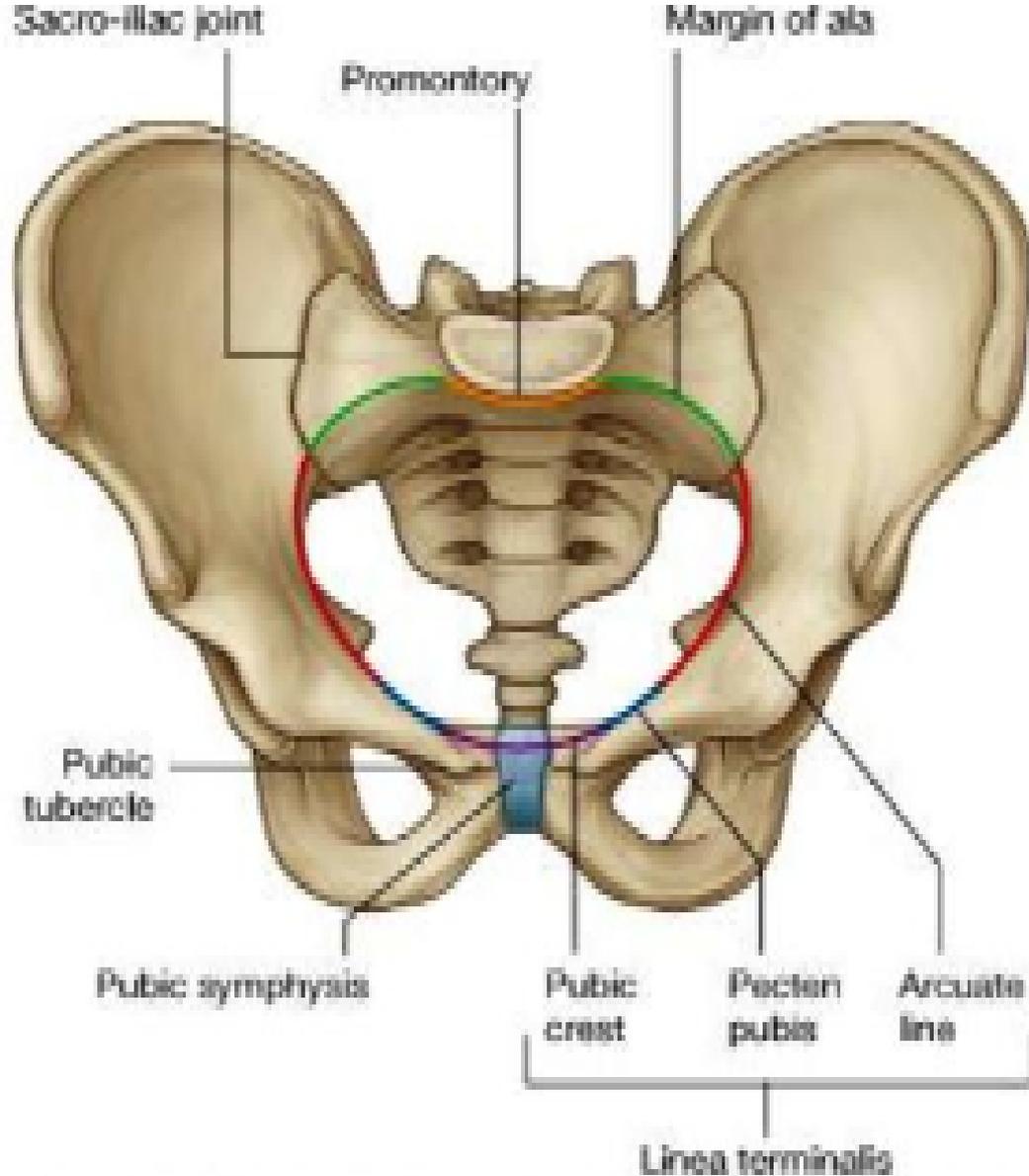
- **The pelvis is divided by the pelvic brim (superior pelvic aperture or pelvic inlet) into two parts.**
- **The part above pelvic brim is called false (greater) pelvis, and the part below pelvic brim is called true (lesser) pelvis.**
- **The latter is bounded above by superior pelvic aperture and below by inferior pelvic aperture.**



## True and False pelvis

# **Superior Pelvic Aperture or Pelvic Inlet**

- a. Posteriorly: By the promontory of sacrum and the margin of the ala of sacrum.**
- b. Anterolaterally: By linea terminalis (arcuate line, pecten pubis, and pubic crest).**
- c. Anteriorly: By upper border of pubic symphysis.**



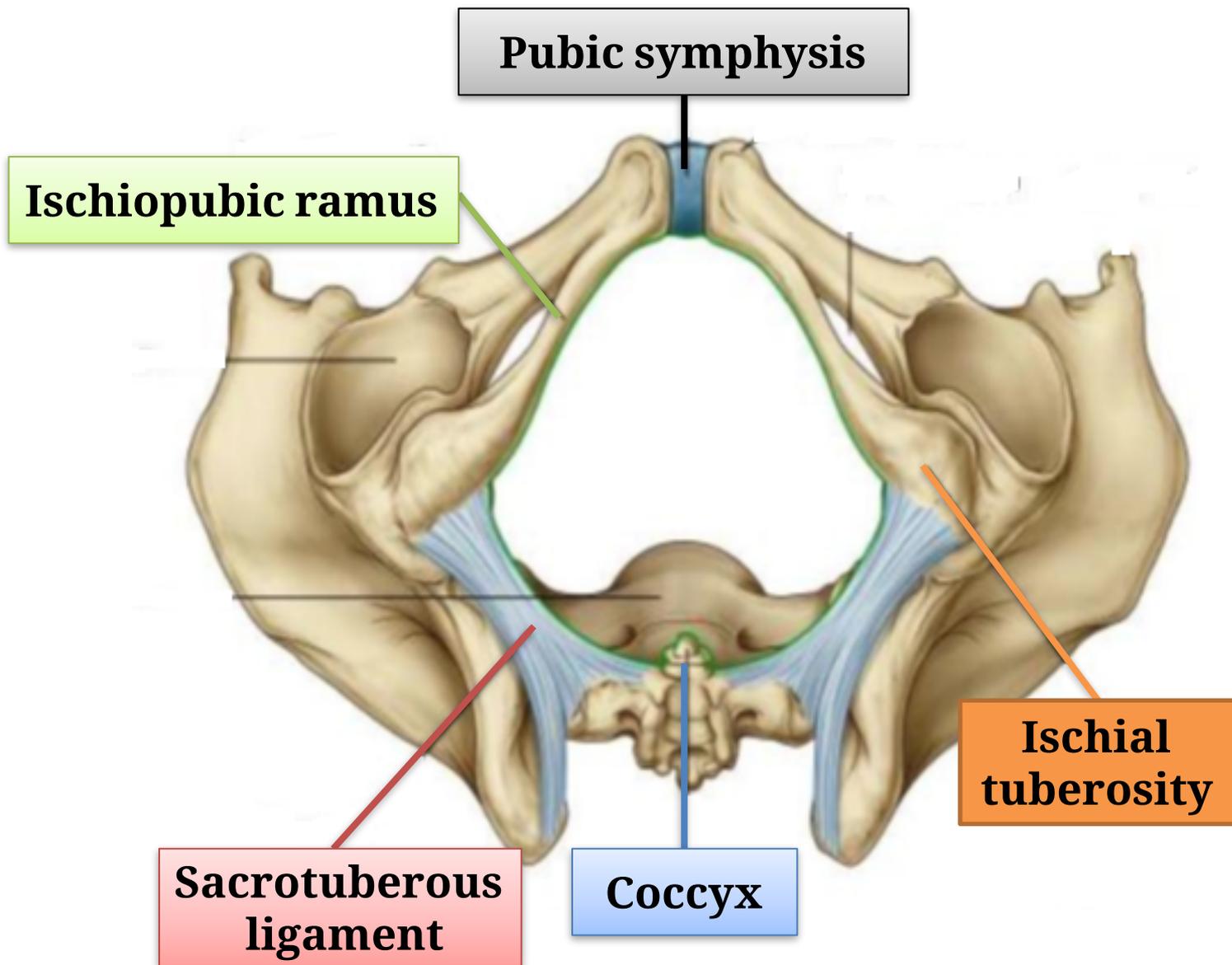
**The pelvic inlet (superior pelvic aperture)**

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# **Inferior Pelvic Aperture or Pelvic Outlet**

- It is diamond-shaped.**
- Its anterior limbs are formed by the lower border of the symphysis pubis and ischiopubic rami.**
- The posterior limbs of the aperture are formed by the sacrotuberous ligaments, with the coccyx in the midline.**
- It presents anteriorly the pubic arch (subpubic angle), which lies between the ischiopubic rami.**

- **Laterally, on each side, the aperture exhibits the greater and lesser sciatic notches.**
- **The two notches are converted by means of the sacrospinous and the sacrotuberous into the greater and lesser sciatic foramina.**



