

Abdominal Wall & Pelvis

By Sarah Cullen

The Abdominal Wall

Surrounds the abdominal cavity

Bounded by:

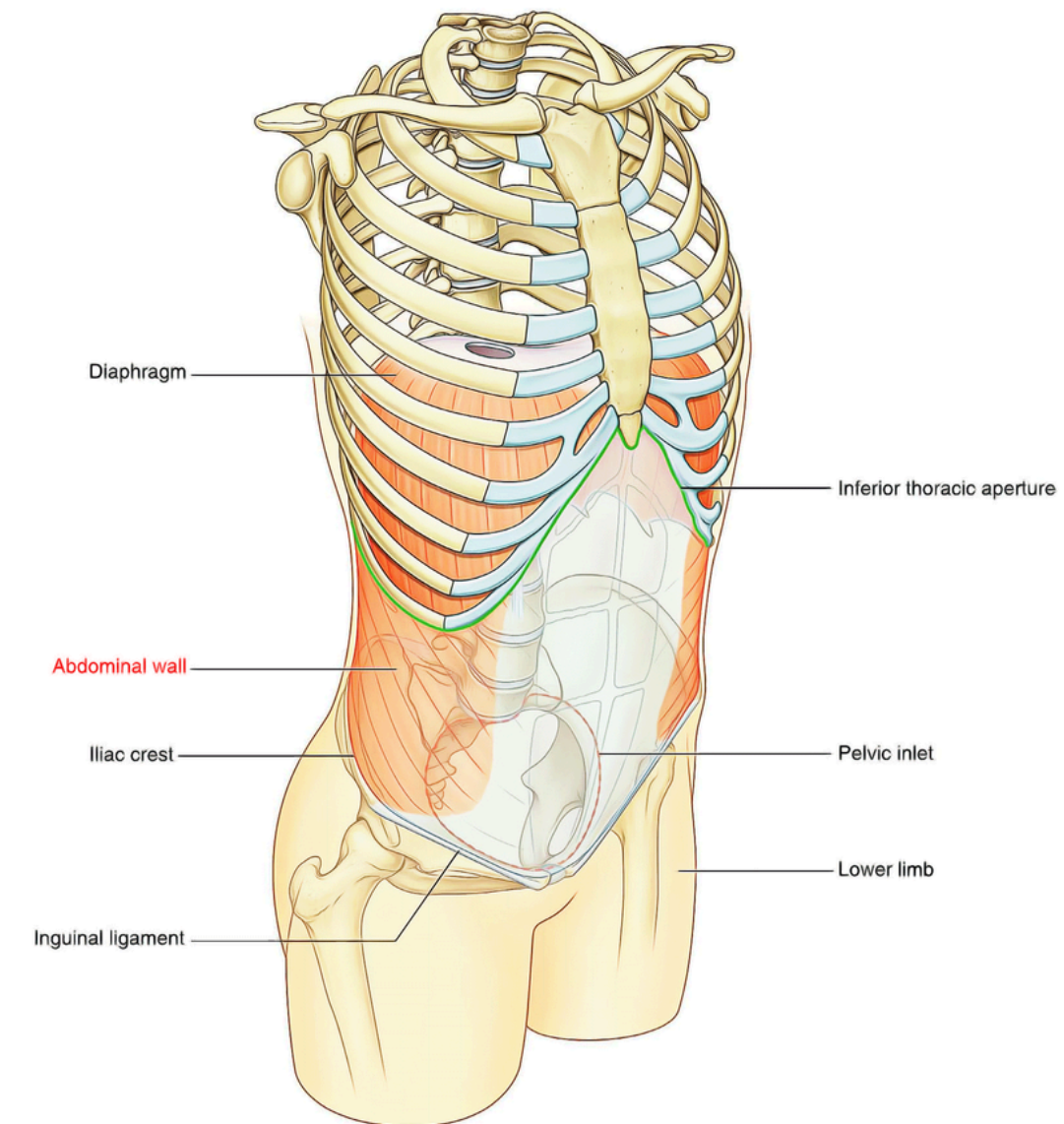
Superiorly: the xiphoid process and costal margins

Posteriorly: vertebral column

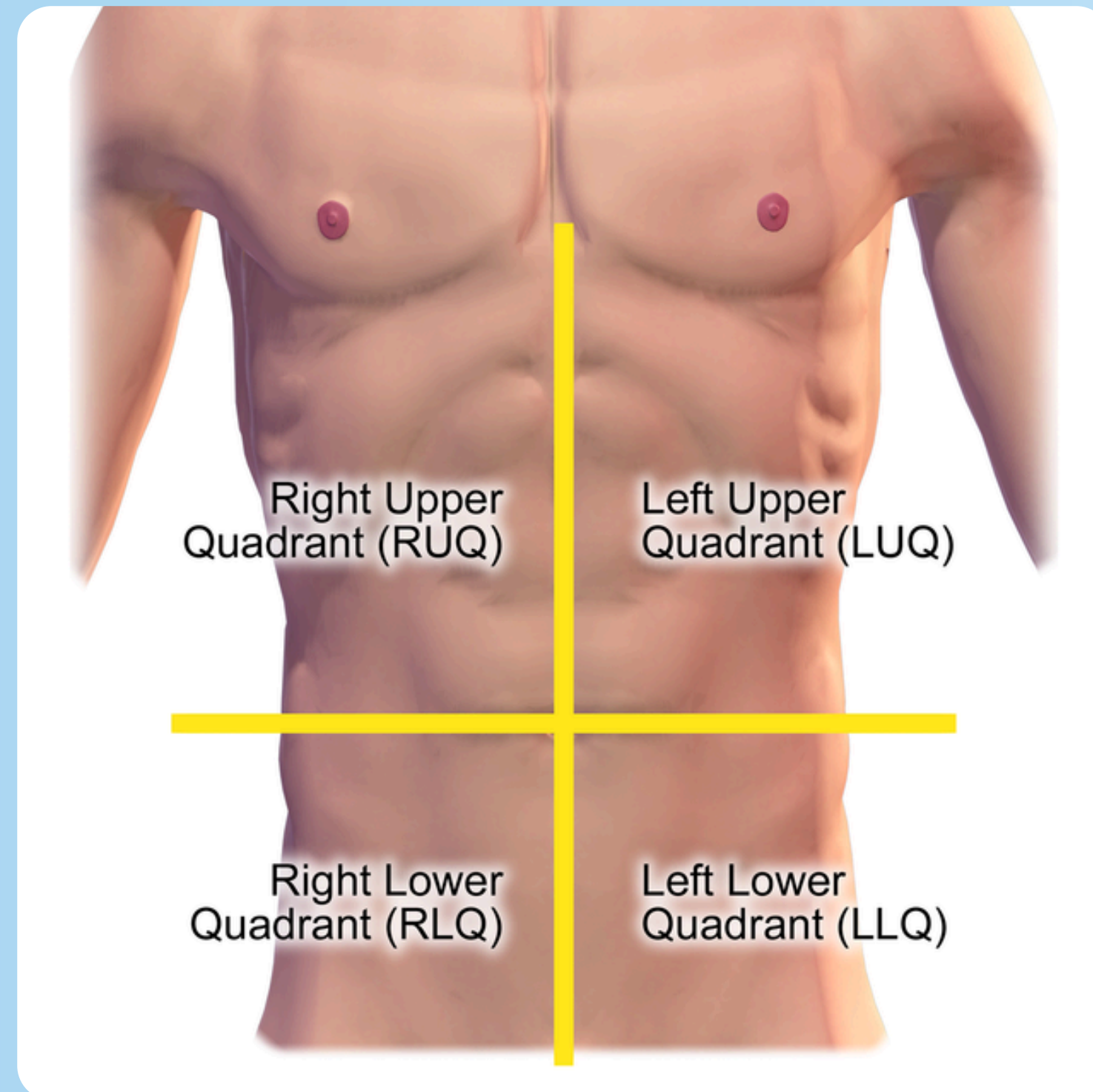
Inferiorly: pelvic bones and inguinal ligament

Function:

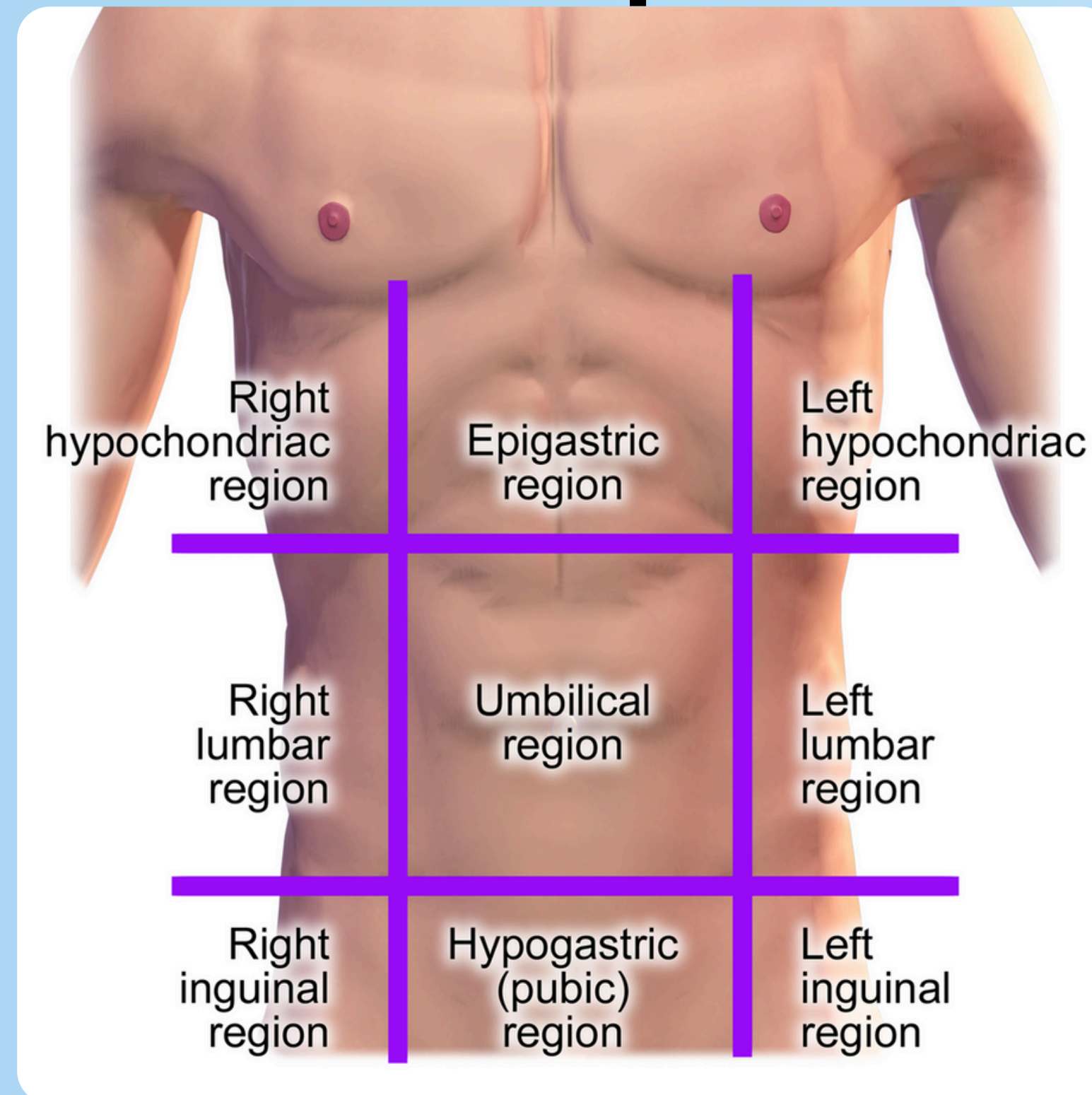
- Protection of internal abdominal organs
- Stabilization and rotation of the trunk
- increase of intra-abdominal pressure (involved in coughing, defecating, vomiting)



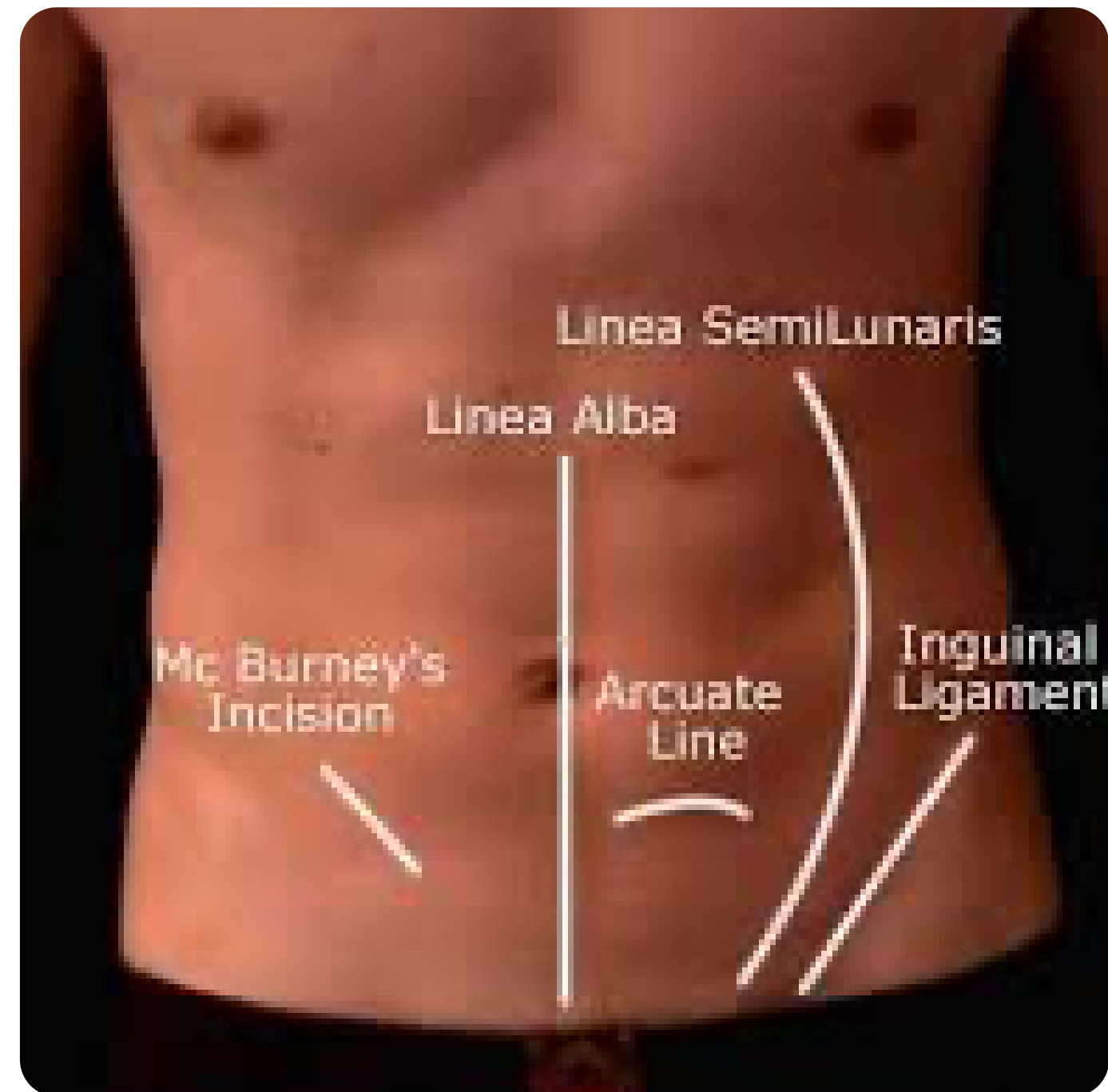
Regions of the Abdominal Wall Simple



Regions of the Abdominal Wall In depth



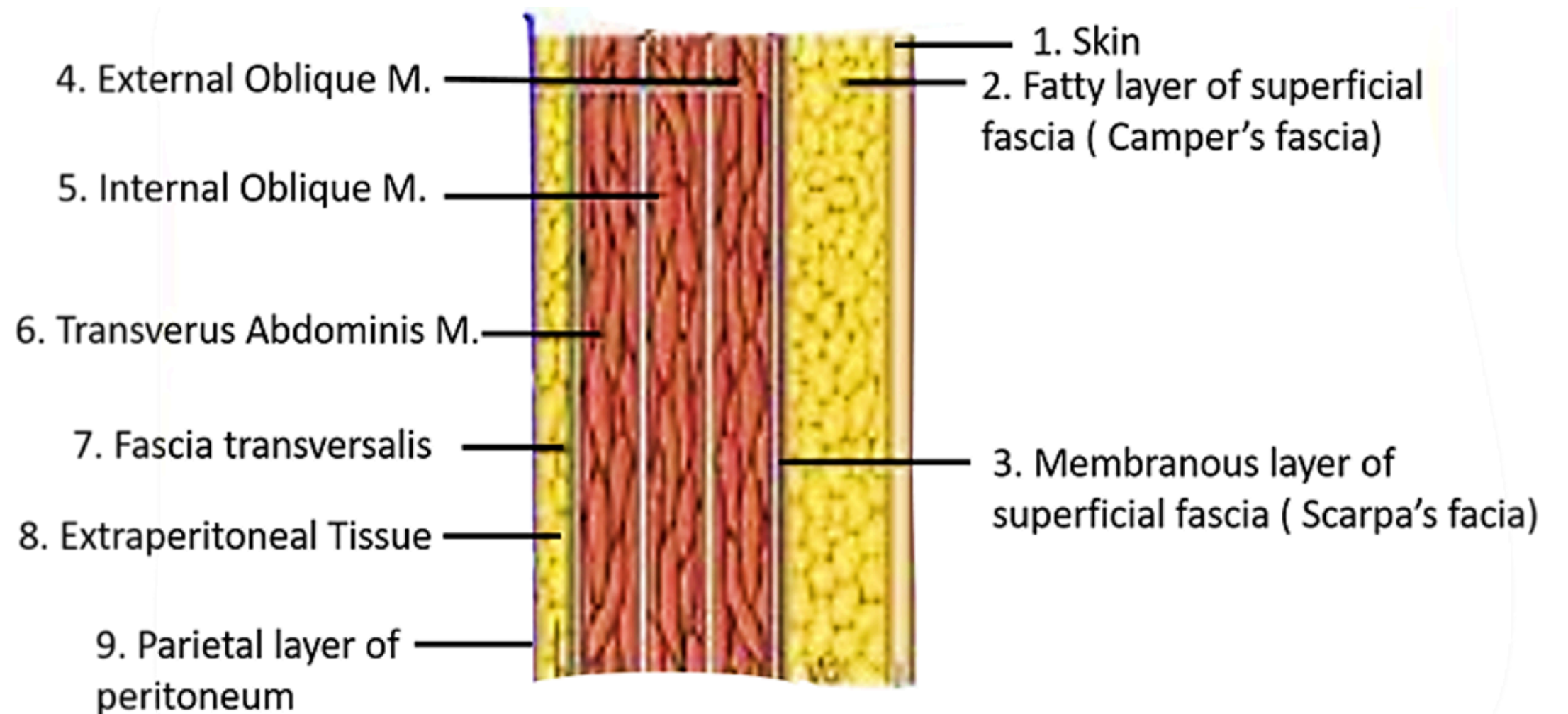
Stable Reference Points of the Abdominal Wall