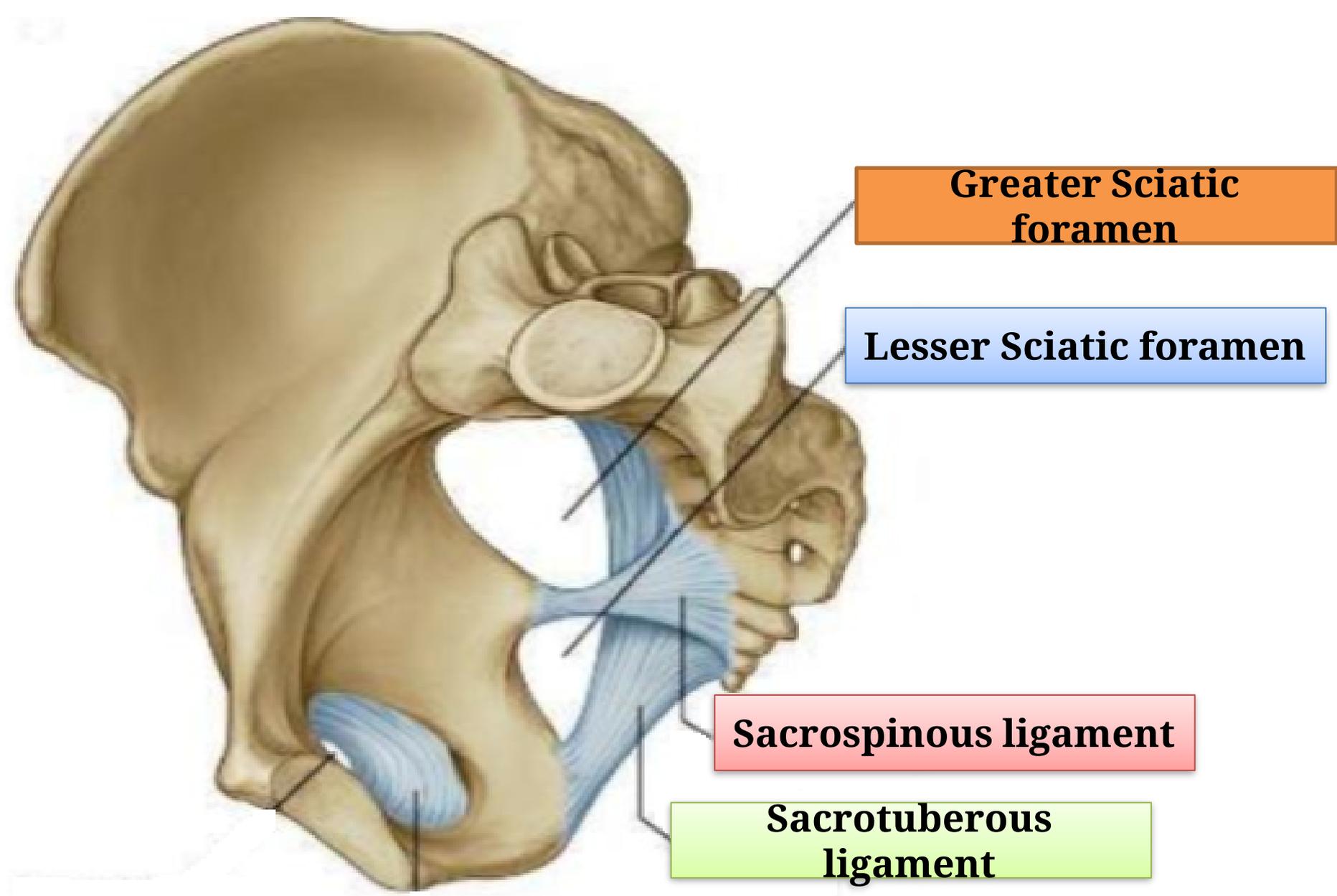
**The pelvic outlet (inferior pelvic aperture)**

# Greater Sciatic foramen

- Provides an exit from pelvis into gluteal region.
- The piriformis passes through the foramen dividing it into an upper and a lower part.
- Through the upper part passes the superior gluteal nerve and vessels.
- Through the inferior part passes the inferior gluteal nerve and vessels, sciatic nerve, posterior cutaneous nerve of thigh, nerve to obturator internus, nerve to quadratus femoris, pudendal nerve, and internal pudendal vessels.

# **Lesser sciatic foramen**

- **Provides an entrance into the perineum from the gluteal region.**
- **Through it passes the tendon of the obturator internus, nerve to obturator internus, pudendal nerve, and internal pudendal vessels.**



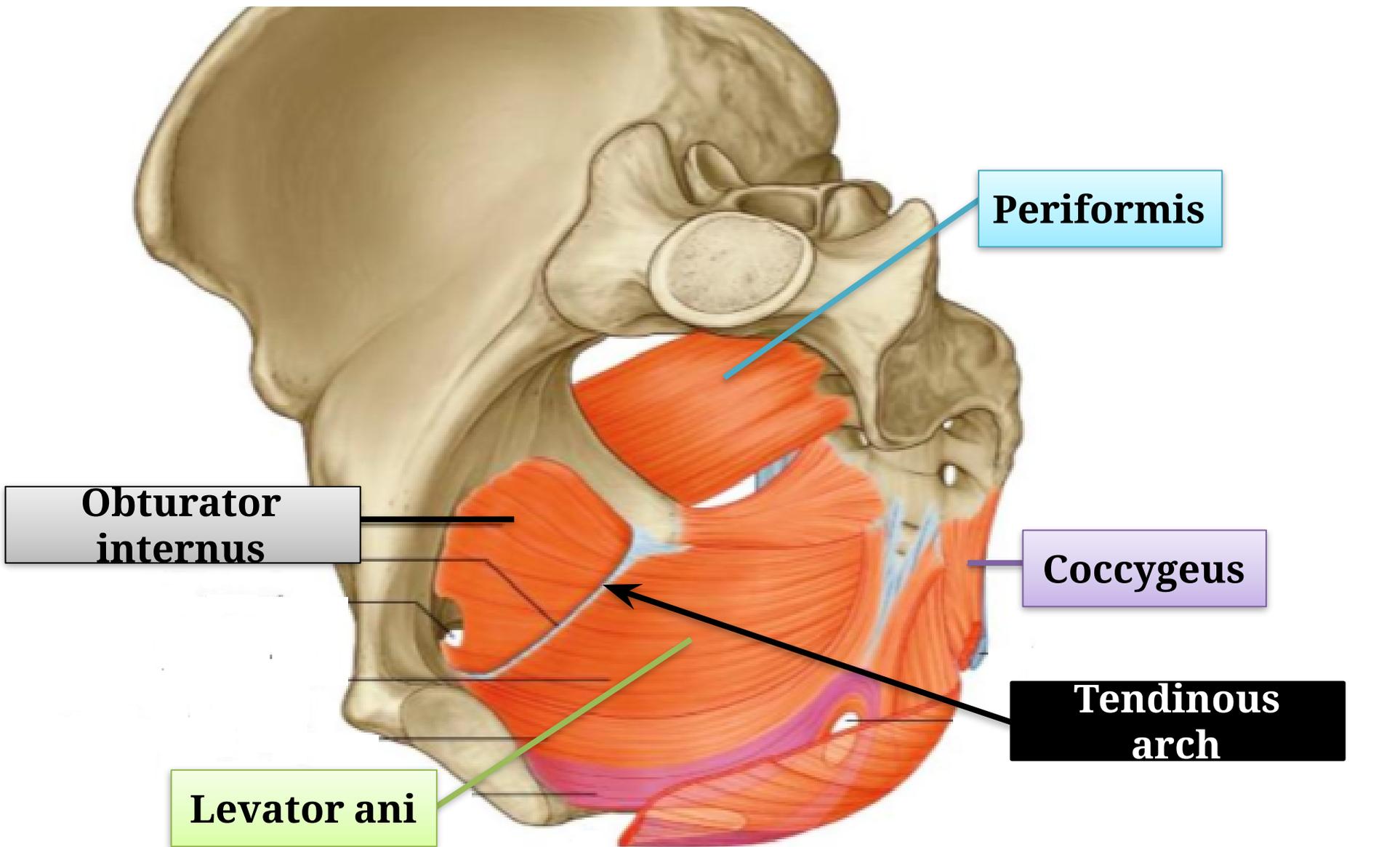
**The greater and lesser sciatic foramen 16**

# **Greater (False) Pelvis**

- **The greater pelvis lies above the superior pelvic aperture.**
- **The cavity of the greater pelvis is regarded as part of abdominal cavity.**
- **Its anterior wall is formed by the lower part of anterior abdominal wall.**
- **On each side, the lateral wall is formed by iliac fossa of ilium and iliacus muscle.**
- **The posterior wall is formed by lumbar vertebrae.**