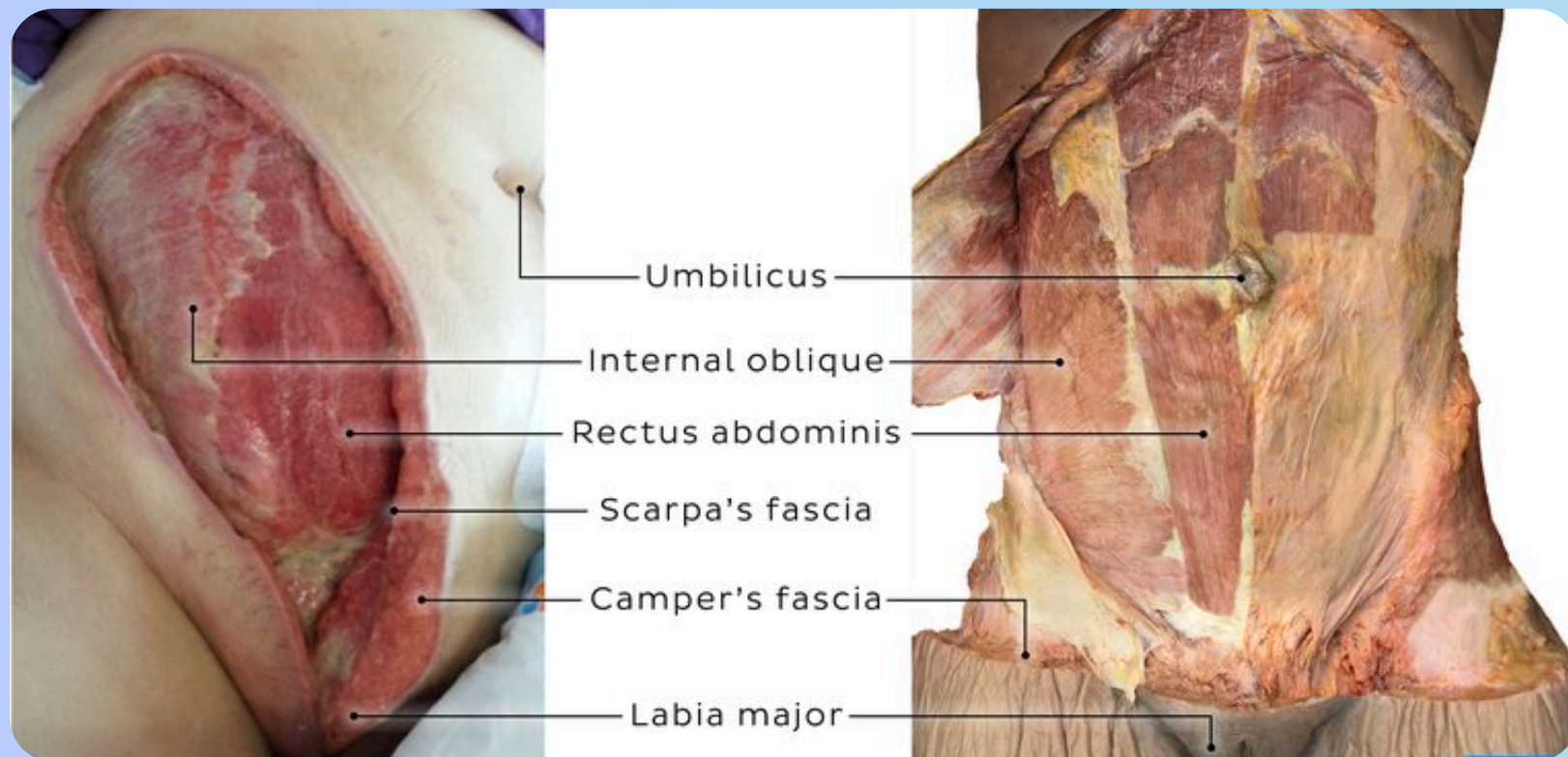
Layers of the Abdominal Wall

Superficial to Deep

1. Skin
2. Superficial Fascia
3. Muscles
4. Transversalis Fascia
5. Extraperitoneal Fat
6. Peritoneum



Anterior Abdominal Wall Superficial Fascia



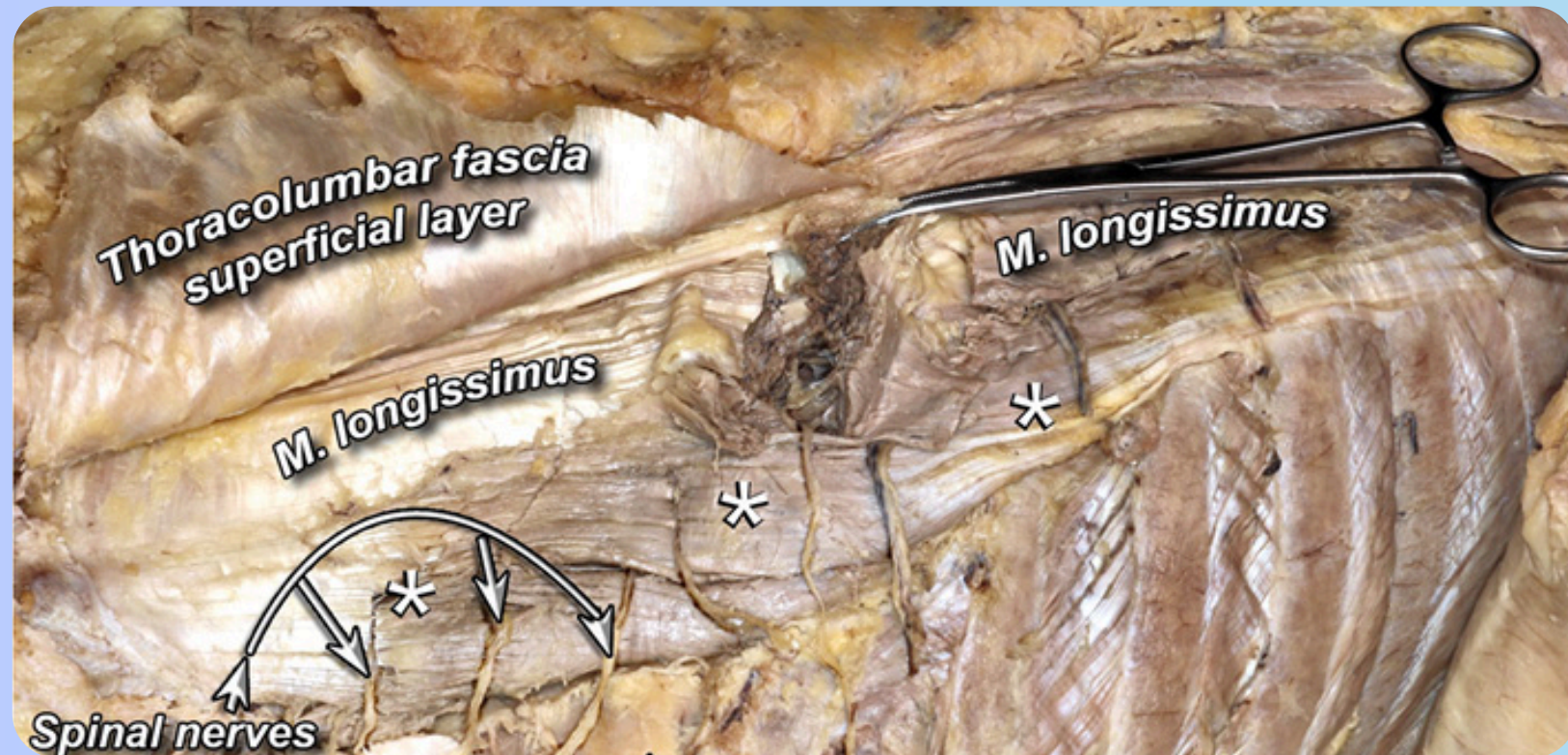
Composed of connective tissue

Located directly underneath the skin

Separated into superior and inferior aspect by the umbilicus

Superior aspect consists of only 1 part
Inferior aspect consists of 2 parts -
Camper's Fascia and Scarpa's Fascia

Posterior Abdominal Wall Thoracolumbar Fascia



Composed of connective tissue

Located directly underneath the skin, inferiorly, adjacent to the caudal lumbar spine, between the posterior superior iliac spines on either side

Diamond shape

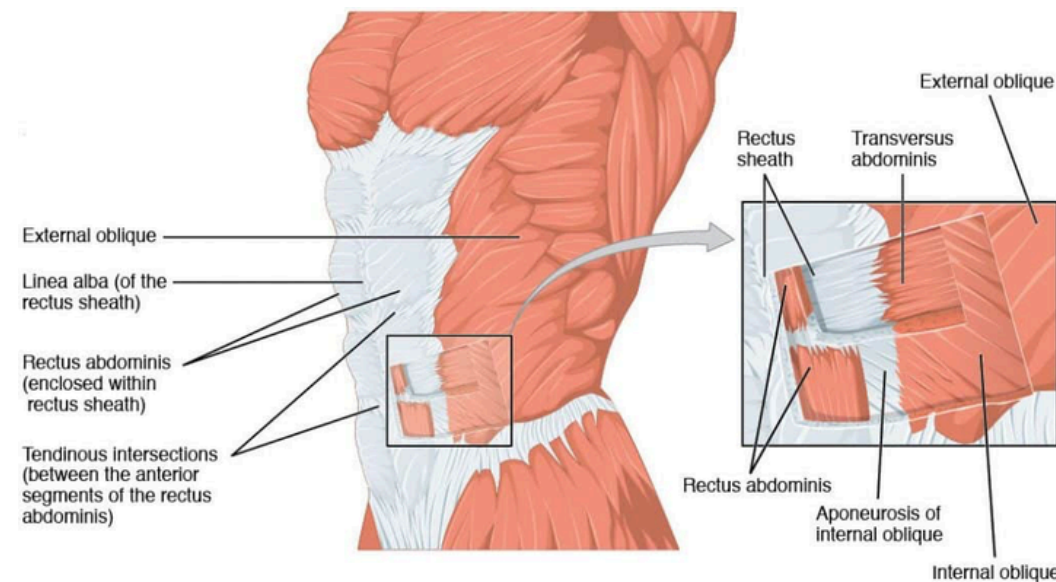
Divided into 3 layers - anterior, middle and posterior

Divisions of the Abdominal Wall

Divided into 2 parts:
1. Anterolateral Wall
2. Posterior Wall

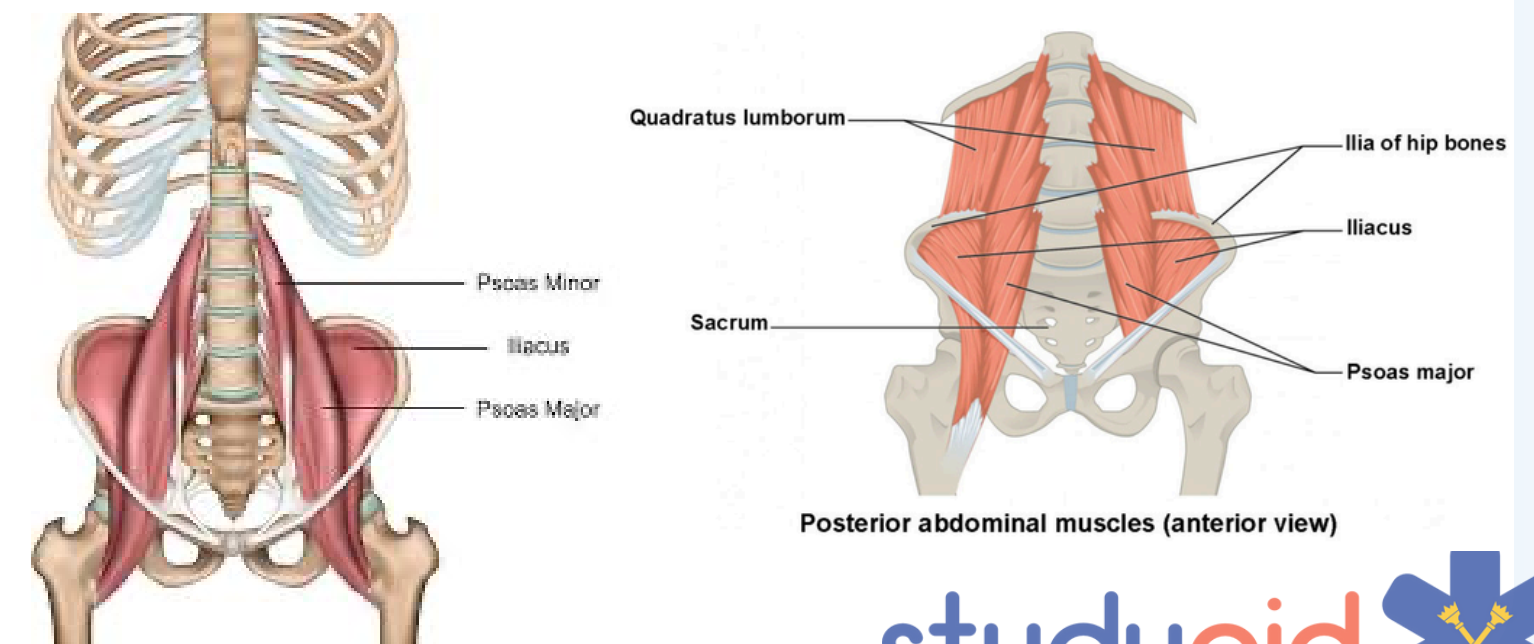
Anterolateral Wall

Transversus Abdominis Muscle
Internal Abdominal Oblique Muscle
Rectus Abdominis Muscle
External Oblique
Pyramidalis Muscle



Posterior Wall

Psoas Major Muscle
Iliacus Muscle
Quadratus Lumborum Muscle
Psoas Minor



Mnemonic!

Anterolateral Abdominal Wall Muscles

PIRATE

- P**yramidalis
- I**nternal Abdominal Oblique
- R**ectus Abdominis
- A**nd
- T**ransversus Abdominis
- E**xternal Abdominal Oblique



Muscles of the Abdominal Wall

Anterolateral

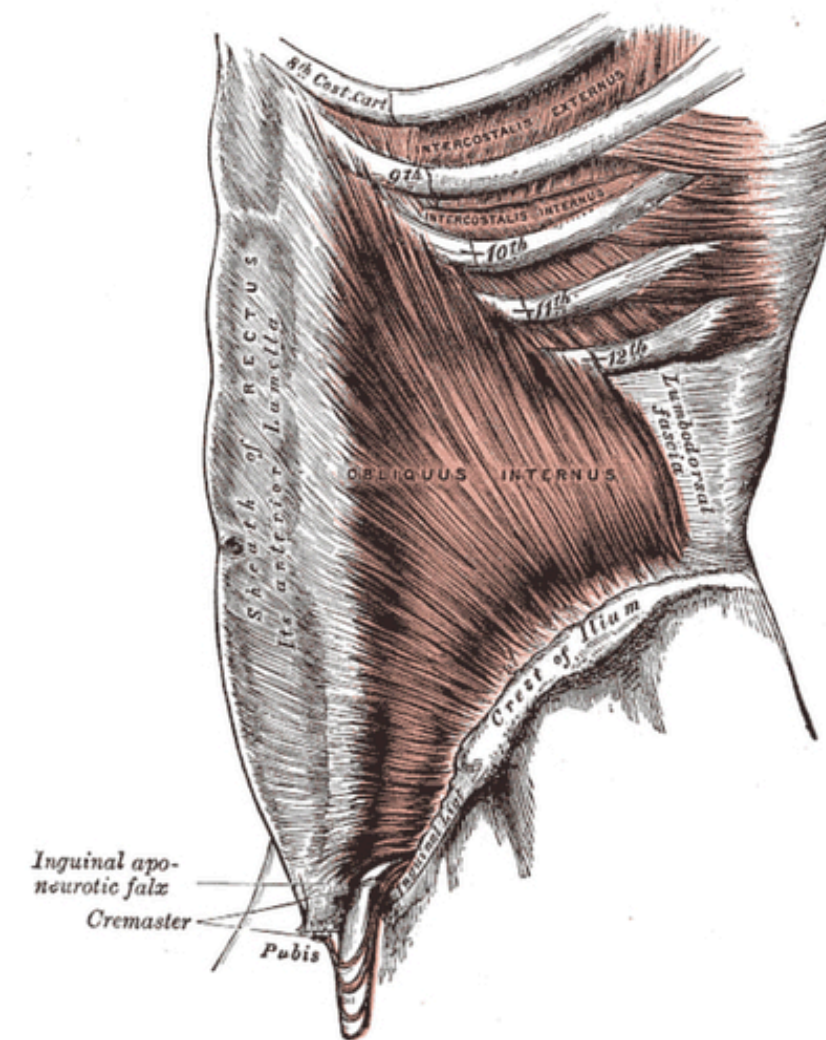
Lateral

External Abdominal
Oblique
Internal Abdominal
Oblique
Transversus Abdominis

Anterior

Rectus Abdominis
Pyramidalis

Anterior abdominal wall
Anterolateral view



External Abdominal Oblique Muscle

Origin - External surface of 5th to 12th ribs

Insertion - linea alba, pubic tubercle, anterior half of iliac crest

Innervation - lower intercostal nerves (T7 - T11), subcostal nerve (T12), iliohypogastric nerve (L1)