# **Lesser (True) Pelvis**

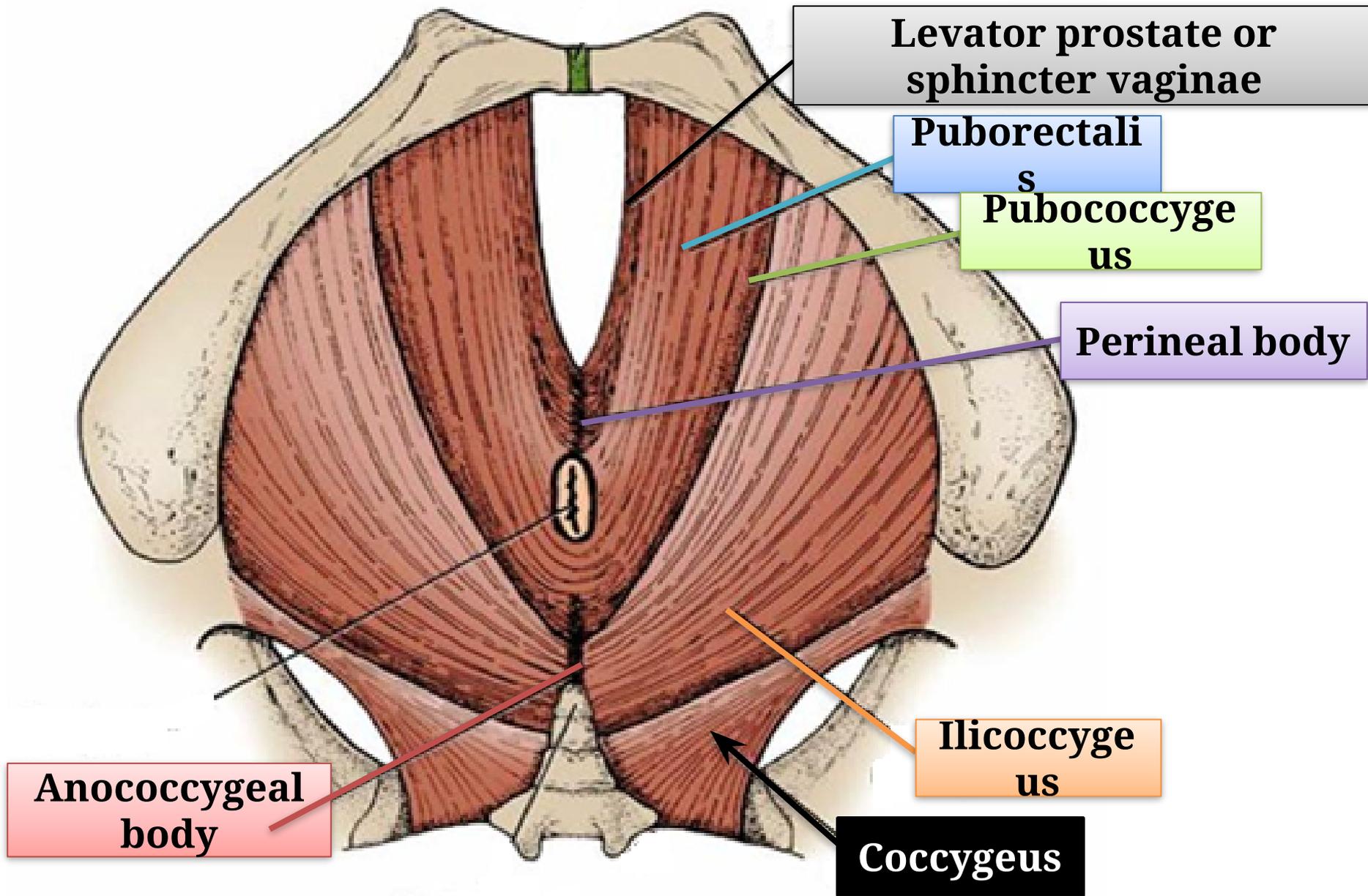
- 1.The anterior wall: Is the shallowest wall, formed by symphysis pubis, and bodies and rami of pubic bones.**
- 2.The lateral wall: Is formed on each side by the part of hip bone below pelvic inlet, sacrospinous and sacrotuberous ligaments, obturator membrane, and obturator internus muscle and its covering fascia.**
- 3.The posterior wall: Is formed by sacrum, coccyx, and the two piriformis muscles and their covering fascia.**



## The walls of the lesser pelvis

#### **4. The inferior wall (floor or pelvic diaphragm):**

- It stretches between pelvic cavity, above and perineum, below.**
- It is formed anteriorly by levatores ani muscles, and posteriorly by coccygeus muscles posteriorly with their covering fascia.**
- The pelvic diaphragm is incomplete anteriorly at pubic arch to allow passage of urethra in the males, and urethra and vagina in the females.**



# **Parietal Pelvic Fascia**

- The parietal pelvic fascia is continuous above with parietal fascia that lining abdominal wall and below with fascia of perineum.**
- It lines the wall of pelvis and is named according to muscle it overlies.**
- Over obturator internus muscle it is thick and strong and is called obturator internus fascia.**

- **Over levatores ani and coccygeus muscles it form levator ani and coccygeus fascia, frequently known as superior fascial layer of pelvic diaphragm.**
- **Where pelvic diaphragm is deficient anteriorly, the superior fascial layer of pelvic diaphragm becomes continuous with inferior fascial layer of pelvic diaphragm in perineum.**

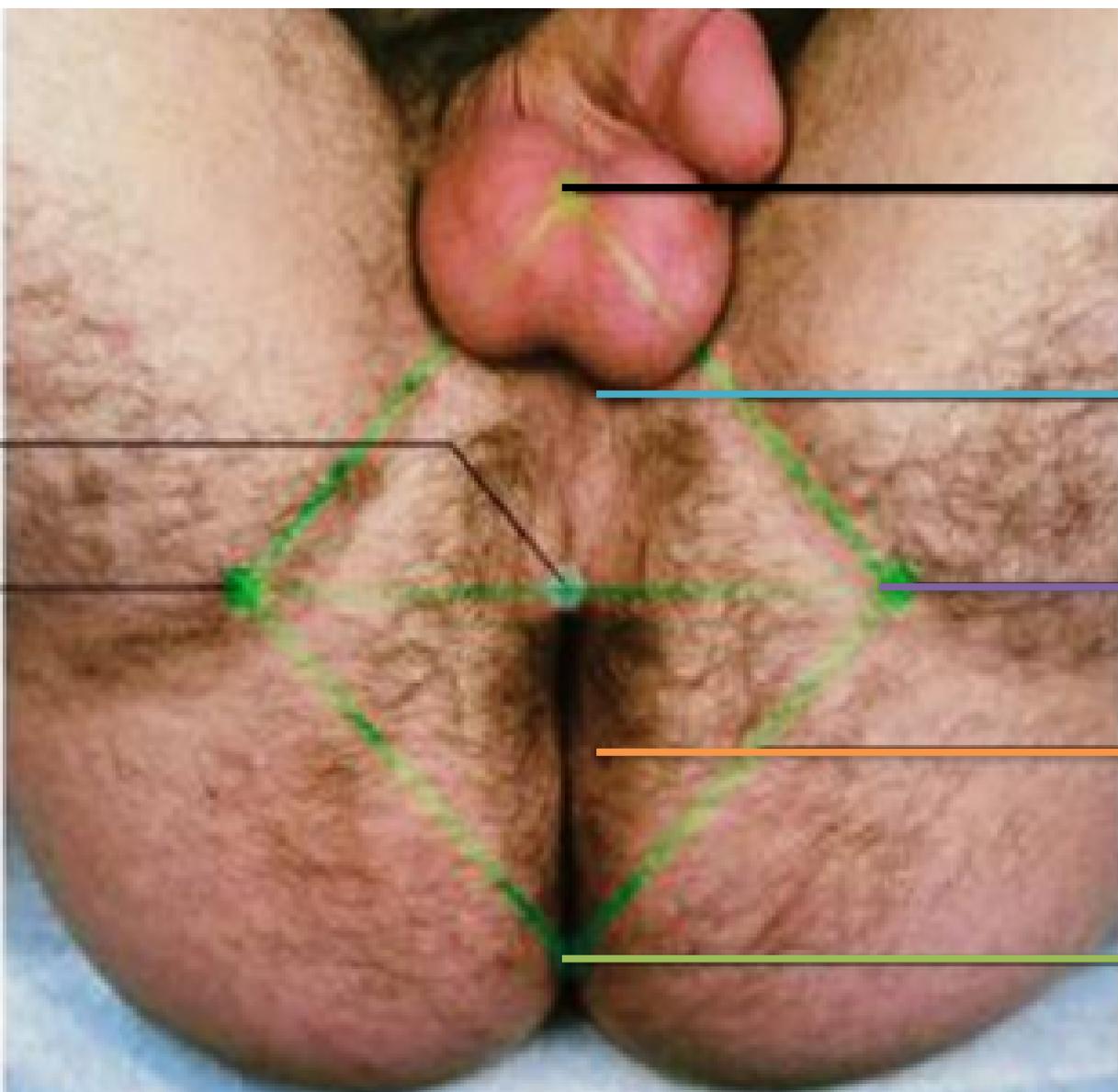
- In perineum, the parietal pelvic fascia covers sphincter urethrae muscle and perineal membrane, where it is called perineal layer of parietal pelvic fascia, which forms superior fascial layer of urogenital diaphragm.
- Injury to pelvic floor during a difficult childbirth can result in loss of support for pelvic viscera leading to uterine and vaginal prolapse, and alteration in the position of the bladder neck and urethra.