Function -

- bilateral contraction - trunk flexion, compresses abdominal viscera, expiration
- unilateral contraction - trunk lateral flexion (ipsilateral), trunk rotation (contralateral)



Internal Abdominal Oblique Muscle

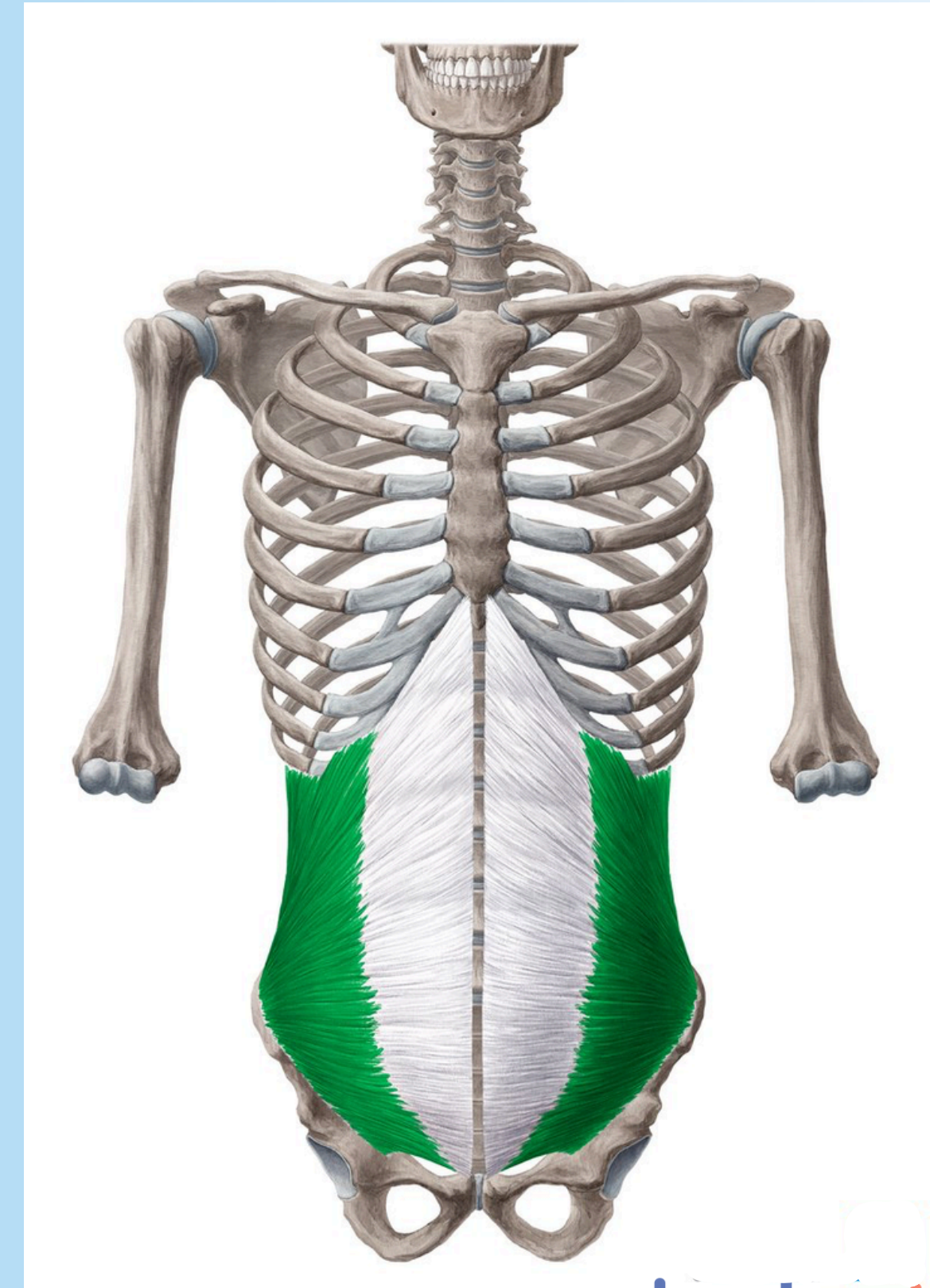
Origin - thoracolumbar fascia, anterior iliac crest, iliopectineal arch

Insertion - inferior borders of 10th - 12th ribs, linea alba, junction with cremaster muscle, pectineal line of pubis

Innervation - lower intercostal nerves (T7 - T11), subcostal nerve (T12), iliohypogastric nerve (L1), ilioinguinal nerve (L1)

Function -

- bilateral contraction - trunk flexion, compresses abdominal viscera, expiration (same as external)
- unilateral contraction - trunk lateral flexion (ipsilateral), trunk rotation (ipsilateral)



Transversus Abdominis Muscle

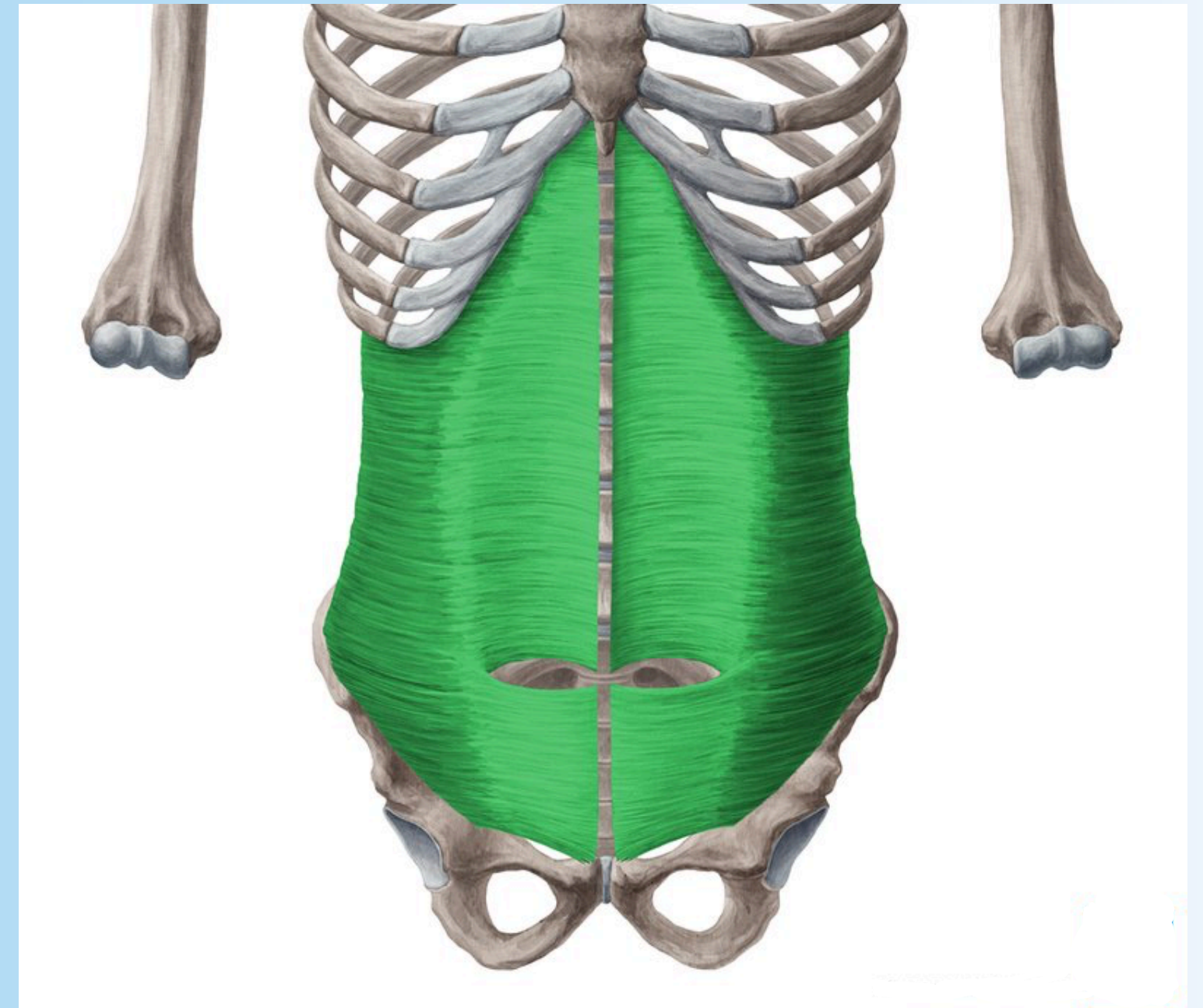
Origin - costal cartilage of 7th - 12th ribs, thoracolumbar fascia, anterior iliac crest, iliopectineal arch

Insertion - linea alba, aponeurosis of internal abdominal oblique muscle, pubic crest, pectineal line of pubis

Innervation - lower intercostal nerves (T7 - T11), subcostal nerve (T12), iliohypogastric nerve (L1), ilioinguinal nerve (L1)

Function -

- bilateral contraction - compresses abdominal viscera, expiration (same as external + internal)
- unilateral contraction - trunk rotation (ipsilateral)



Rectus Abdominis Muscle

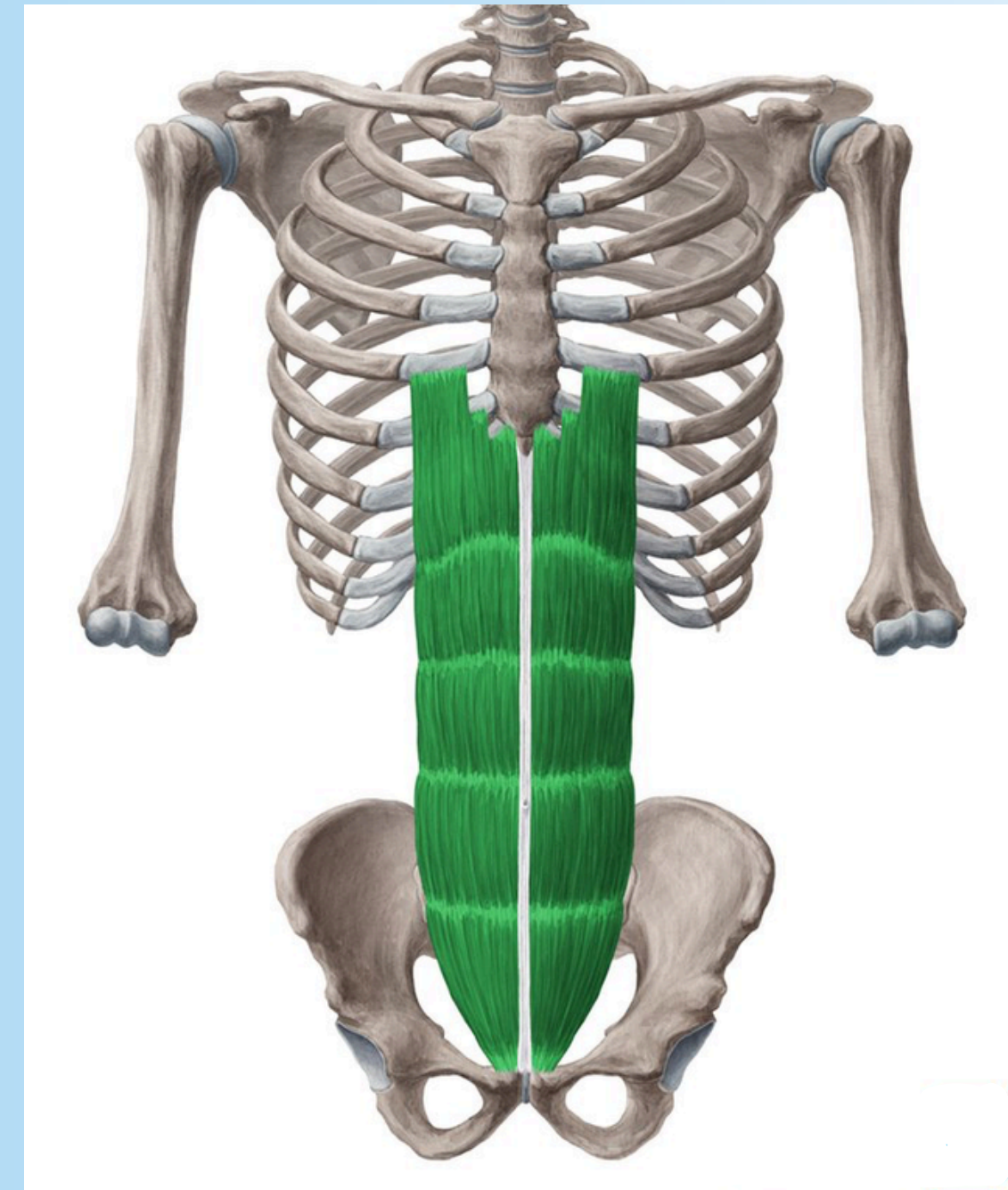
Origin - pubic symphysis, pubic crest

Insertion - xiphoid process, costal cartilages of 5th - 7th ribs

Innervation - intercostal nerves (T7 - T11), subcostal nerve (T12)