- **In the latter condition, patient dribbles urine whenever intra abdominal pressure is raised, as in coughing. Prolapse of the rectum may also occur.**

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# Gross Anatomy of Perineum

- The perineum is diamond shaped area located below pelvic diaphragm (fig. 7), seen from below in lithotomy position (patient is in supine position with both hip joints flexed and abducted; feet are held in position by stirrups).
- It is bounded anteriorly by symphysis pubis; posteriorly by tip of the coccyx, and laterally by ischial tuberosities.
- It is divided into an anterior part called urogenital triangle and a posterior part called anal triangle.



Symphysis pubis

Urogenital triangle

Ischial tuberosity

Anal triangle

Coccyx

The perineum seen from below in lithotomy position. 27

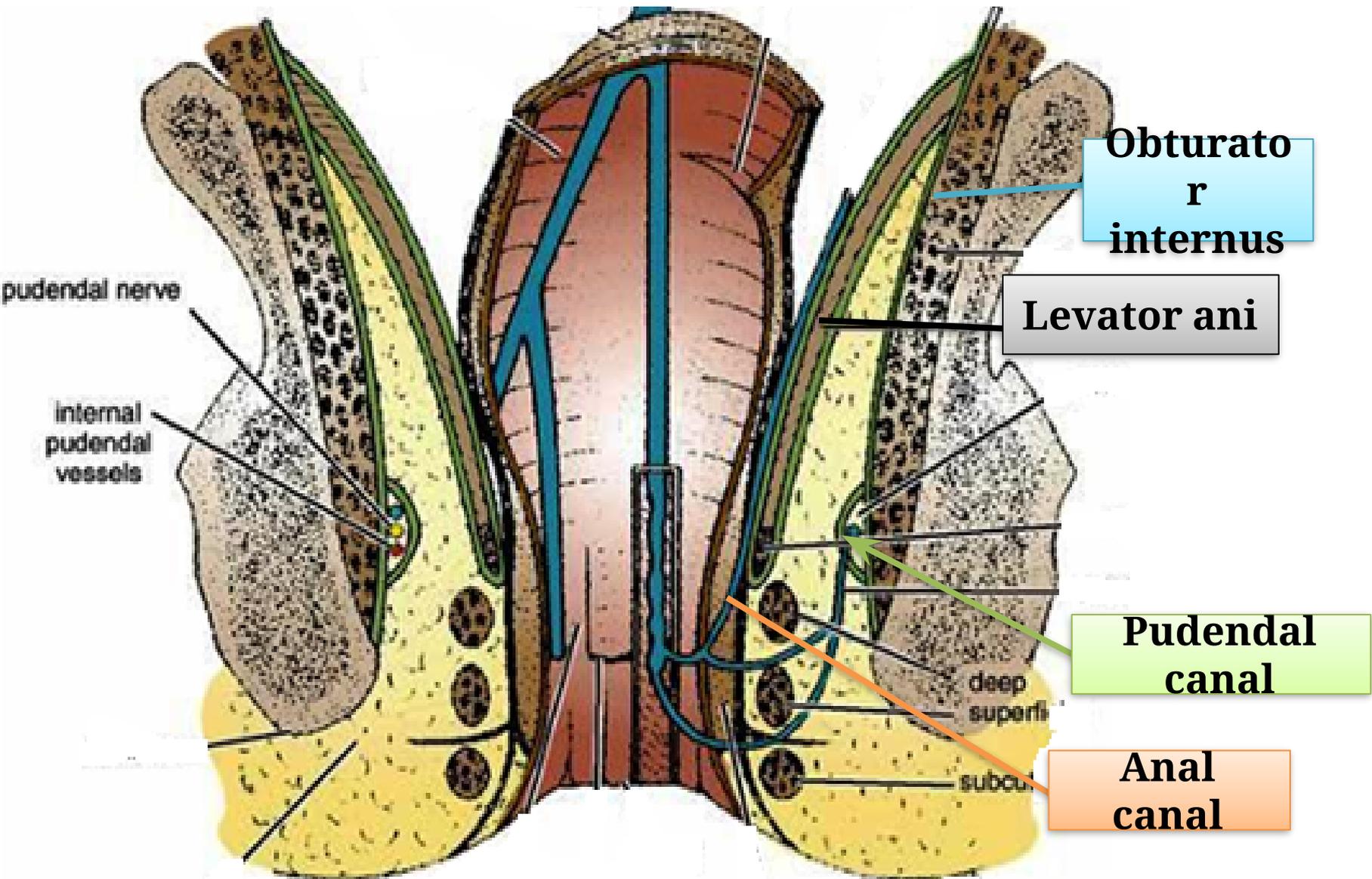
# **Anal Triangle**

- **The anal triangle is bounded on each side by ischial tuberosities and sacrotuberous ligaments, and posteriorly by tip of coccyx, overlapped by borders of gluteus maximus.**
- **It contains anus in midline and ischiorectal fossa on each side.**
- **The skin around anus is supplied by inferior rectal nerve.**

# **Ischiorectal (Anorectal) Fossa**

- **It is a wedge-shaped space situated on each side of anal canal.**
- **The medial wall is formed by sloping levator ani muscle and anal canal.**
- **The lateral wall is formed by pelvic fascia covering lower part of obturator internus muscle.**
- **The base of wedge is superficial and formed by skin of perineum.**

- **The edge of wedge is at junction of medial and lateral walls.**
- **The internal pudendal vessels and pudendal nerve lie on lateral wall of fossa in pudendal canal.**
- **The ischiorectal fossa is filled with a fatty pad which allows anal canal to expand during passage of feces.**
- **The inferior rectal vessels and nerve pass medially from lateral wall of fossa to anal canal.**



# The ischioanal fossa

# The Urogenital Triangle

- Is bounded on each side by ischial tuberosity, and anteriorly by pubic arch.
- In male, it contains root of penis and scrotum; in female, it contains external genitalia and orifices of urethra and vagina.

# Superficial fascia

**Consists two layers:**

**a. The fatty layer (fascia of camper):**

- It is continuous with fat of ischiorectal fossa, and superficial fascia of thigh.
- Anteriorly, in scrotum, the fat is replaced by smooth muscle known as dartos muscle.

**b. The membranous layer (colles' fascia):**

- It is attached posteriorly to posterior border of urogenital diaphragm, and laterally to margins of pubic arch.
- Anteriorly, it is continuous with membranous layer of superficial fascia of anterior abdominal wall, the scarpa's fascia.

- **Over penis (or clitoris), It continued as a tubular sheath.**

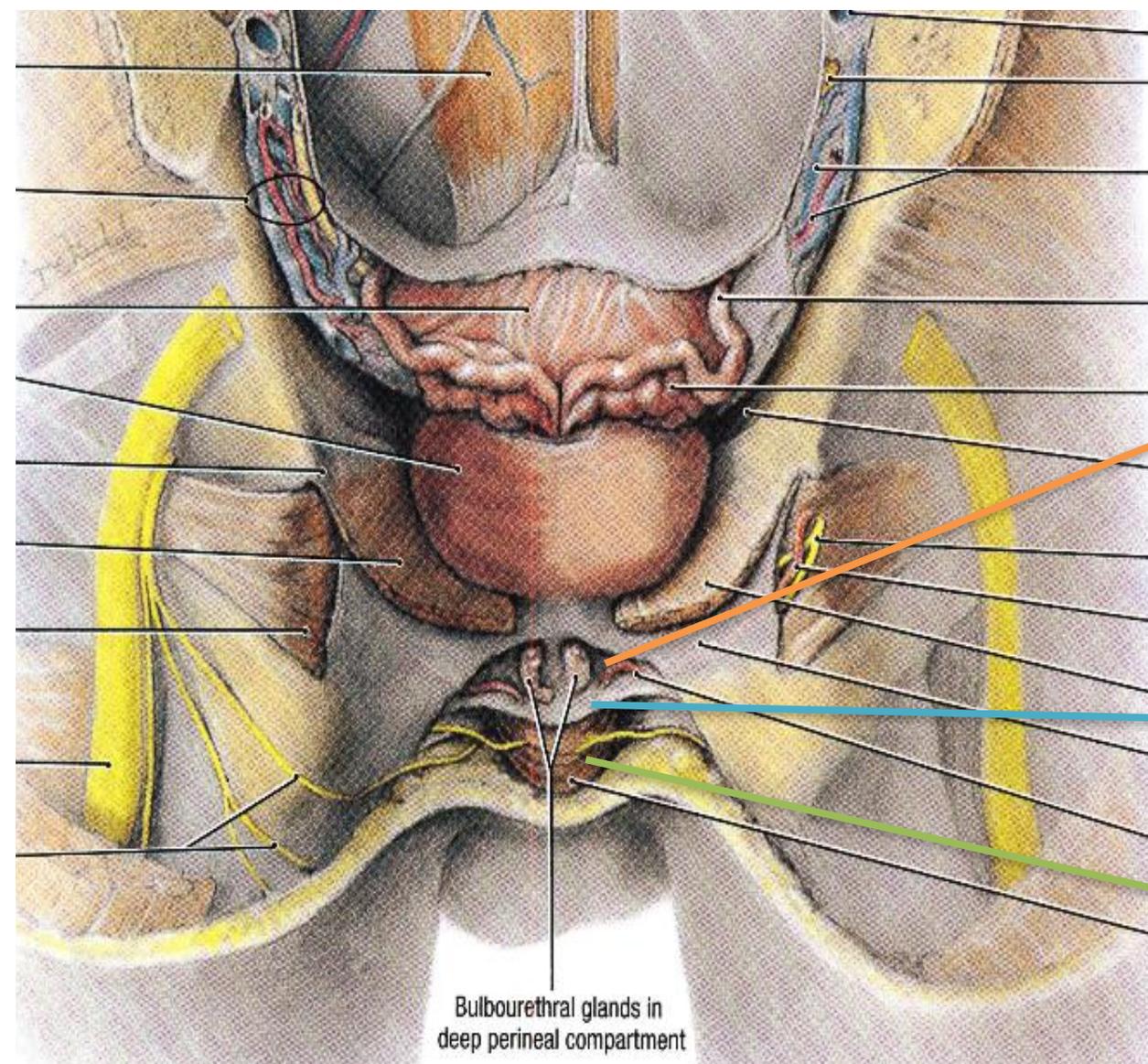
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# **Urogenital Diaphragm**

- The urogenital diaphragm is a triangular musculofascial diaphragm, situated in anterior part of the perineum, filling gap of pubic arch.**
- It is formed by sphincter urethrae and deep transverse perineal muscles, which are enclosed between a superior and inferior layer of fascia of urogenital diaphragm.**
- The inferior layer of fascia of urogenital diaphragm is called perineal membrane. 35**

- **Anteriorly, superior and inferior layers of fascia of urogenital diaphragm fuse, leaving a small gap beneath symphysis pubis.**
- **Posteriorly, the two fascial layers fuse with each other and with membranous layer of the superficial fascia and perineal body.**
- **Laterally, the two fascial layers are attached to pubic arch.**
- **The close space that is contained between two fascial layers is known as deep perineal pouch.**

- **The closed space below inferior layer of fascia of urogenital diaphragm (perineal membrane) is called superficial perineal pouch.**



Deep perineal pouch

perineal membrane

Superficial perineal pouch

Bulbourethral glands in deep perineal compartment

# The superficial and deep perineal pouch

# Superficial Perineal Pouch

- **Closed posteriorly by fusion of upper and lower walls.**
- **Laterally, it is closed by attachment of upper and lower walls to margins of pubic arch.**
- **Anteriorly, space communicates with a potential space lying between the superficial fascia of anterior abdominal wall and anterior abdominal muscles.**

# **Contents in the Male**

**a. Bulbospongiosus muscles: One on each side of midline, cover bulb of penis.**

**Their action is:**

**i. They compress penile part of urethra and empty it of residual urine or semen;**

**ii. They compress deep dorsal vein of penis, thus impeding venous drainage of erectile tissue and there by assisting in process of erection of penis.**

**b. Ischiocavernosus muscles: One on each side, cover corresponding crus penis.**

**Their action is: Assist in process of erection of penis.**

**c. Bulb of penis: It is firmly attached to perineal membrane.**

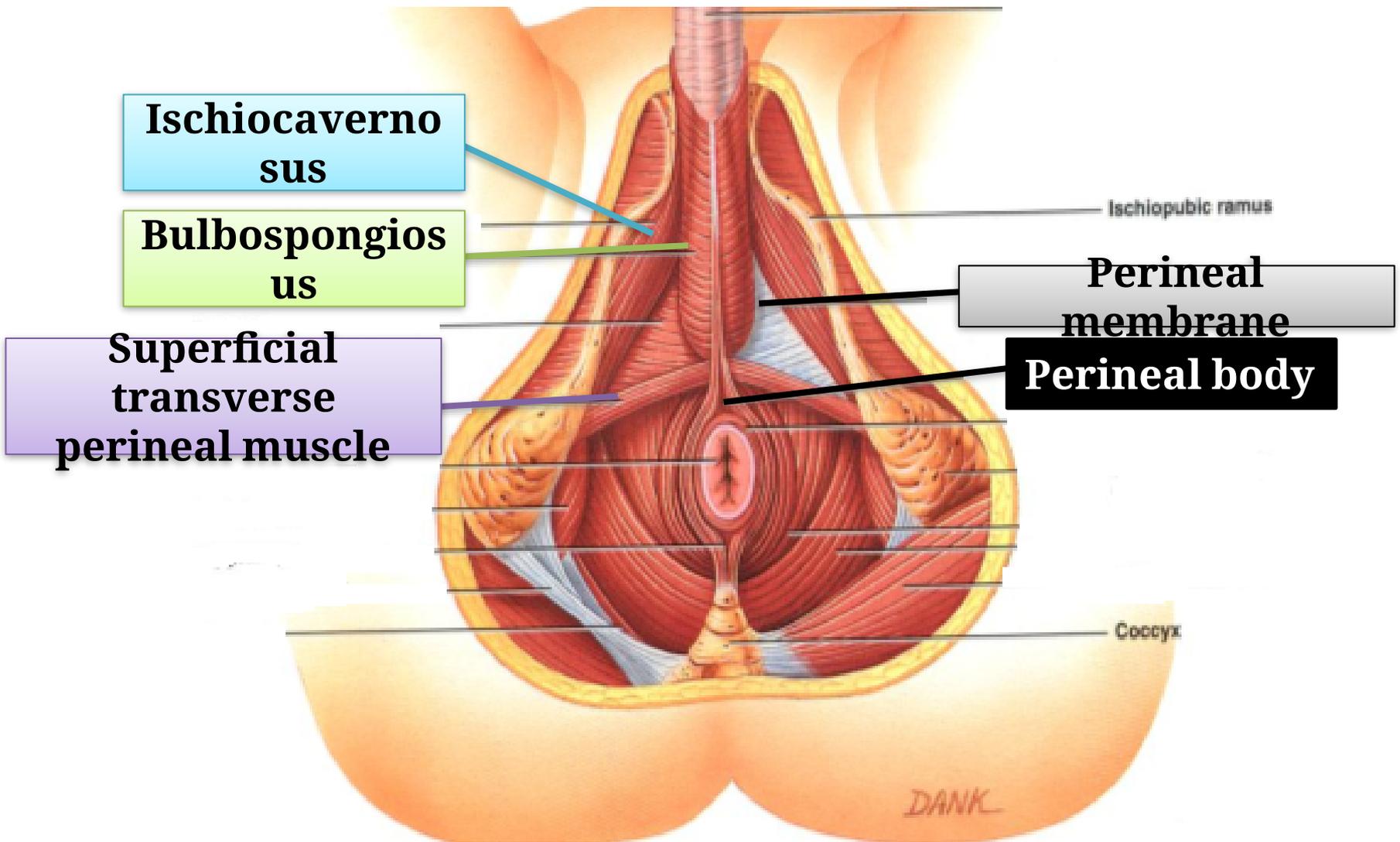
**d. Crura of penis: One on each side, are firmly attached to margins of pubic arch.**