Function -

- trunk flexion, compresses abdominal viscera, expiration



Pyramidalis Muscle

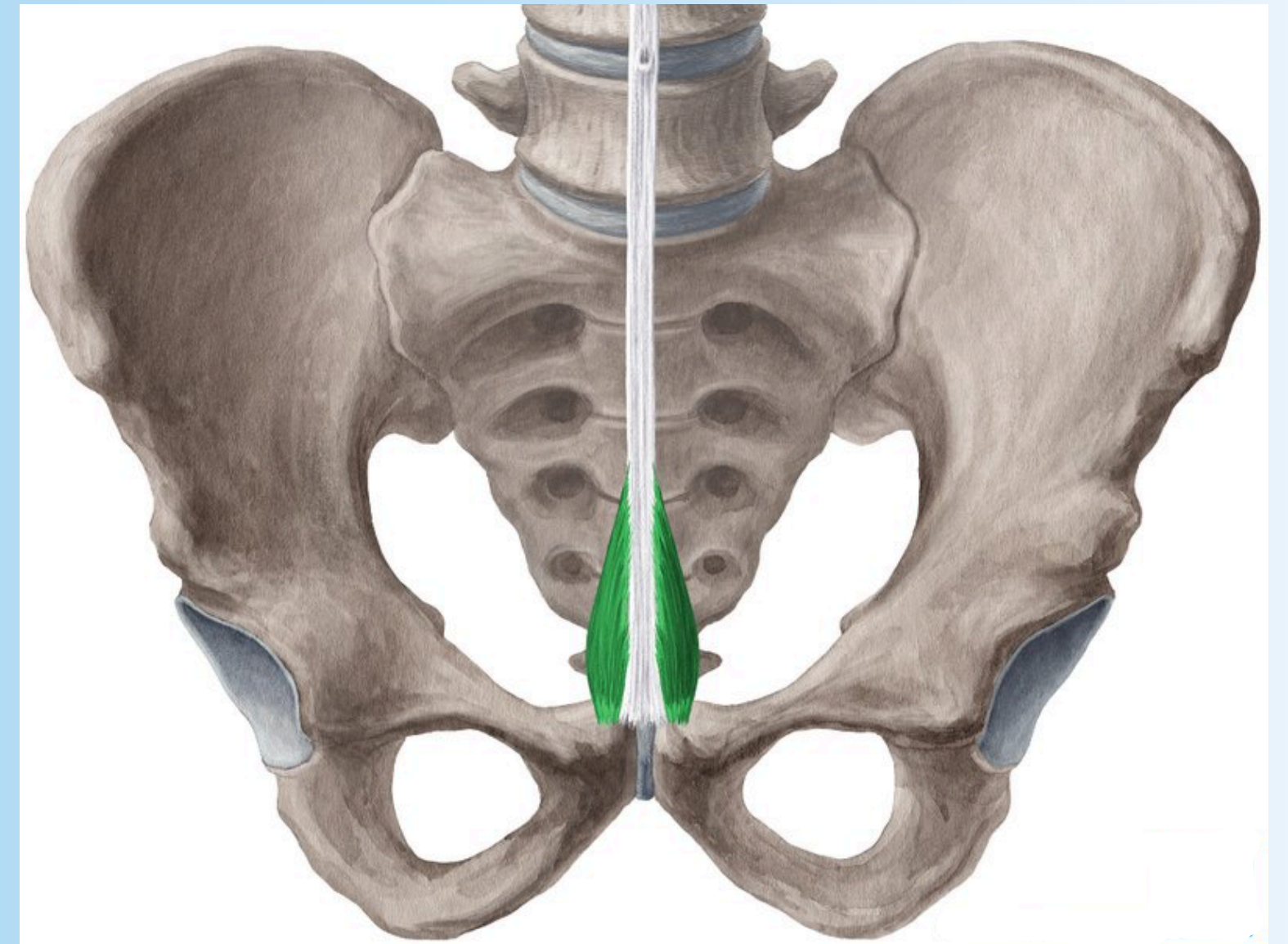
Origin - pubic symphysis, pubic crest

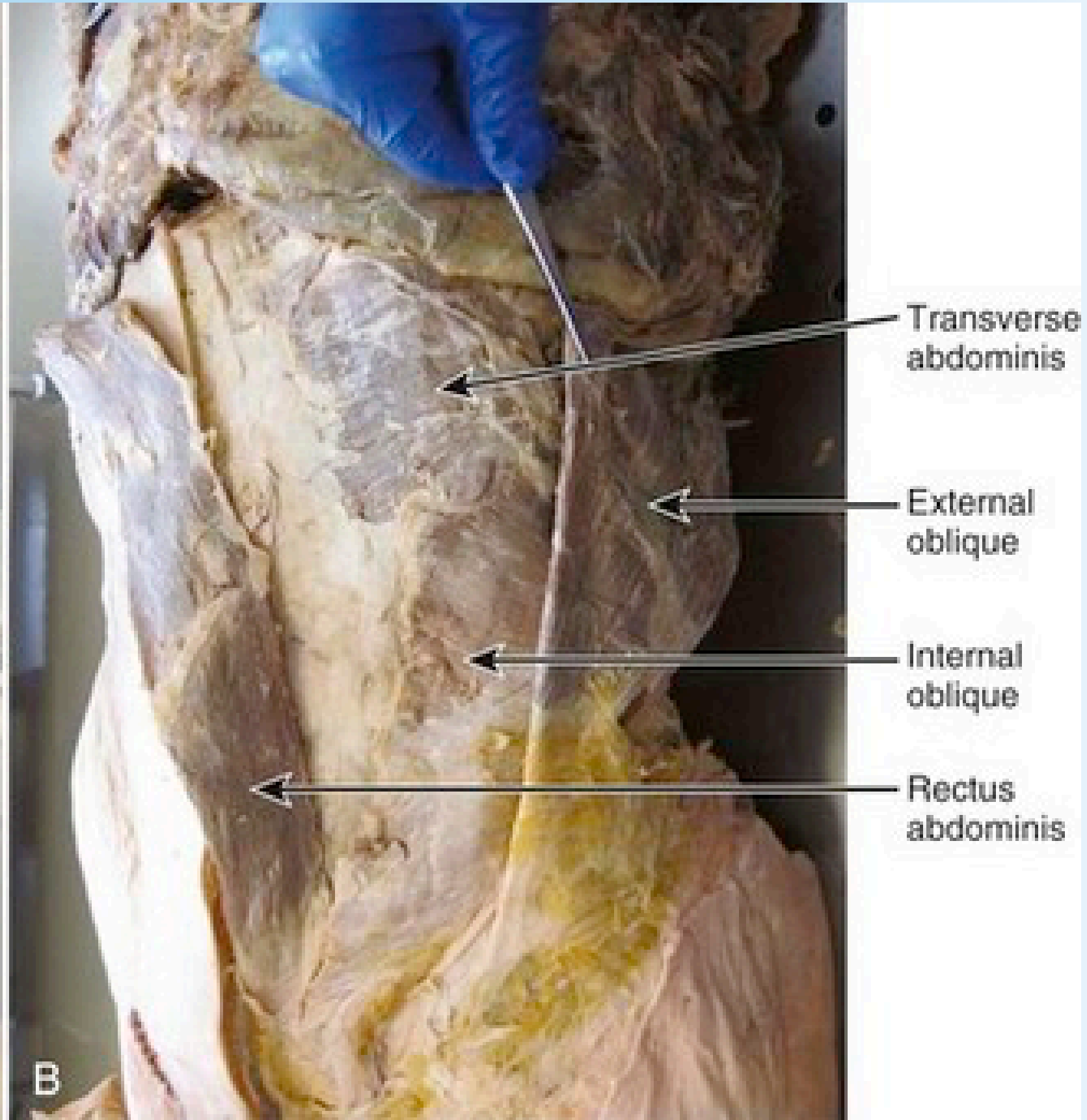
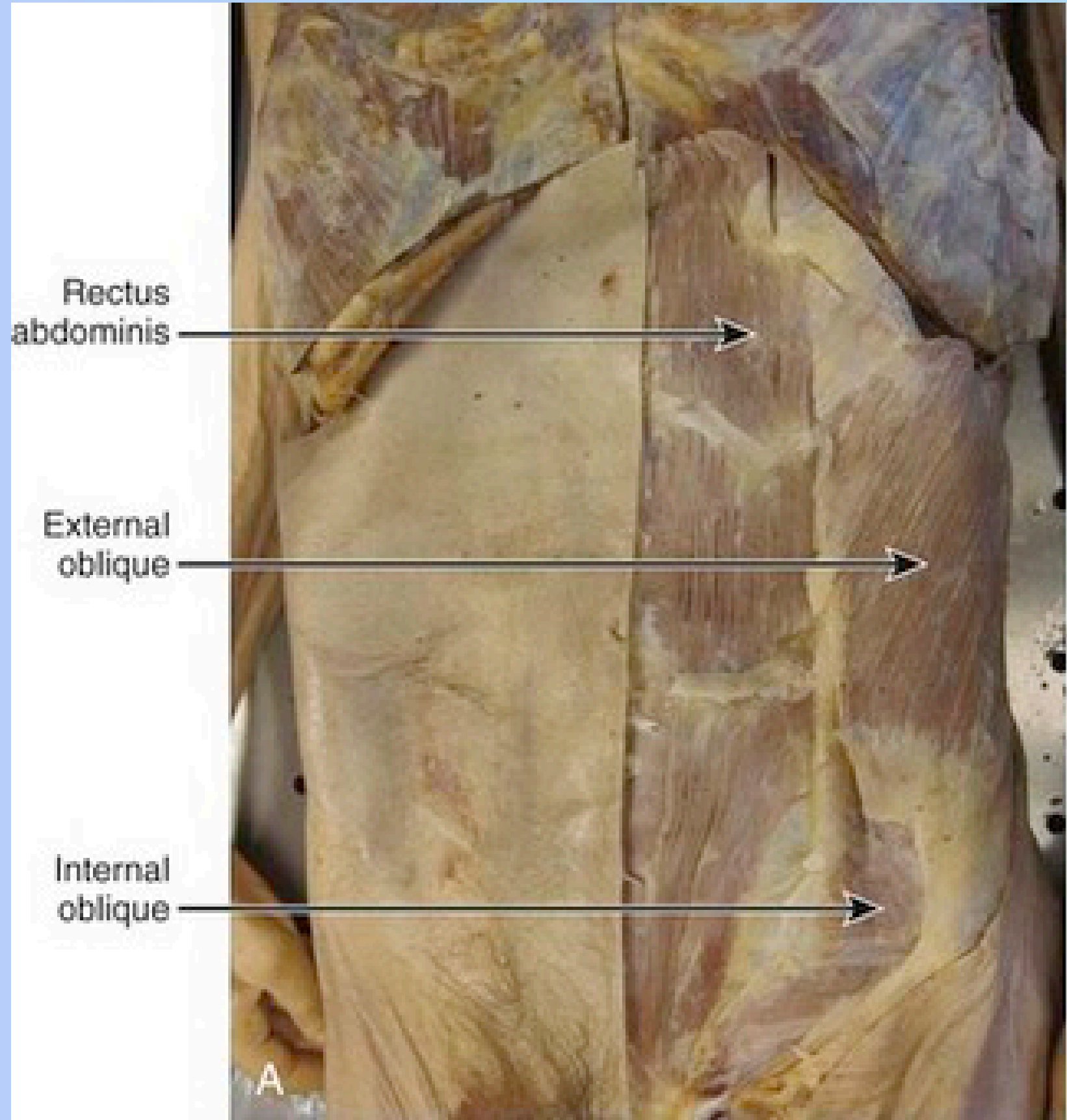
Insertion - linea alba

Innervation - subcostal nerve (T12)

Function -

- tenses linea alba





Psoas Major Muscle

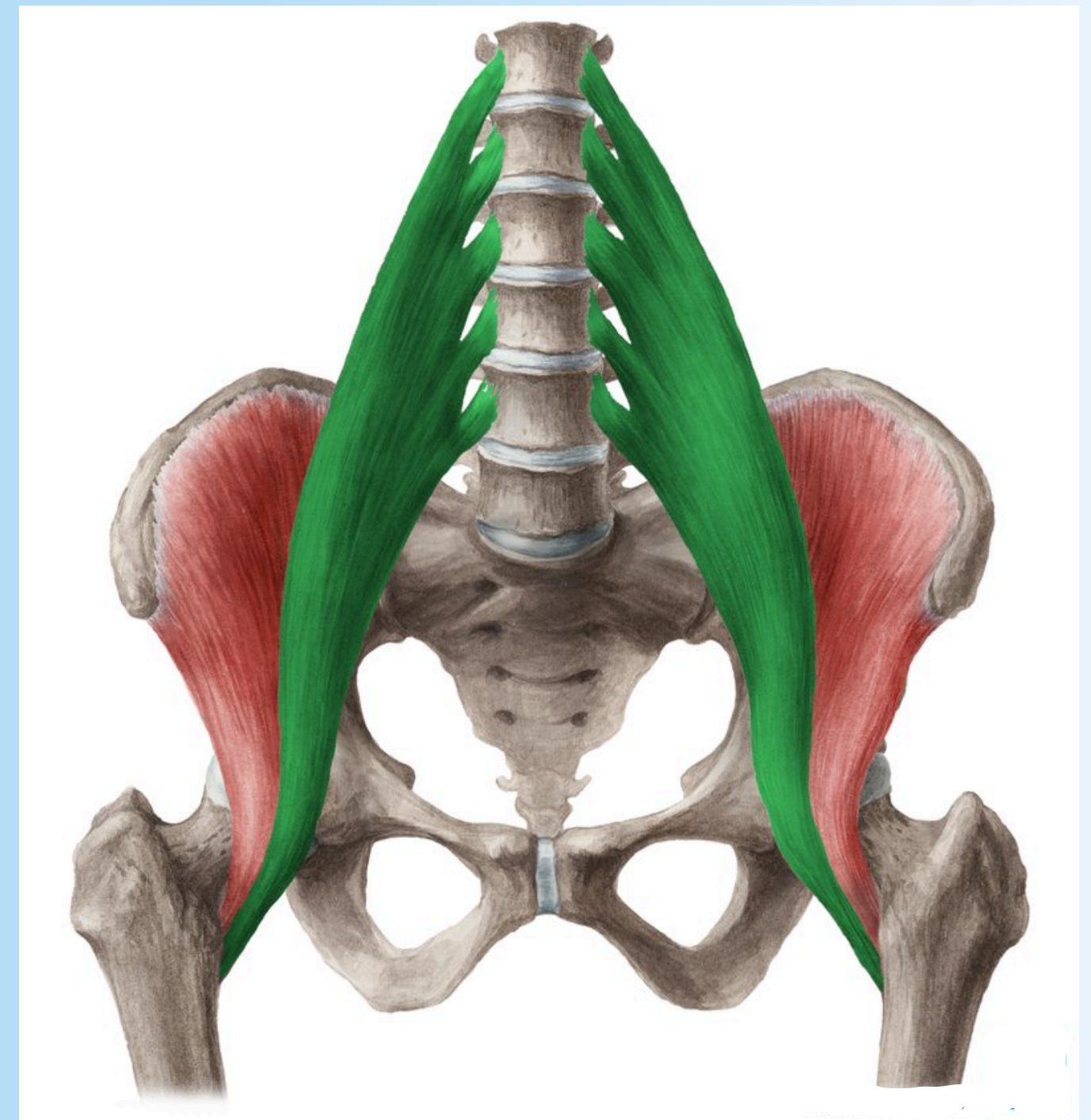
Origin - vertebral bodies T12 - L4, intervertebral discs T12 - L4, transverse processes of L1-L5 vertebrae

Insertion - lesser trochanter of femur

Innervation - anterior rami of spinal nerves L1-L3

Function -

- hip joint - thigh / trunk flexion
- thigh - external rotation
- trunk - lateral flexion



Psoas Minor Muscle

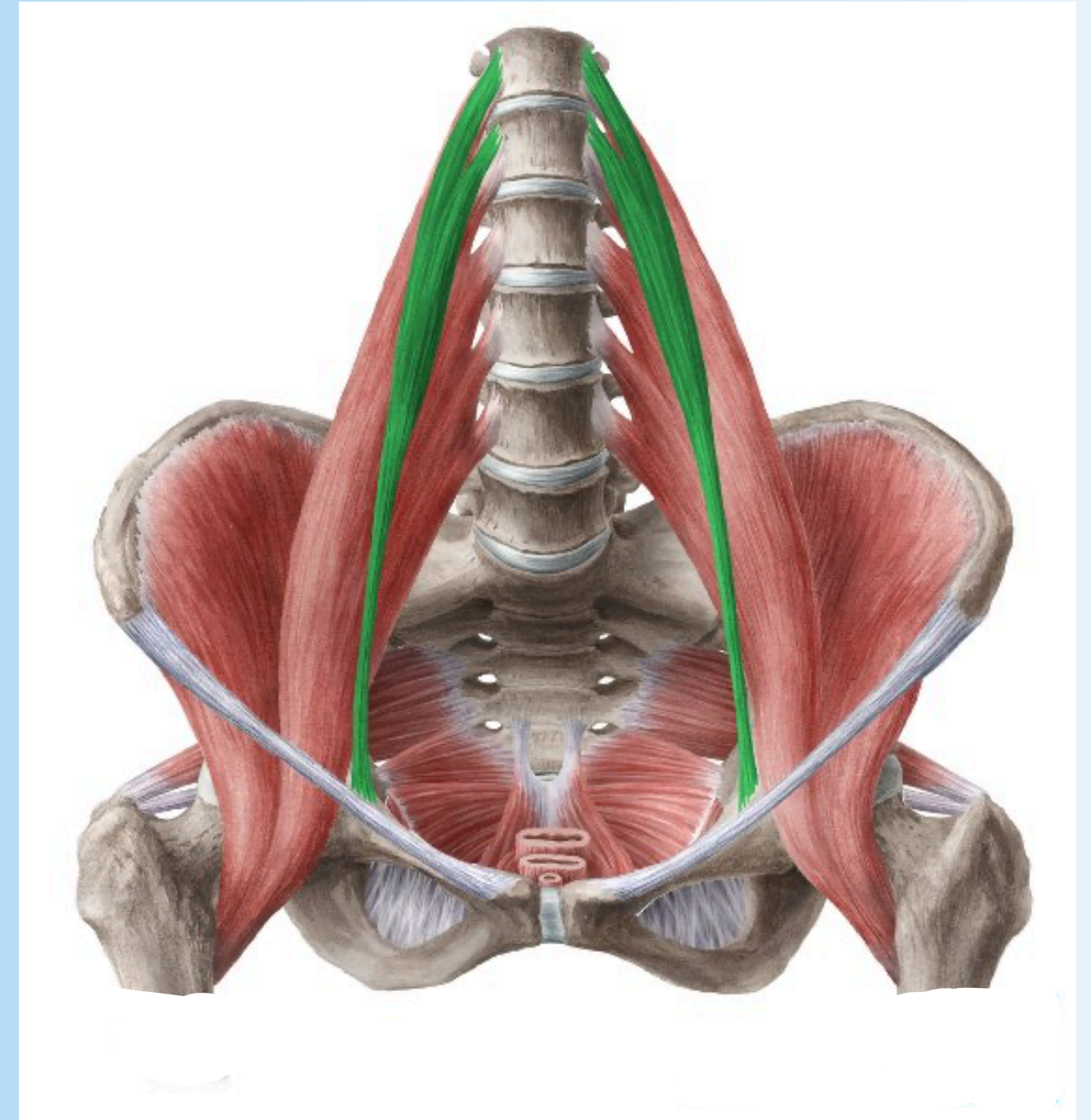
Origin - vertebral bodies T12 - L1

Insertion - iliopubic eminence, pectineal line of pubis

Innervation - anterior rami of spinal nerves L1-L3

Function -

- hip joint - thigh / trunk flexion
- thigh - external rotation
- trunk - lateral flexion



Iliacus Muscle

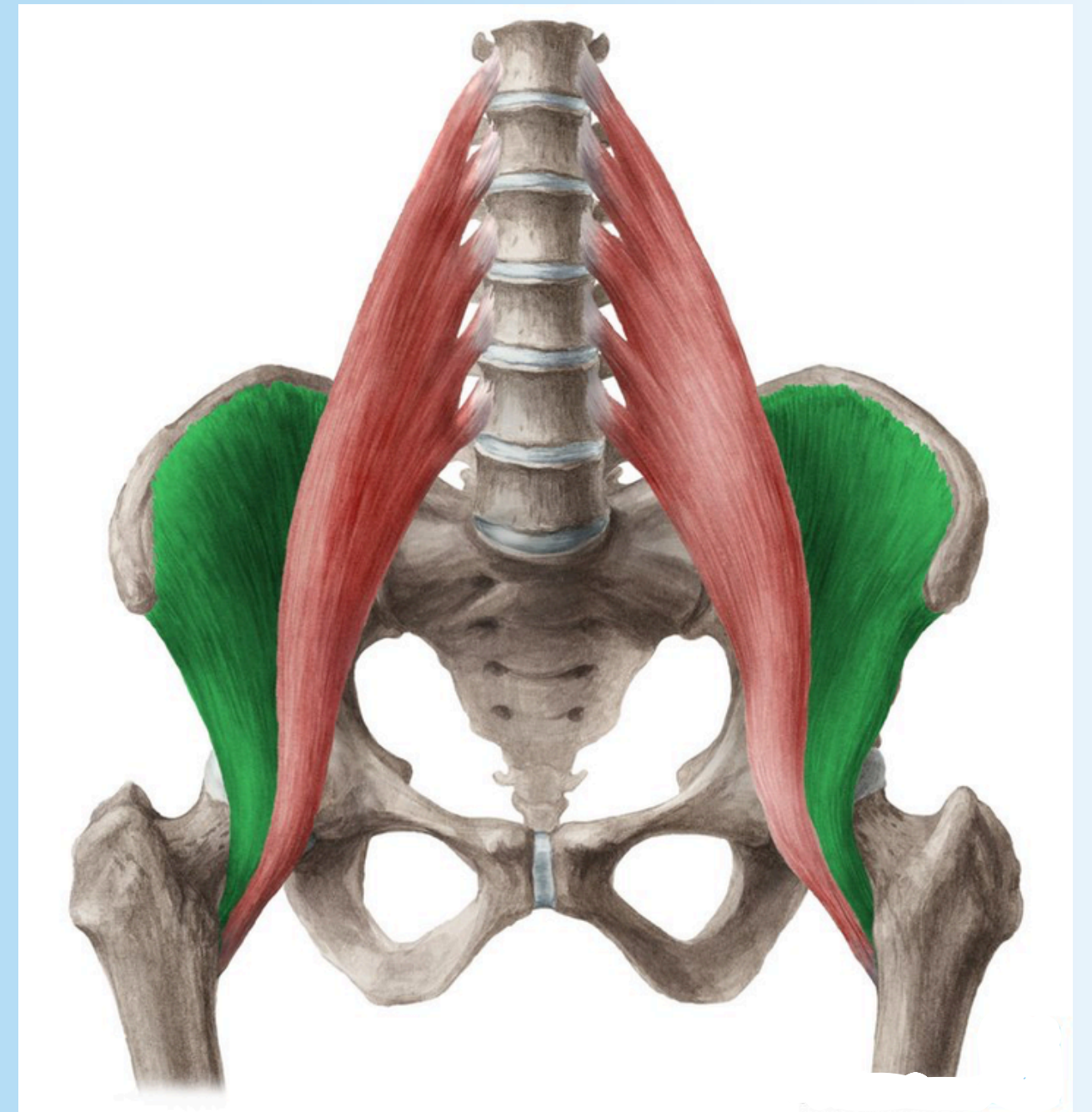
Origin - iliac fossa

Insertion - lesser trochanter of femur

Innervation - femoral nerve (L2-L4)

Function -

- hip joint - thigh / trunk flexion
- thigh - external rotation
- trunk - lateral flexion



Quadratus Lumborum Muscle

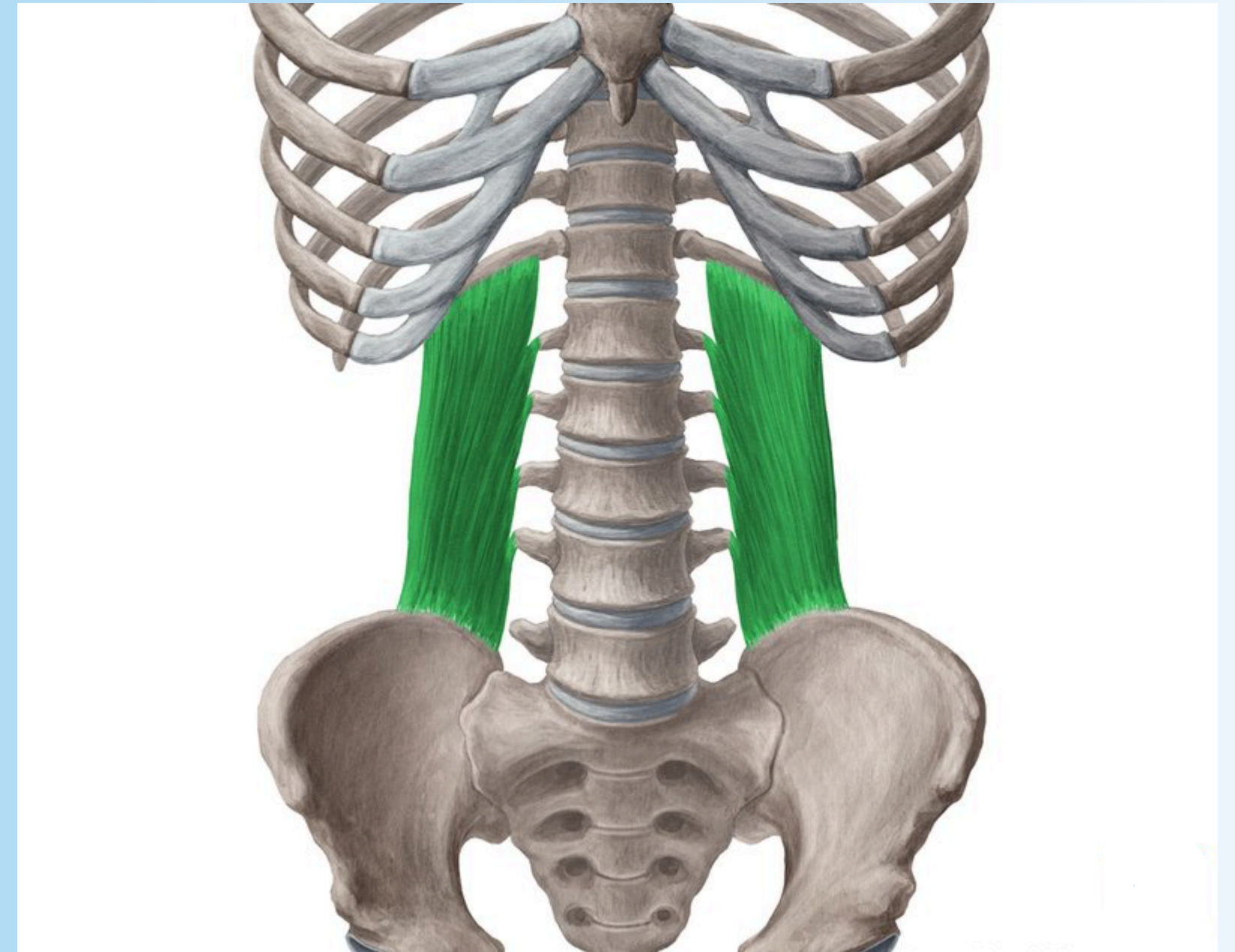
Origin - iliac crest, iliolumbar ligament

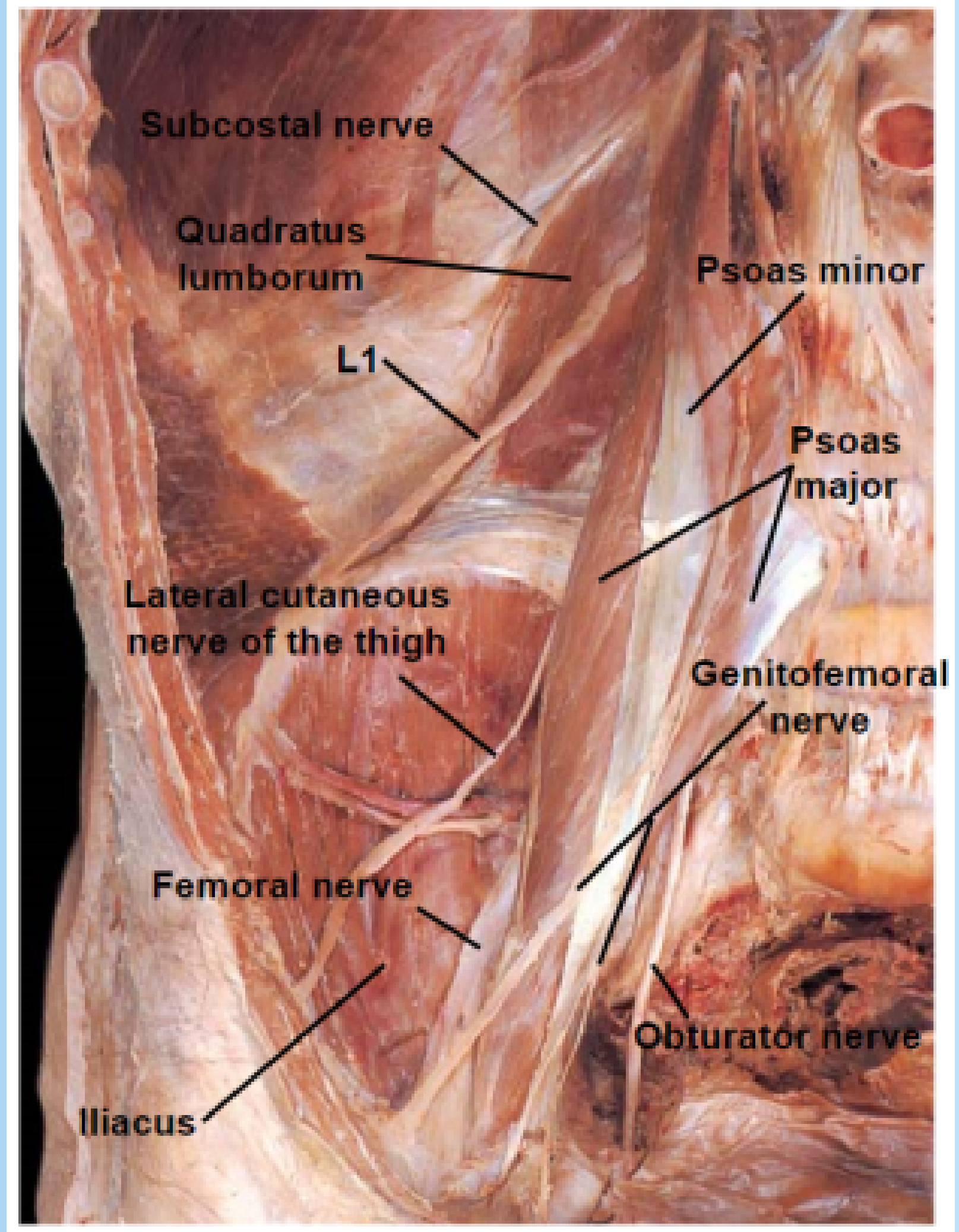
Insertion - inferior border of 12th rib, transverse process of L1-L4 vertebrae

Innervation - subcostal nerve (T12), anterior rami of spinal nerves L1-L4

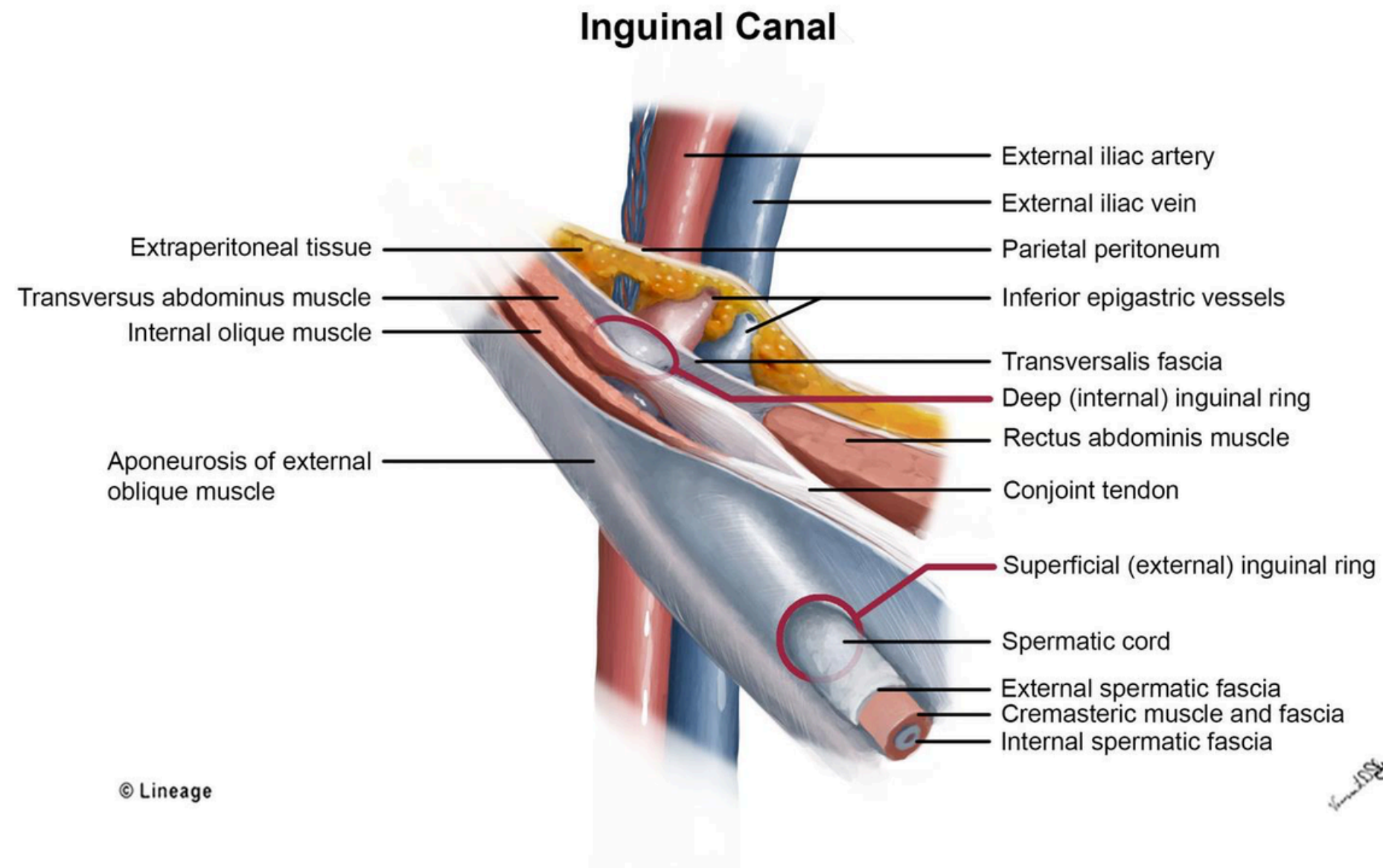
Function -

- bilateral contraction - fixes 12th rib during inspiration, trunk extension
- unilateral contraction - lateral flexion of trunk (ipsilateral)

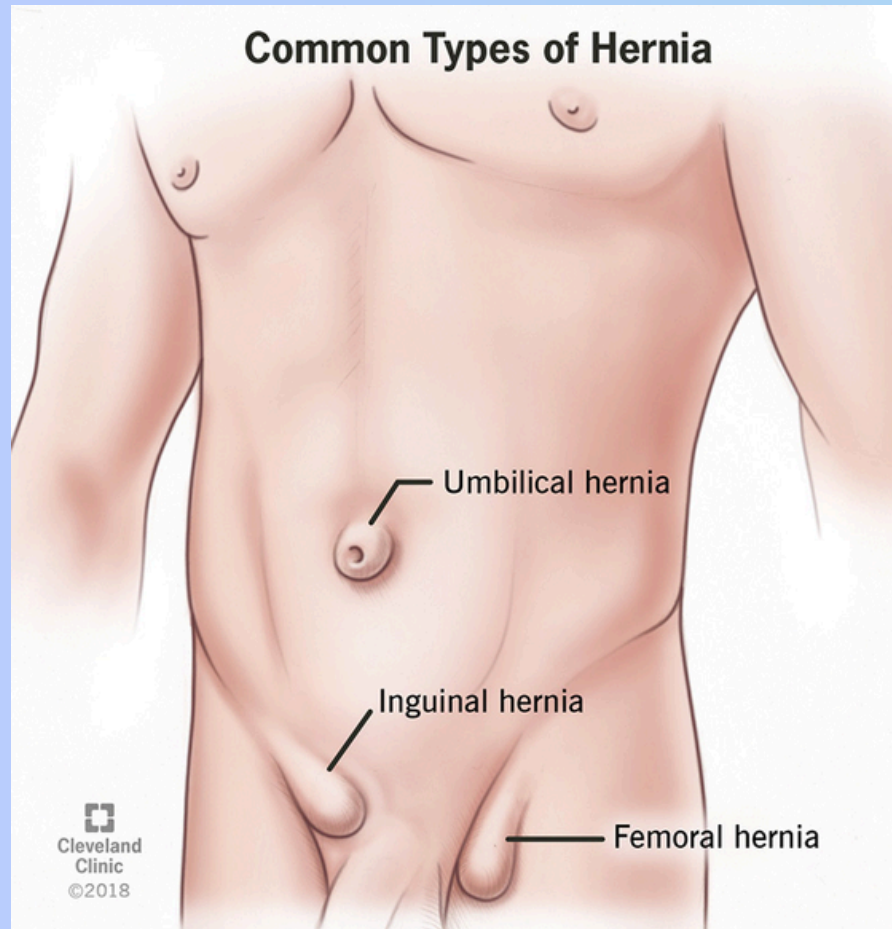




Inguinal Canal



Pathology - Hernia

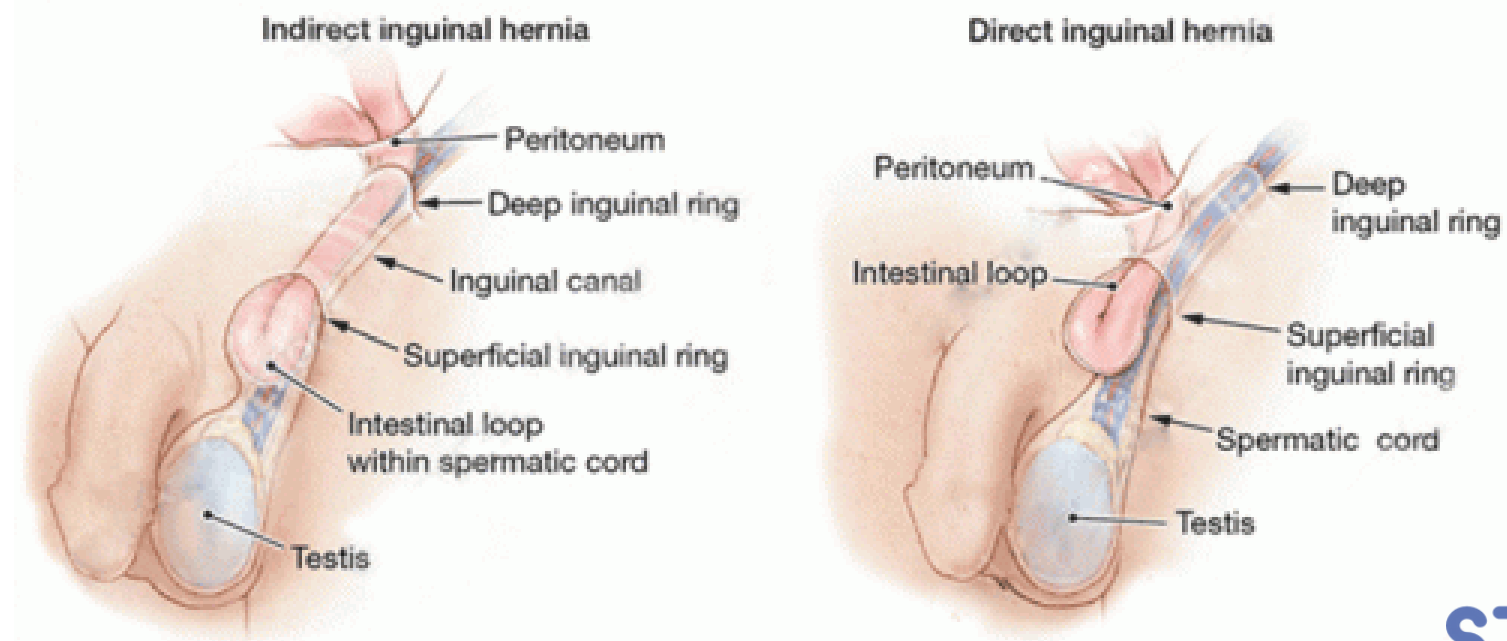


Caused as a result of a gap in the muscular wall that allows the contents inside the abdomen to protrude outward