**e. Superficial transverse perineal muscles: The two muscles lie in posterior part of pouch.**

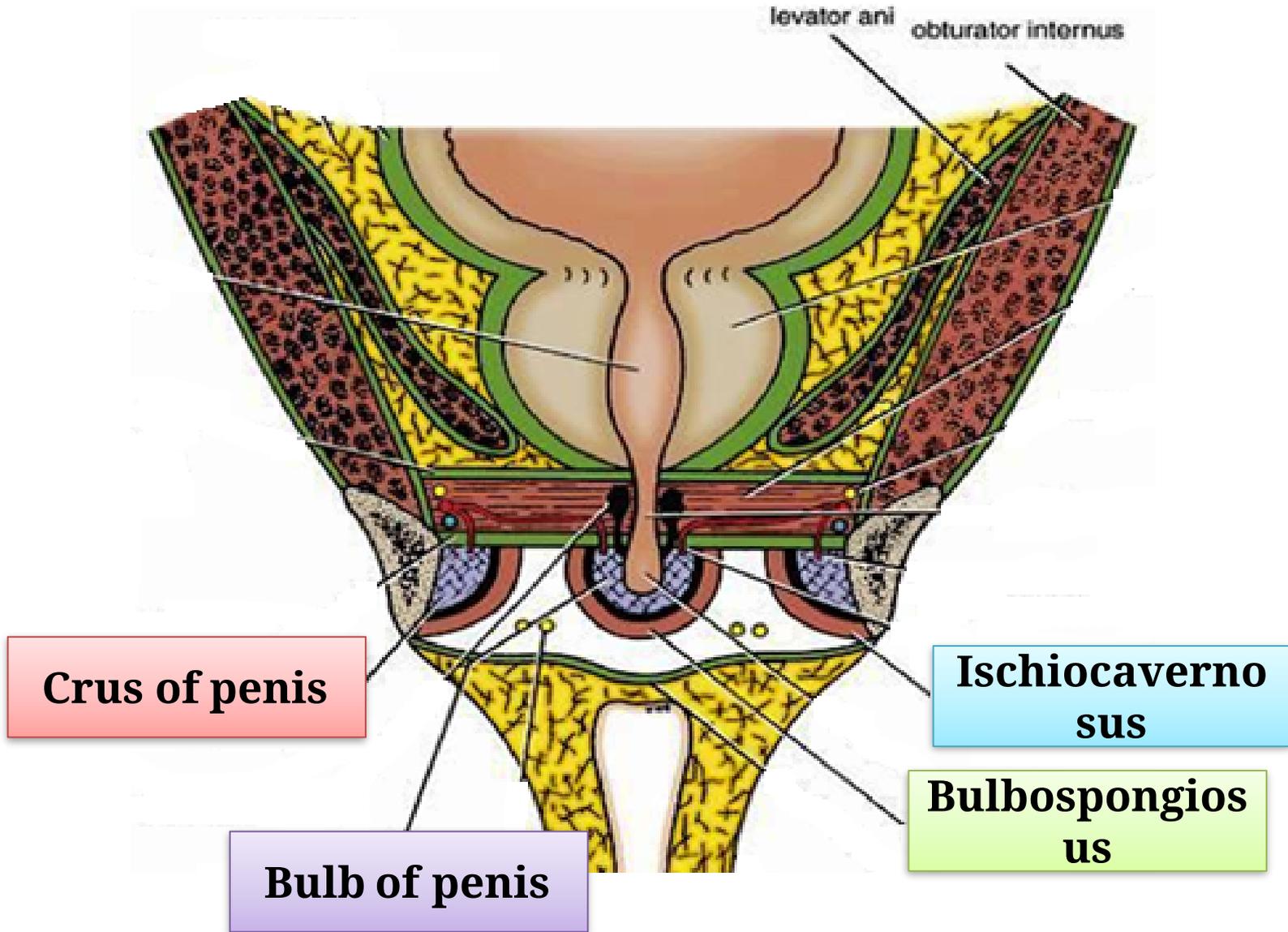
**f. Perineal body:**

- The perineal body is a fibromuscular mass, occupies:**

- In male, space between anal canals, posteriorly and bulb of penis, anteriorly.
  - In the female, space between anal canal and vagina.
  - The perineal body supports vagina in female.
  - During childbirth it is liable to be torn, and if repair does not occur, the upper part of vagina together with uterus is liable to descend (prolaps).
- g. Perineal branch of pudendal nerve: Supplies muscles within the superficial perineal pouch and covering skin.



# Superficial perineal pouch – Male



## Superficial perineal pouch – Male

# **Contents in Female**

**a. Bulbospongiosus muscles: One on each side of midline, surround orifice and lower part of vagina and cover lateral part of vestibular bulb.**

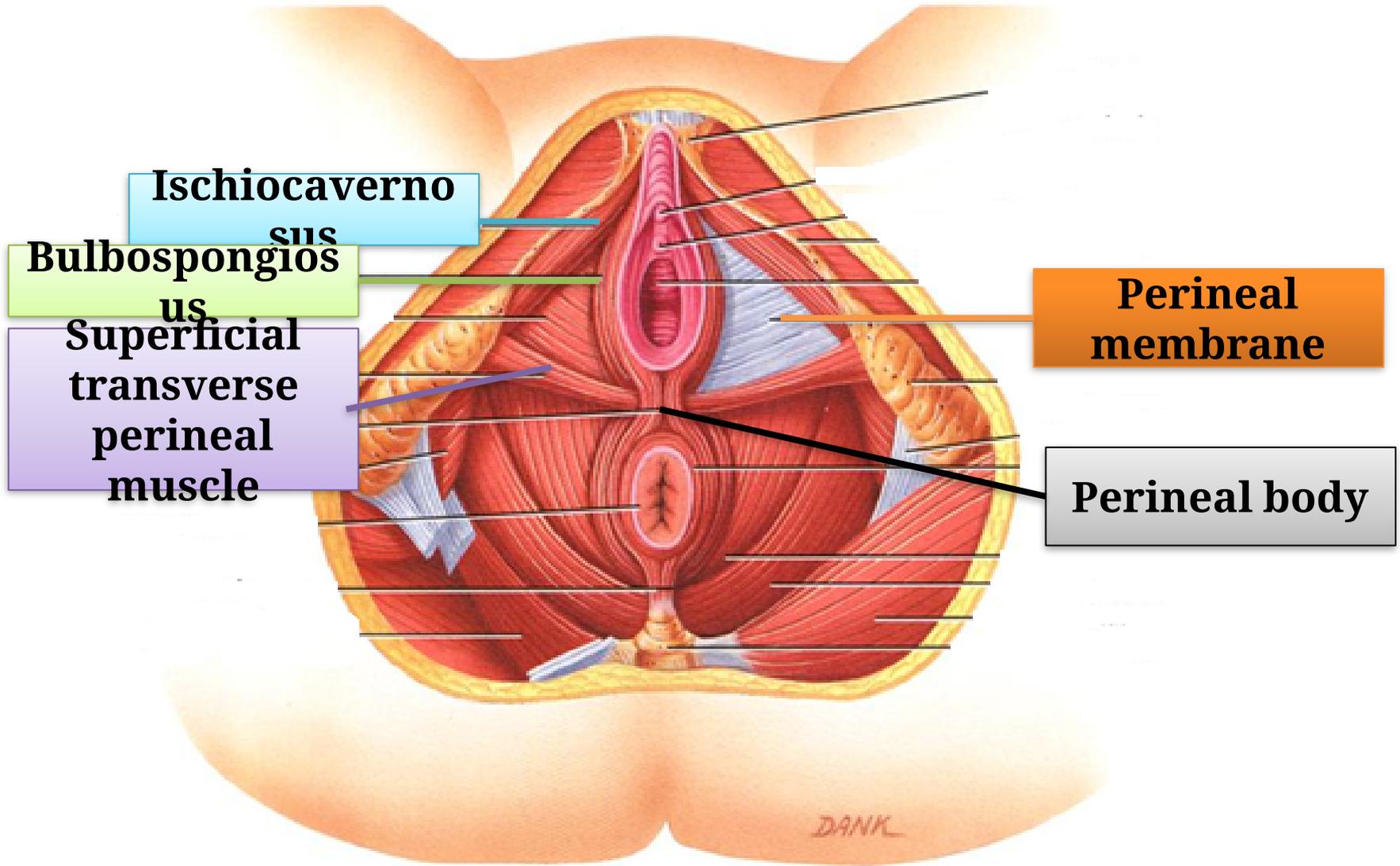
**Their action is:**

- (1) They reduce the size of vaginal orifice;**
- (2) They compress deep dorsal vein of clitoris, thereby assisting in mechanism of erection of clitoris.**