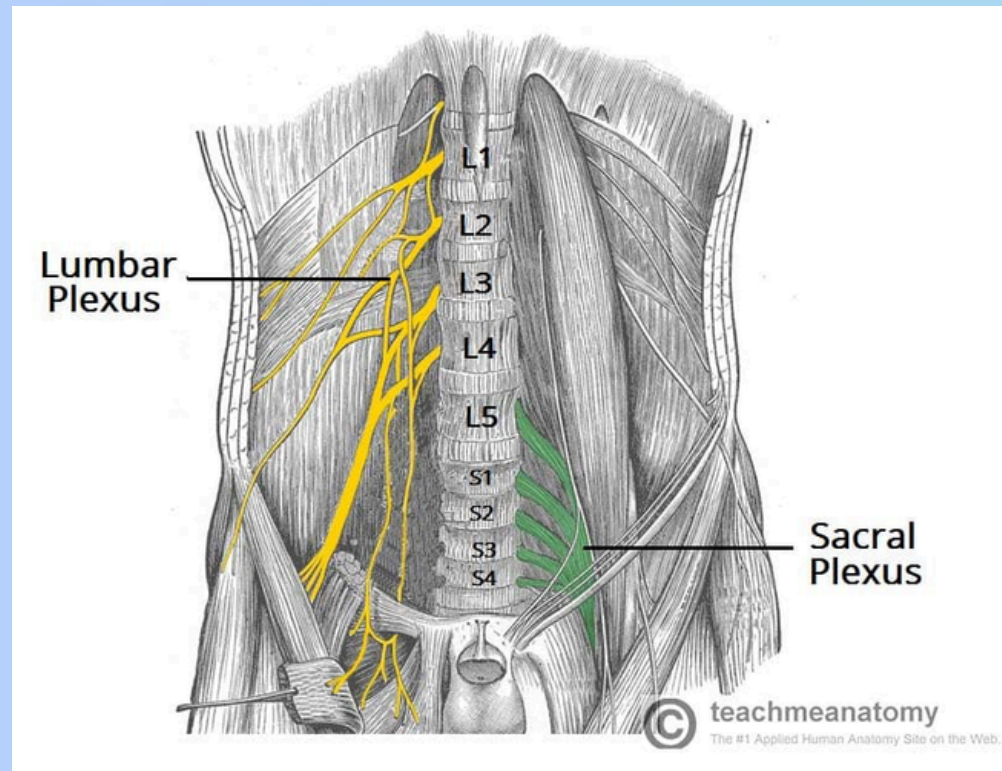
Weak points of the abdominal wall include:
Umbilicus and Inguinal Ring



A direct inguinal hernia penetrates directly through the wall of your inguinal canal, whereas an indirect inguinal hernia occurs when abdominal contents protrude through the internal inguinal ring and into the inguinal canal

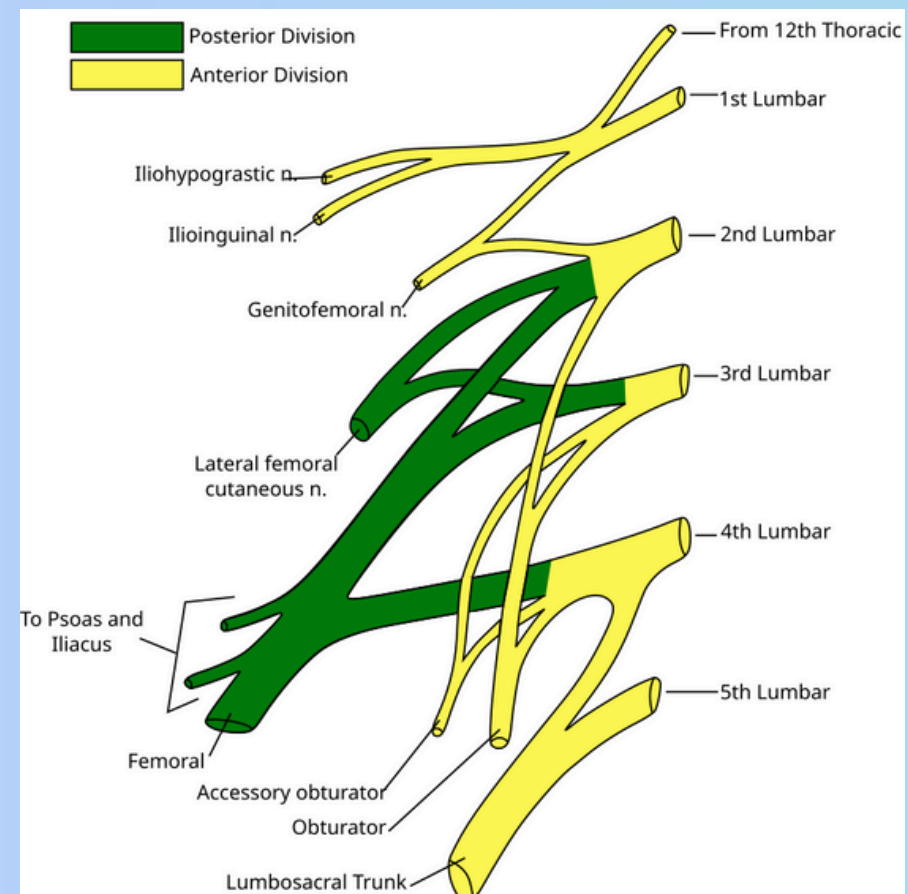


Lumbar Plexus



Located on the posterior abdominal wall, anterior to the transverse processes of lumbar vertebrae and within the posterior portion of the psoas major muscle

Formed by divisions of the L1-L4 spinal nerves with a contribution from T12



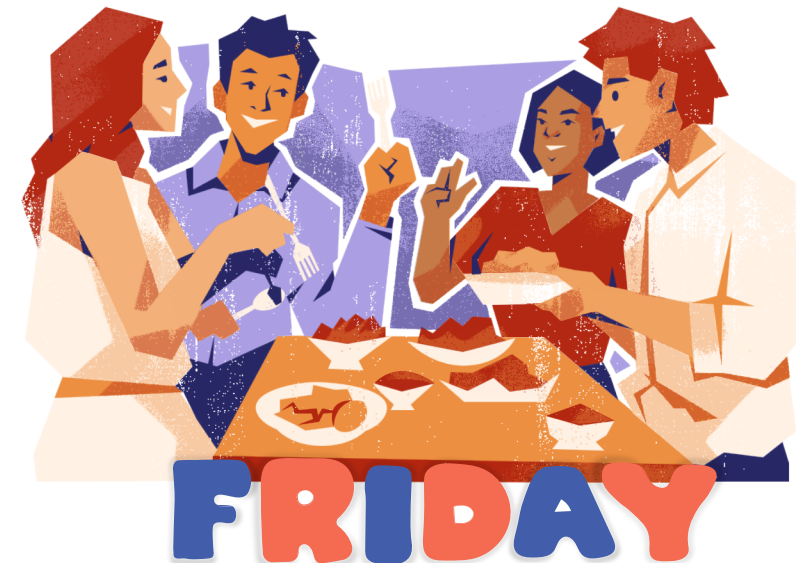
Branches:

- iliohypogastric
- ilioinguinal
- genitofemoral
- lateral femoral cutaneous
- femoral
- obturator

Mnemonic - Branches of the Lumbar Plexus!

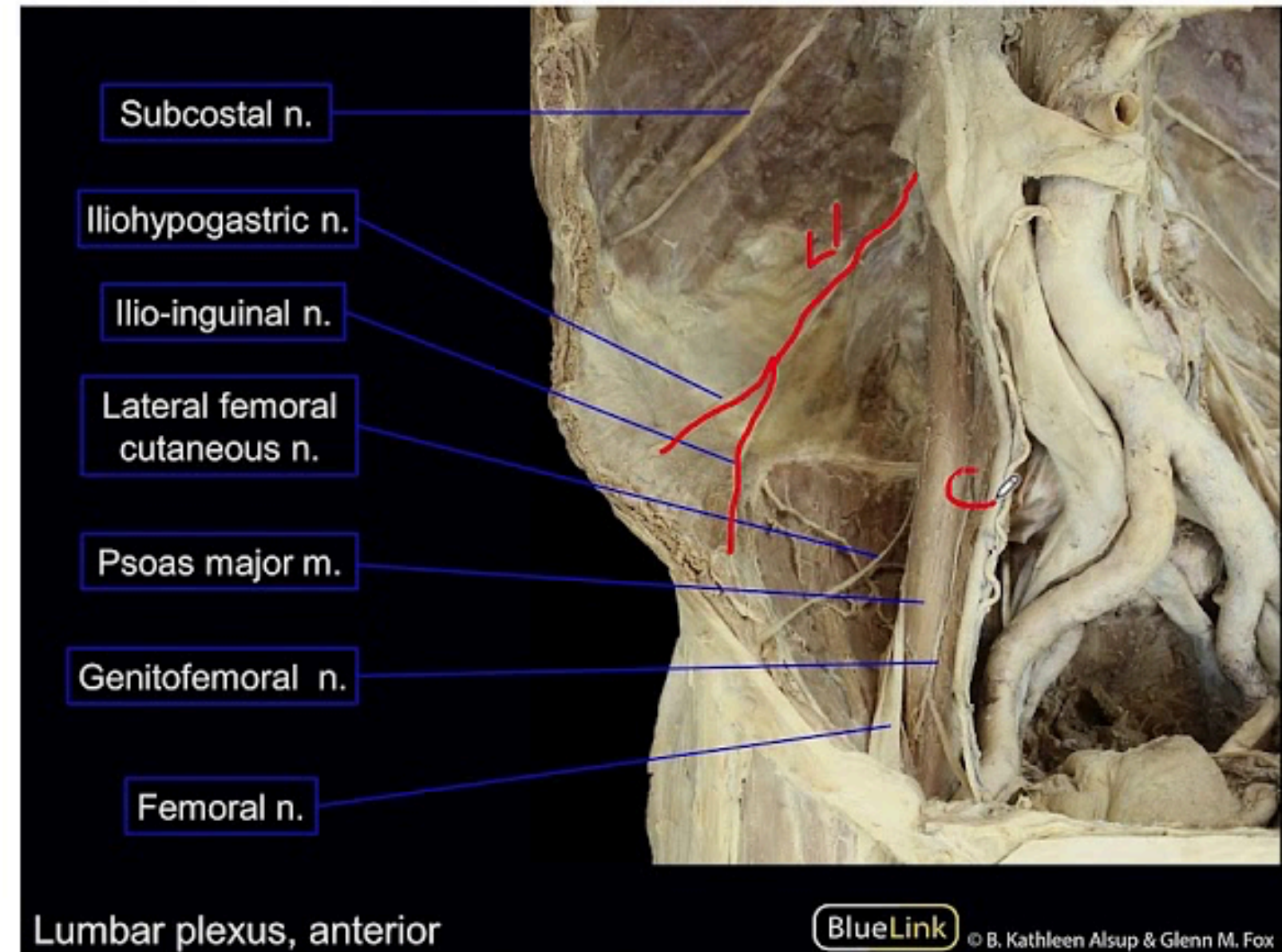
Interested In Getting Lunch On Friday?

- Iliohypogastric
- Ilioinguinal
- Genitofemoral
- Lateral femoral cutaneous
- Obturator
- Femoral



Lumbar plexus branches: relation to psoas major m.

- **Iliohypogastric n.:** superolateral
- **Ilio-inguinal n.:** lateral; inferior and often parallel to IH n.
- **Genitofemoral n.:** pierces psoas
- **Lateral femoral cutaneous n.:** lateral
- **Obturator n.:** inferomedial border
- **Femoral n.:** inferolateral border



Innervations of the Lumbar Plexus

Iliohypogastric

Motor innervation to transversus abdominis and internal oblique muscles
Sensory innervation to posterolateral gluteal skin and skin in the pubic region

Ilioinguinal

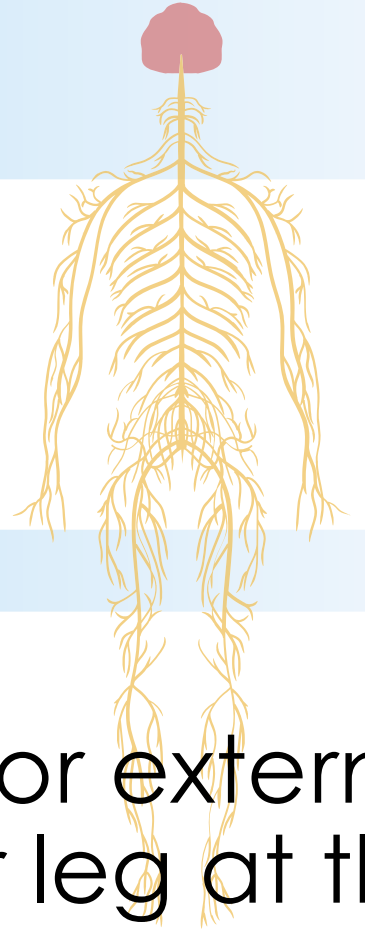
Motor innervation to transversus abdominis and internal oblique muscles
Sensory innervation to upper portion of inner thigh, base of penis, upper part of scrotum (men), mons pubis and lateral aspect of labia (women)

Genitofemoral

Motor innervation to cremaster muscle
Sensory innervation to upper portion of anterior thigh, skin of anterior scrotum (men) and mons pubis (women)



Innervations of the Lumbar Plexus



Lateral Femoral Cutaneous

No motor innervation

Sensory innervation to skin of anterolateral thigh

Obturator

Motor innervation to adductor longus, adductor brevis, gracilis, obturator externus and ischiocondylar part of adductor magnus muscle - help extend your leg at the knee

Sensory innervation to inner thigh

Femoral

Motor innervation to flexors of the hip; pectinous, iliac and sartorius, as well as extensors of the knee; quadriceps femoris

Sensory innervation to anteromedial thigh and medial aspects of the knee, leg and foot

Nerve Roots of Lumbar Plexus

Hint for Remembering Nerve Roots of Lumbar Plexus!

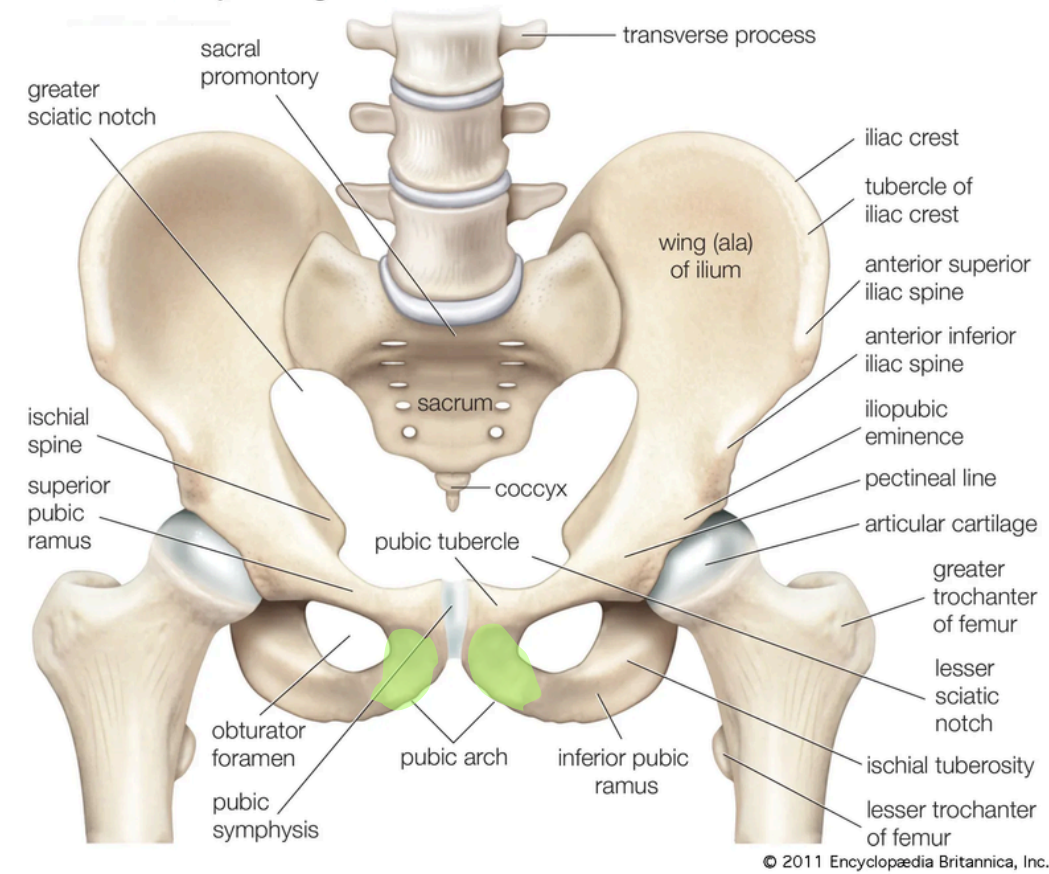
2 nerves arise from 1 root:
Iliohypogastric and Ilioinguinal (L1)

2 nerves arise from 2 roots:
Genitofemoral (L1 + L2) and Lateral Femoral
Cutaneous (L2 + L3)

2 nerves arise from 3 roots:
Femoral and Obturator (L2 + L3 + L4)

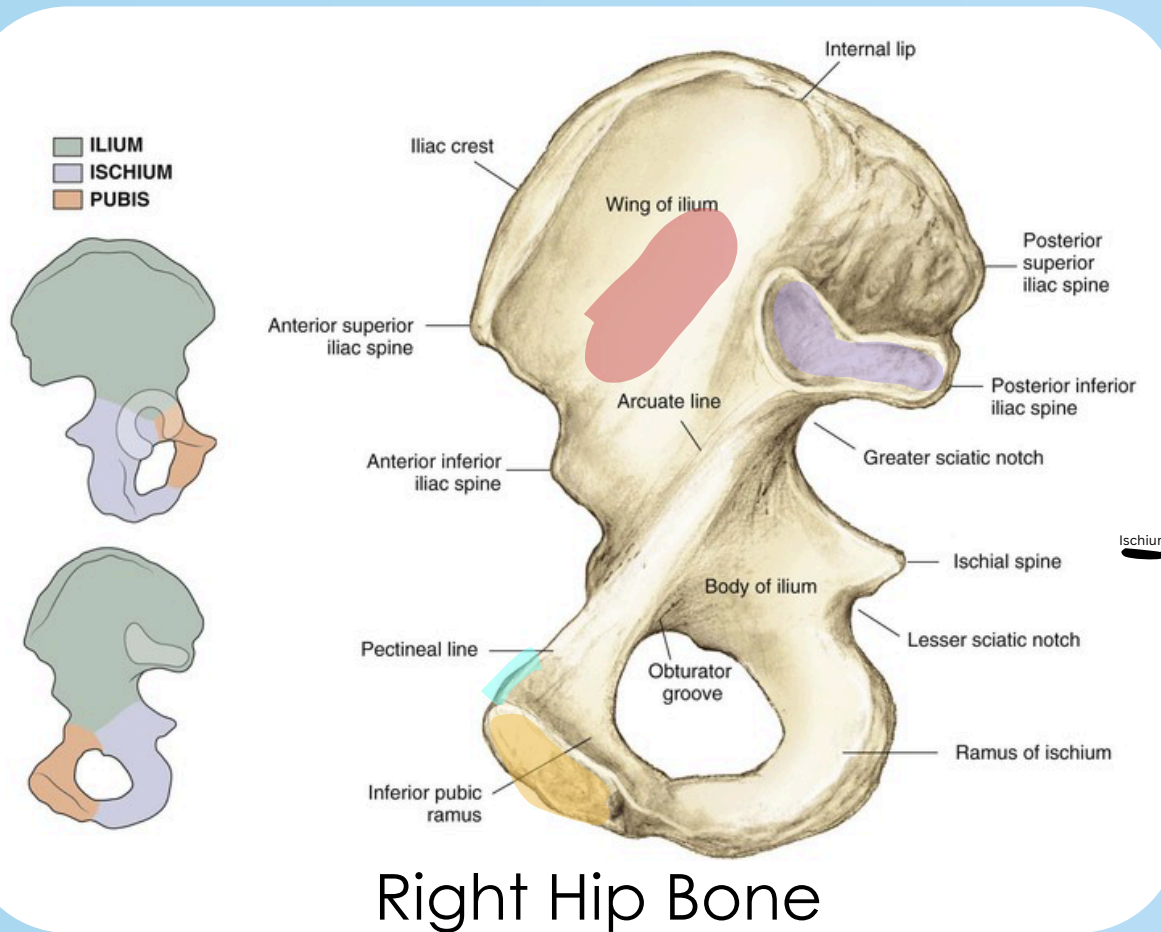
Pelvic Girdle

Bones of the pelvic girdle



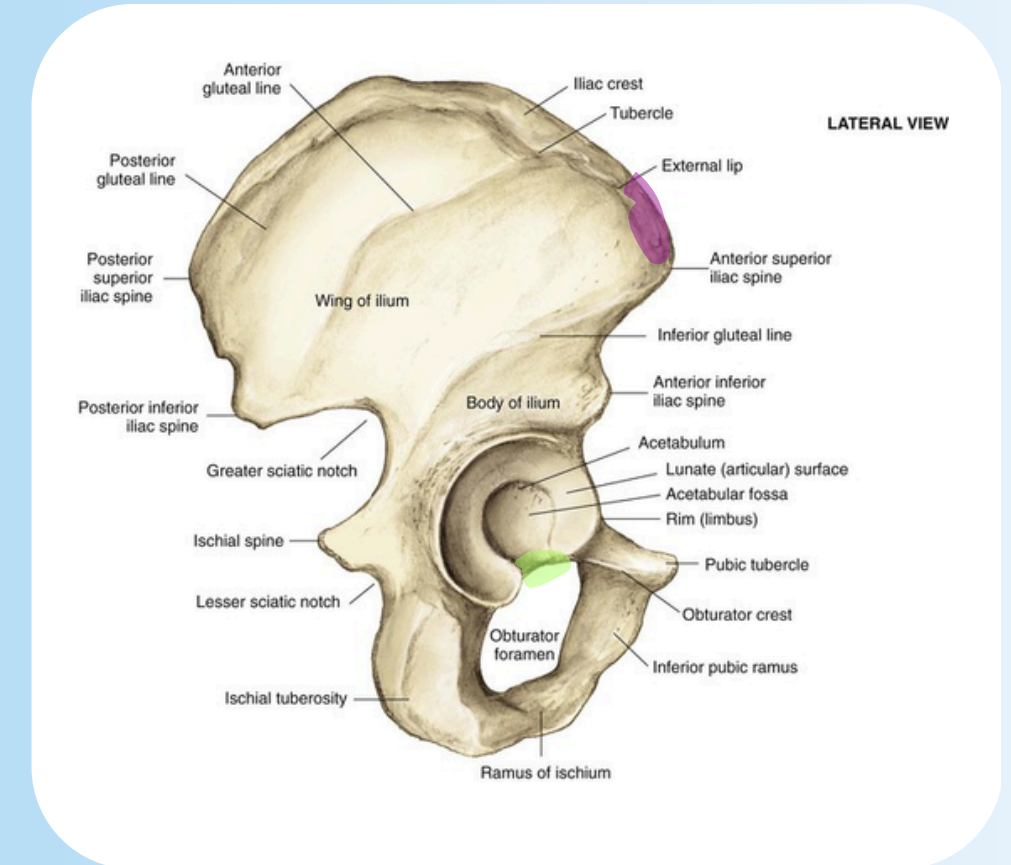
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= pubis body



Right Hip Bone

- = Iliac fossa (depressed region beneath wing)
- = auricular surface
- = pubic crest
- = symphyseal surface

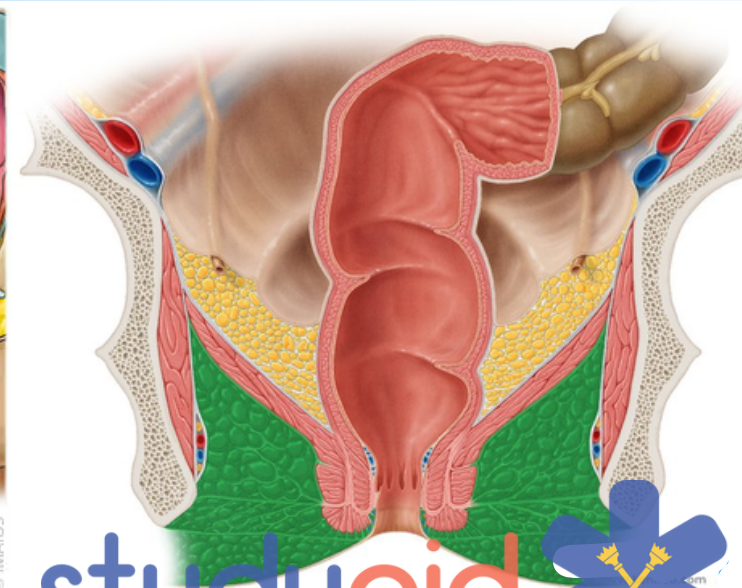
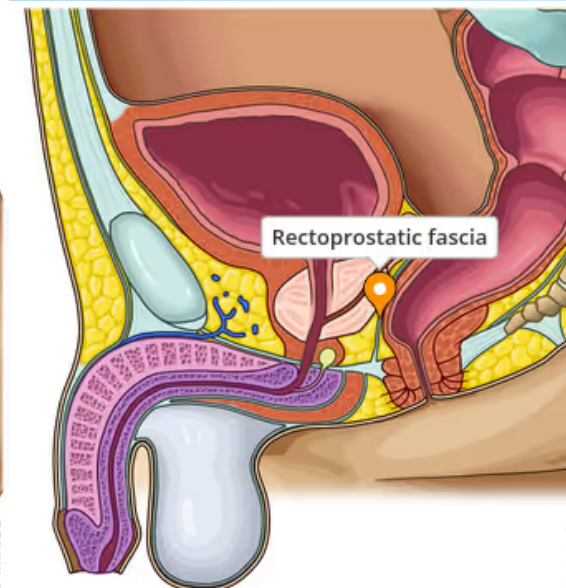
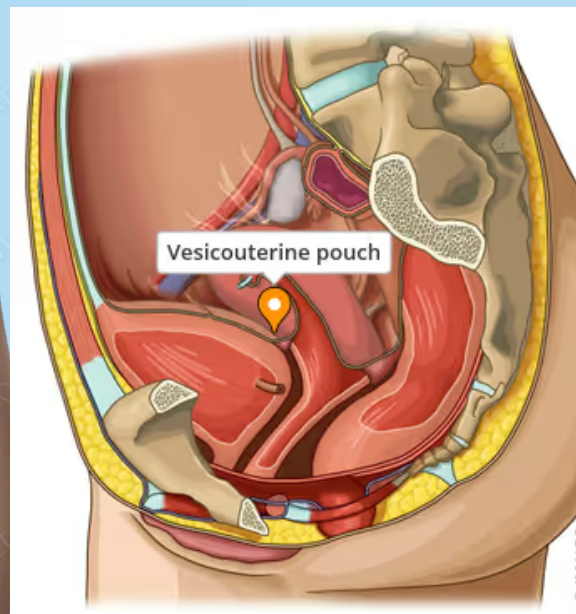
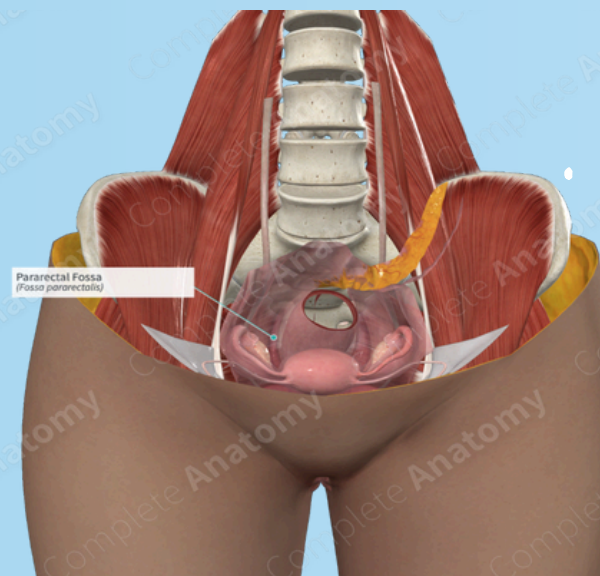
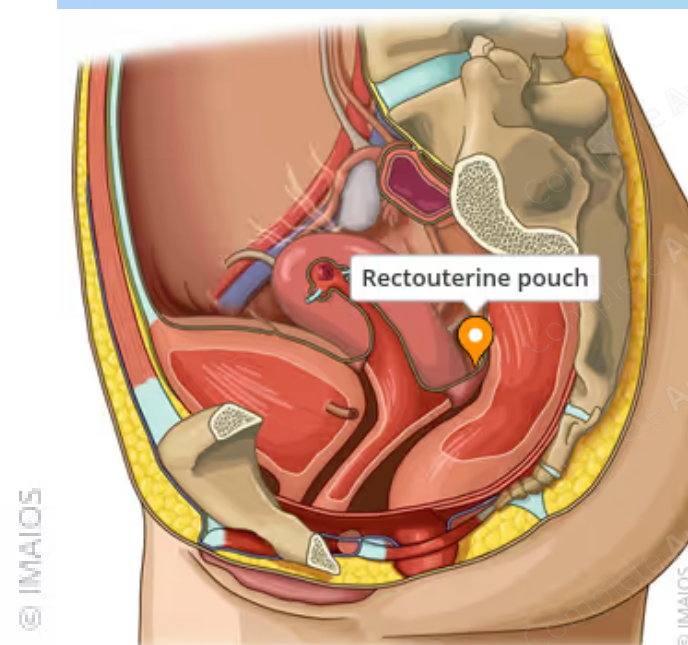
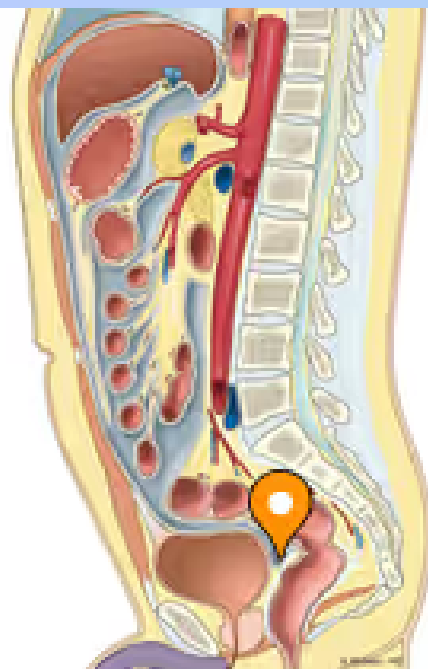


- = Intermediate Zone of iliac crest
- = acetabular notch

Pelvic Spaces

6 High Yield Pelvic Spaces

1. Rectovesical Pouch (male)
2. Rectouterine pouch of Douglas (female)
3. Pararectal fossa
4. Vesicouterine pouch (female)
5. Rectovesical space (male)
6. Ischioirectal (ishioanal) fossa



Male vs. Female Pelvis

The female pelvis is longer and wider compared to males

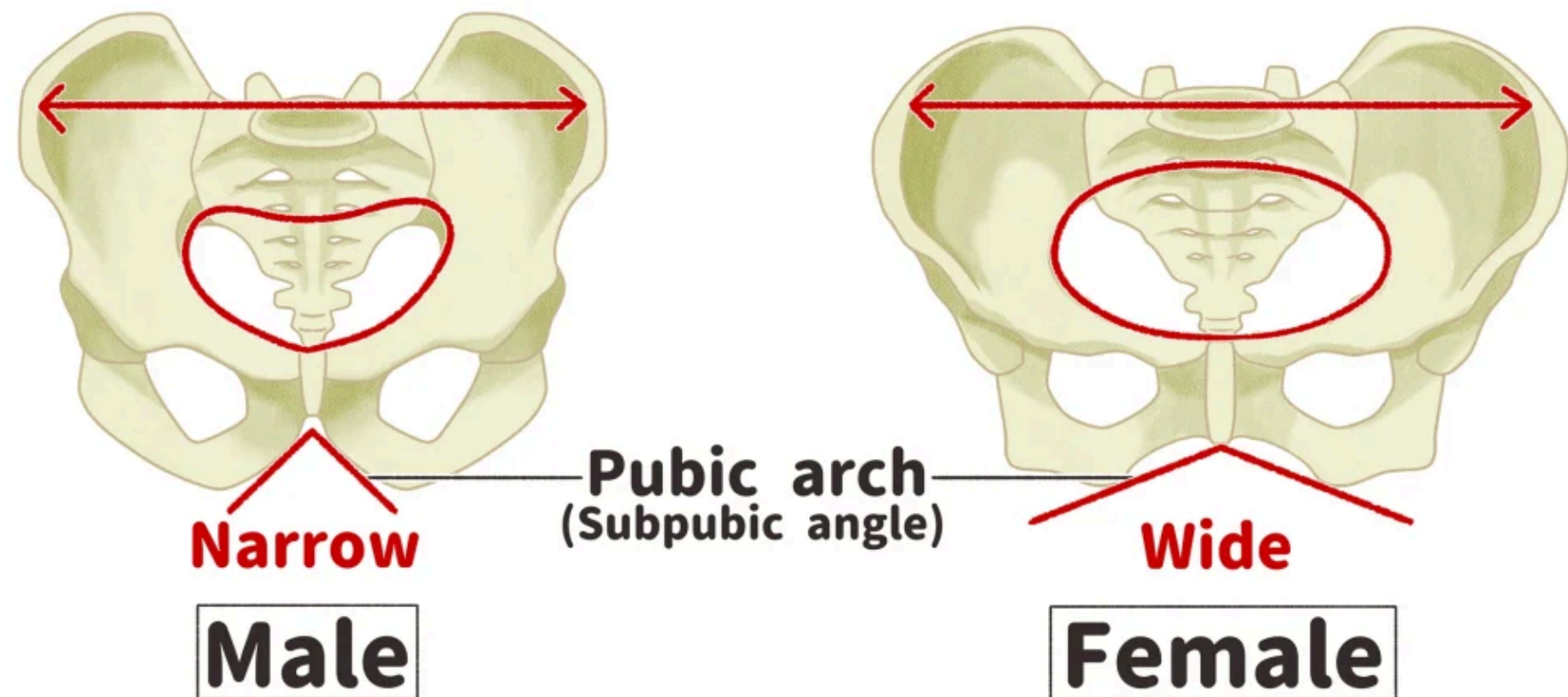
Females have a more oval shaped pelvic inlet