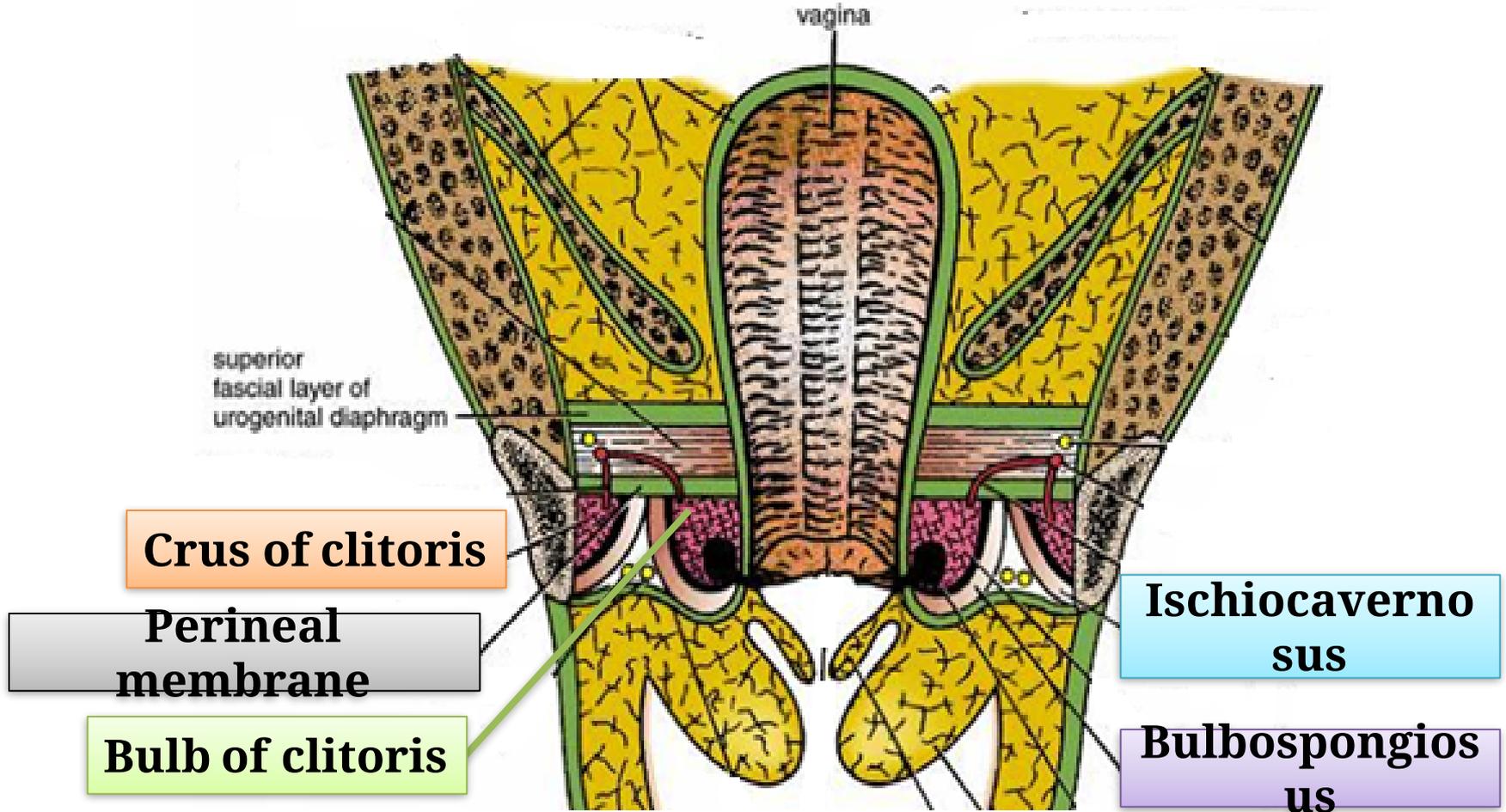
**b. Ischiocavernosus muscles:**

**c. Bulb of the vestibule: They are identical to that of penis.**

- d. Crura of clitoris: They are identical to that of penis.**
- e. Superficial transverse perineal muscles.**
- f. Perineal body: It is larger than that of male, and situated between lower end of the vagina and anal canal.**
- g. Perineal branch of the pudendal nerve: Supplies muscles within the superficial perineal pouch and covering skin.**



# Superficial perineal pouch – Female



## Superficial perineal pouch – Female

# **Deep Perineal Pouch**

**Is the closed space that is contained between superior and inferior (perineal membrane) layers of fascia of urogenital diaphragm.**

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# **Contents in Male**

**a. Membranous part of urethra.**

**b. Sphincter urethrae muscle:**

- Supplied by the perineal branch of the pudendal nerve.**
- Its function is to compress membranous part of urethra and relaxes during micturition.**

**c. Deep transverse perineal muscles:**

**The two muscles lie behind sphincter urethra muscle. They are clinically unimportant.**

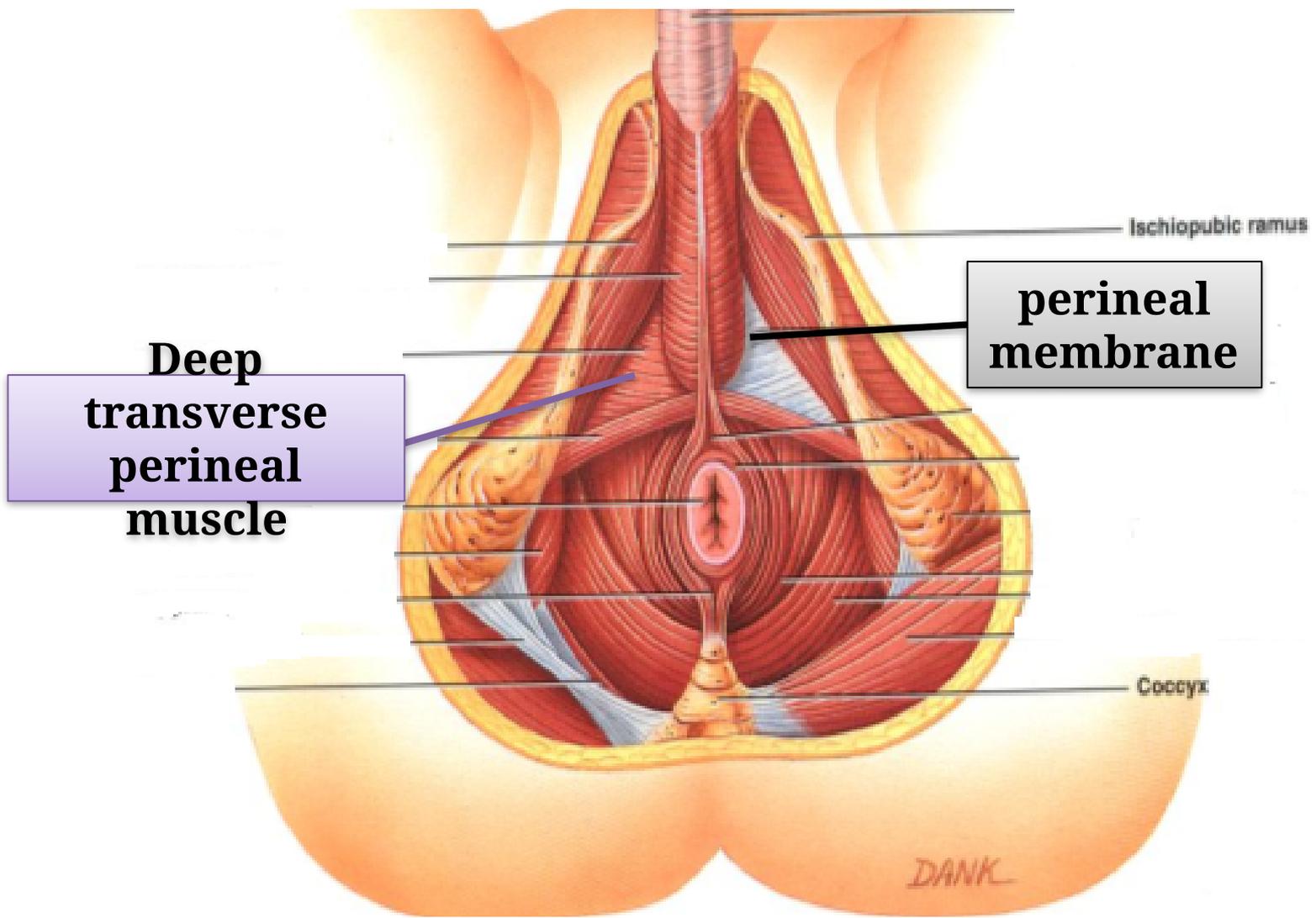
**d. Bulbourethral glands:**

**These are two small glands, situated behind sphincter urethrae muscle.**

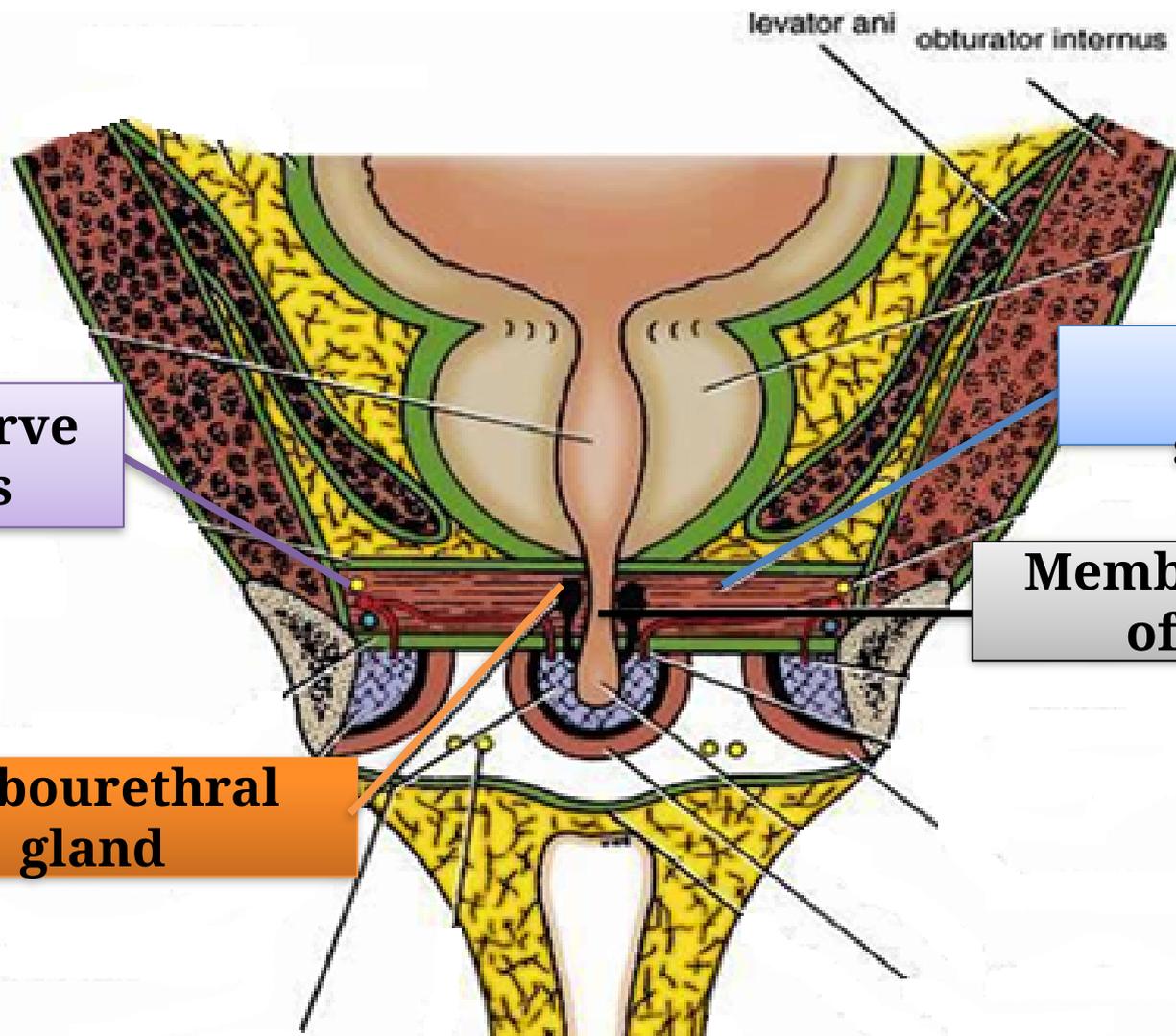
**Their ducts pierce perineal membrane and enter penile urethra.**

**e. Internal pudendal artery.**

**f. Dorsal nerve of the penis.**



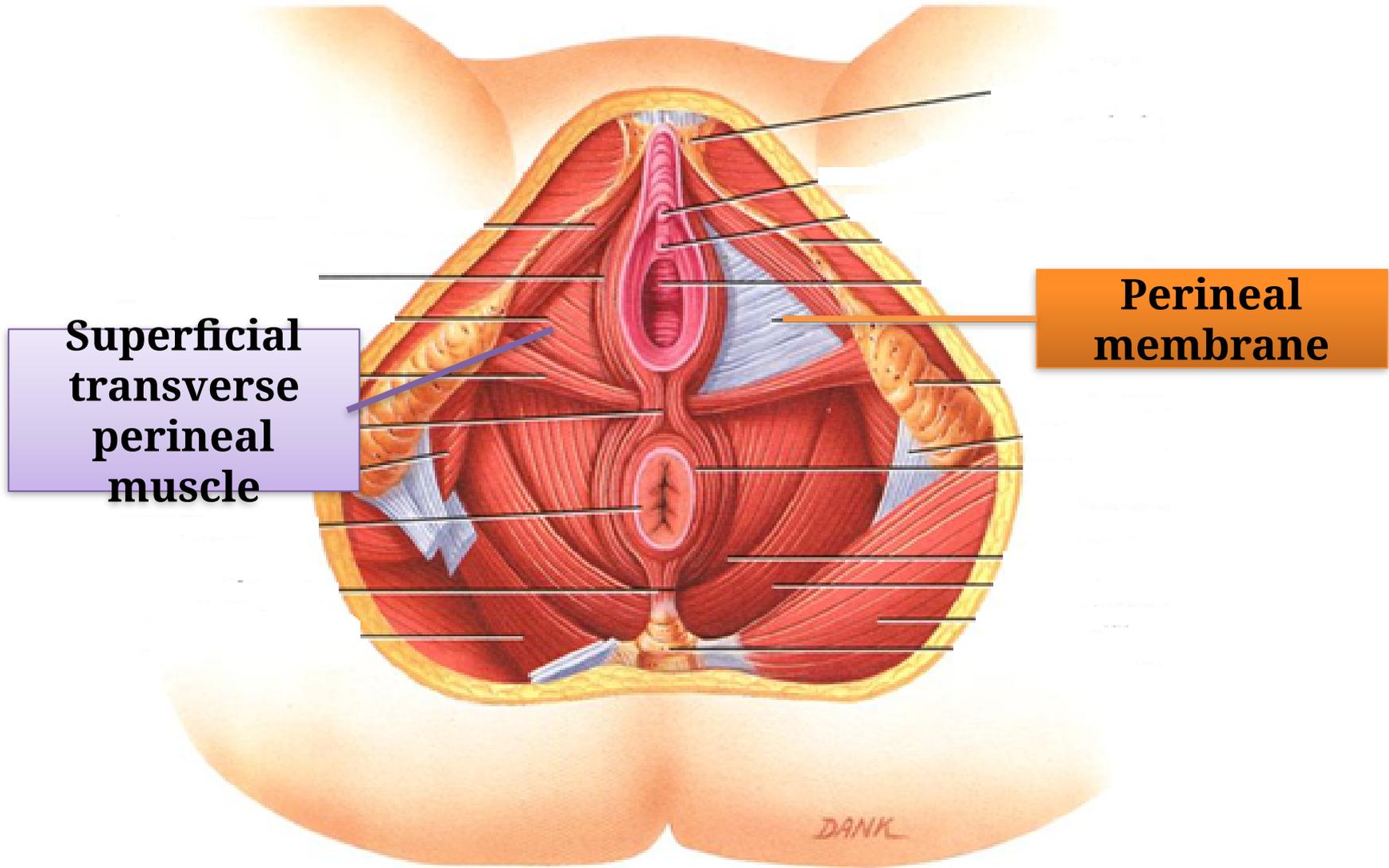
## Deep perineal pouch – Male



## Deep perineal pouch – Male

# Contents in Female

- a. Part of urethra.**
- b. Part of vagina.**
- c. Sphincter urethrae.**
- d. Deep transverse perineal muscles.**
- e. Internal pudendal artery.**
- f. Dorsal nerve of clitoris.**



**Superficial transverse perineal muscle**

**Perineal membrane**

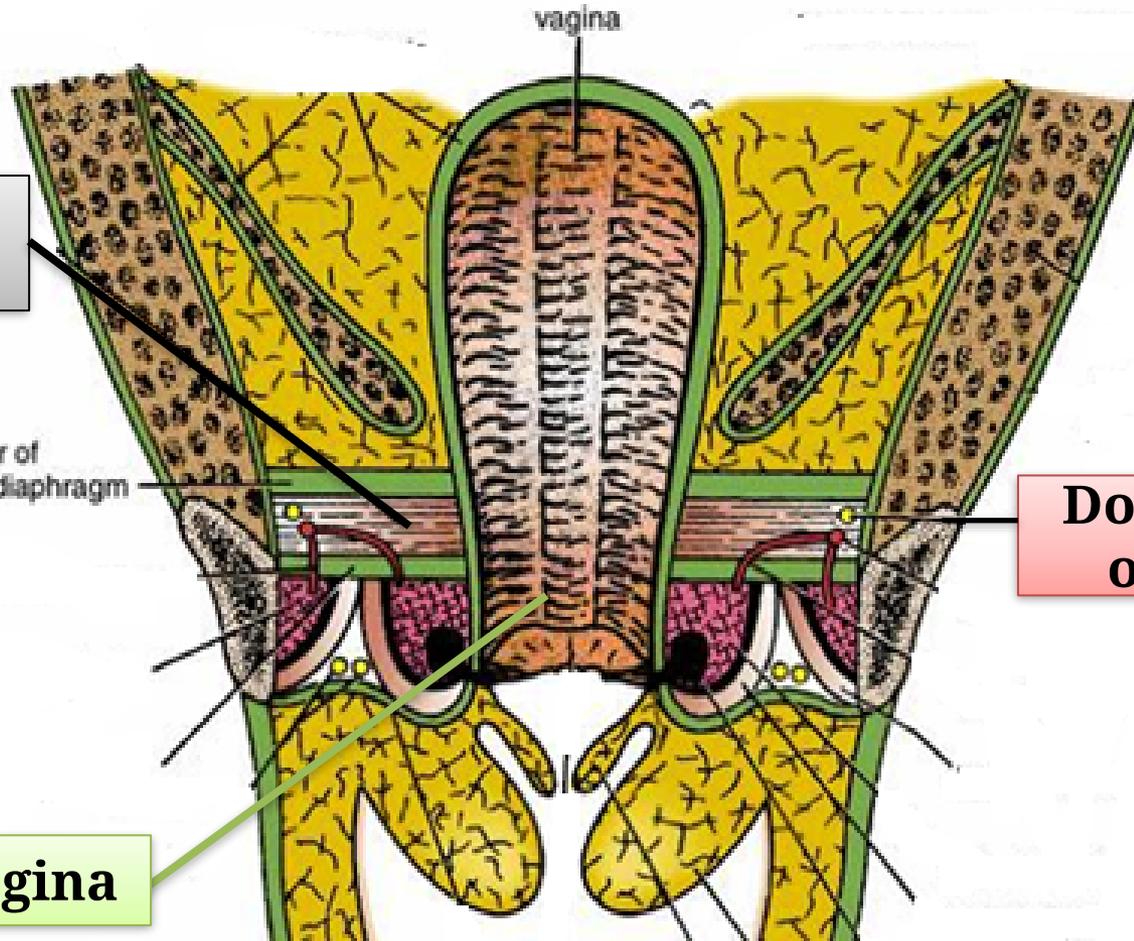
**Deep perineal pouch – Female**  
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**External urethral sphincter**

superior fascial layer of urogenital diaphragm

**Dorsal nerve of clitoris**

**Vagina**



**Deep perineal pouch – Female**

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