Male iliac crests are higher than females

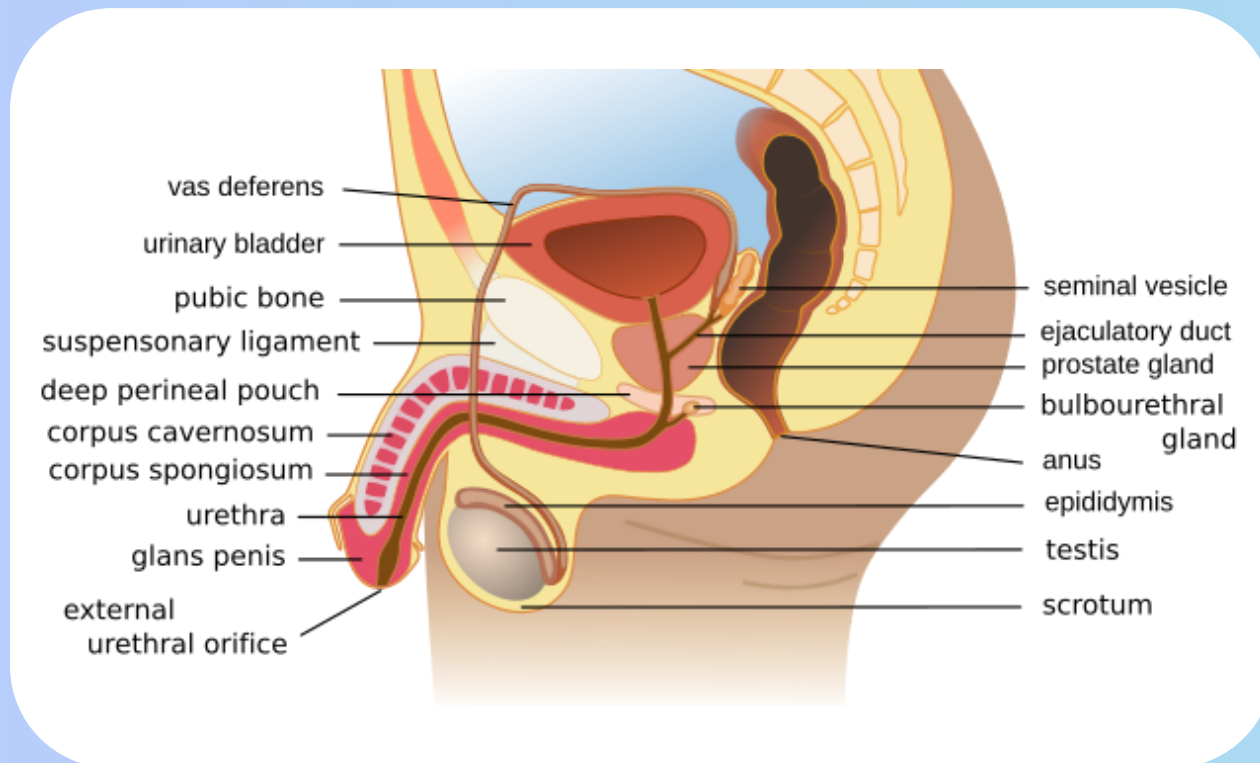
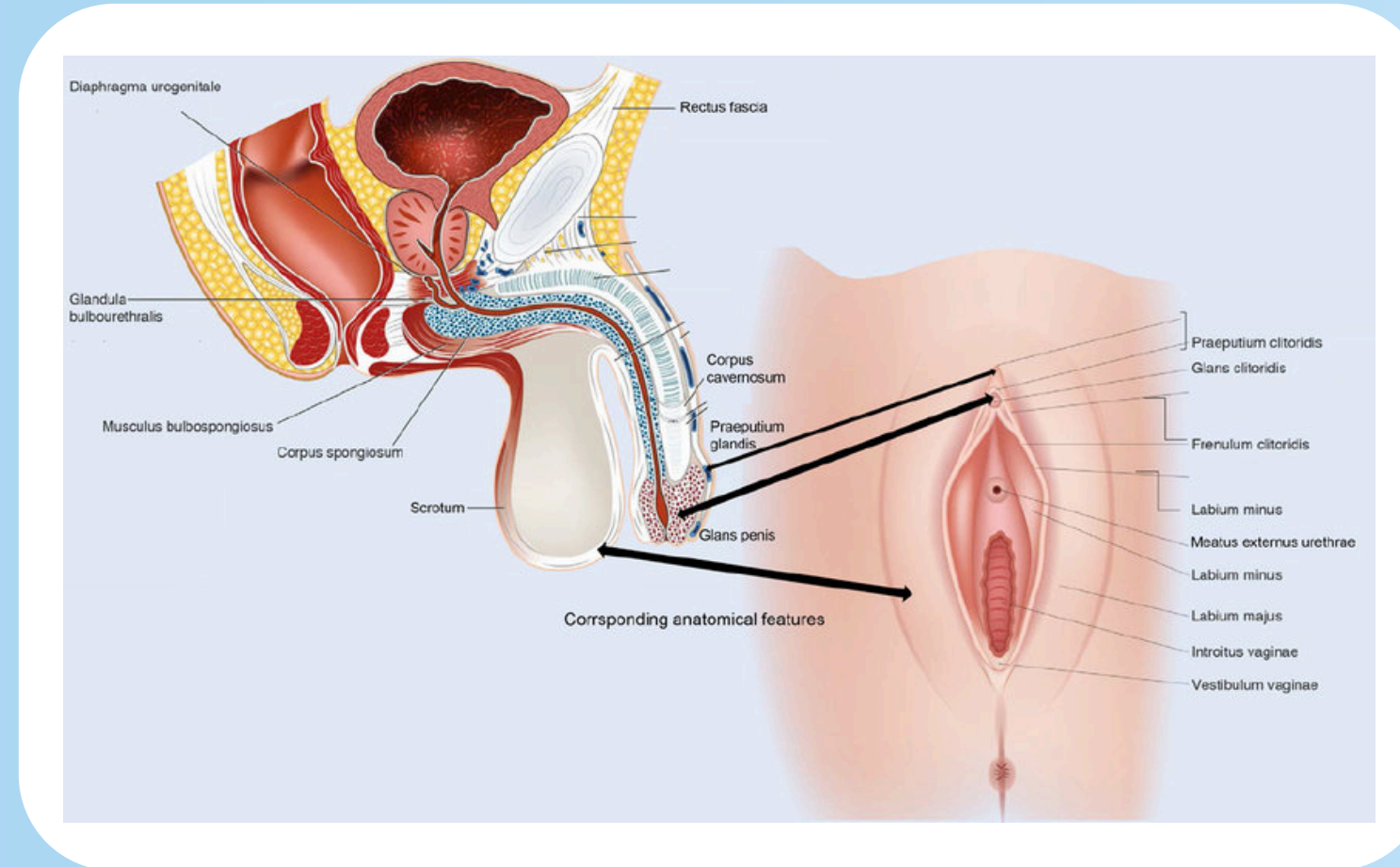
The male sacrum is longer, narrower and straighter

The pubic arch is narrower in males, wider in females

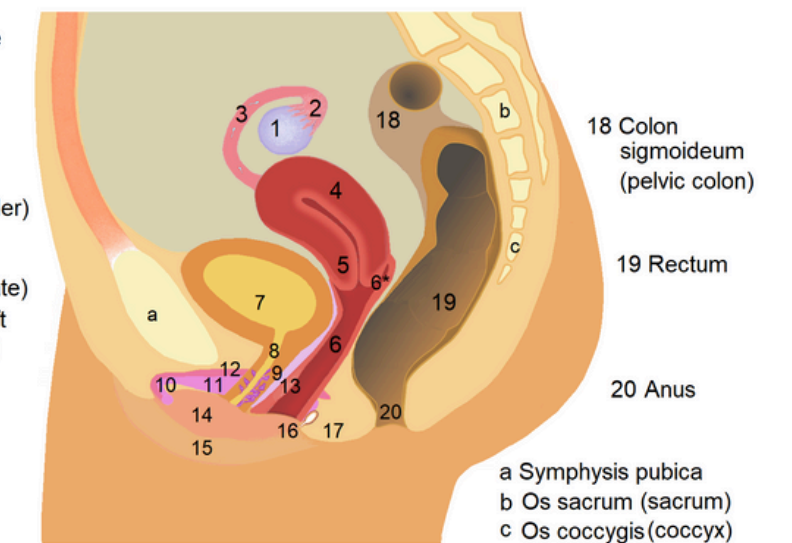
Male vs Female Pelvis



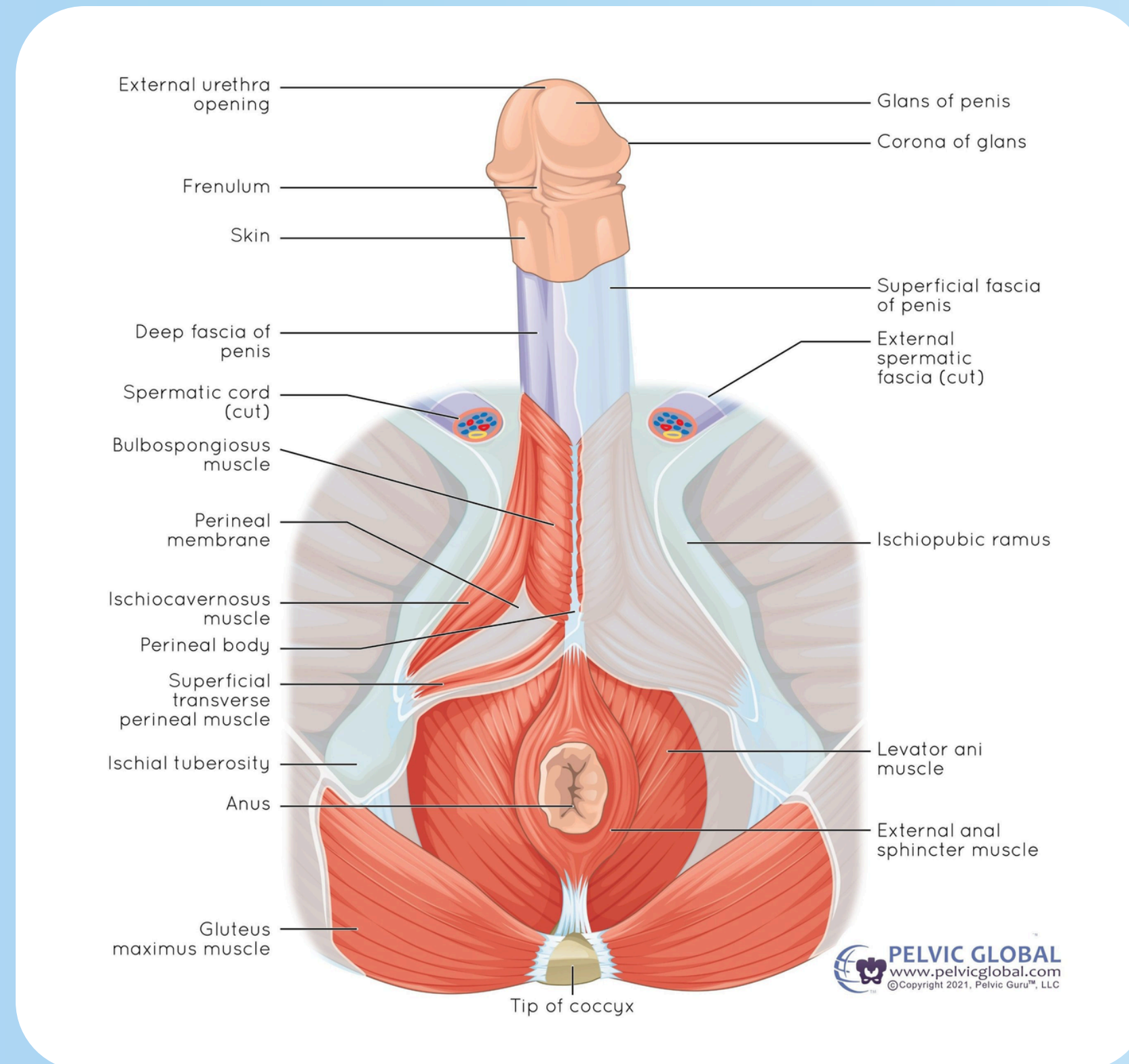
Male and Female Genitalia



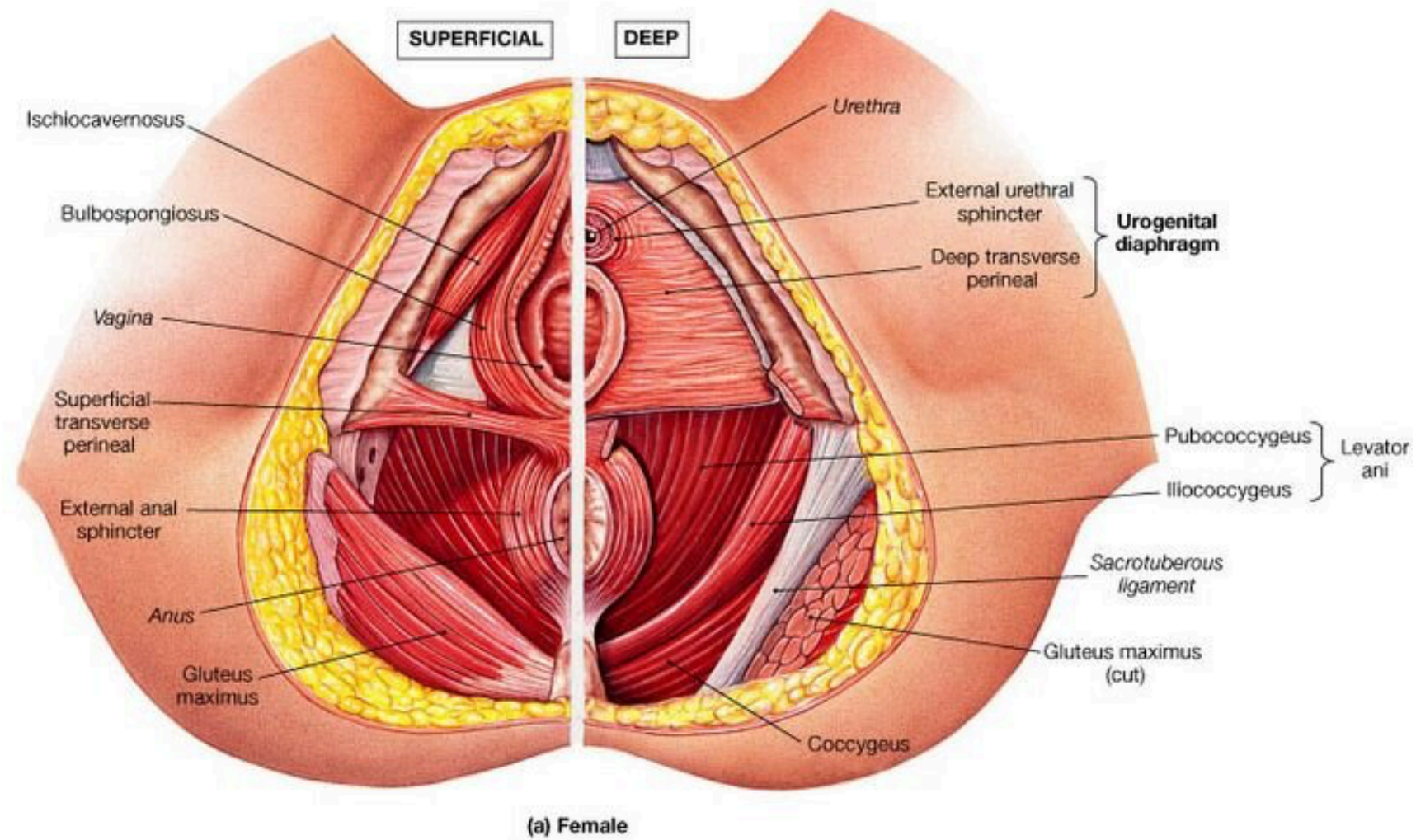
- 1 Ovarium (ovary)
- 2 Infundibulum of fallopian tube
- 3 Oviduct (fallopian tube)
- 4 Uterus
- 5 Cervix
- 6 Vagina
- 6* Fornix vaginae
- 7 Vesica urinaria (Urinary bladder)
- 8 Urethra
- 9 Glandula paraurethralis (Skene's gland, female prostate)
- 10 Clitoris: clitoral glans and shaft
- 11 Bulbus vestibuli (Clitoral bulb)
- 12 Crus (Crus of clitoris)
- 13 Gräfenberg spot (G-spot)
- 14 Labia minora
- 15 Labia majora
- 16 Glandula vestibularis major (Bartholin's gland)
- 17 Perineum



Pelvic Floor Anatomy - Male



Pelvic Floor Anatomy - Female



Genital Innervation - Male

Point & Shoot

Parasympathetic fibres control erection
Sympathetic fibres control ejaculation



Penis

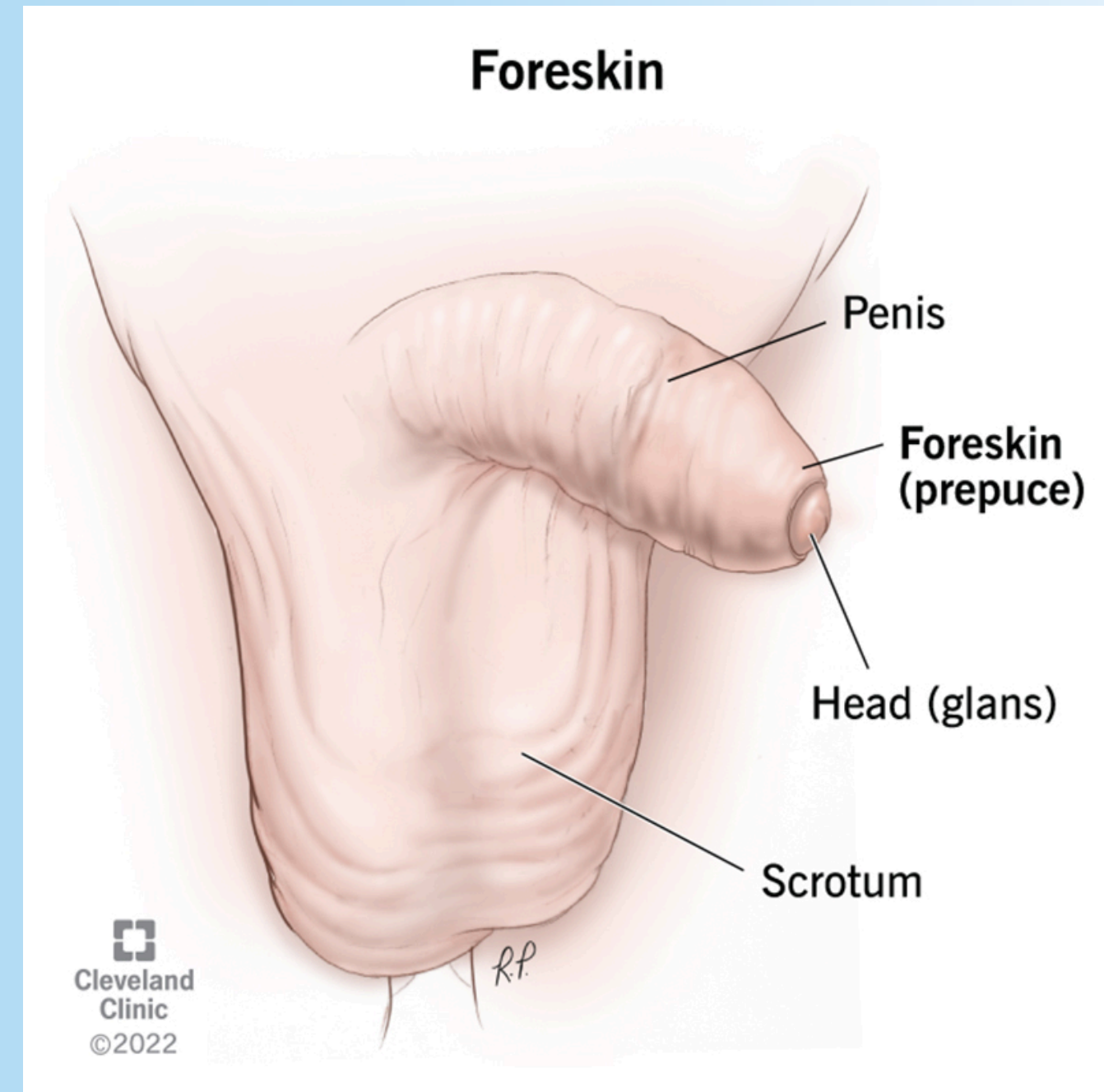
Pudendal (sensory + sympathetic)
Pelvic Splanchnic (parasympathetic)
Ilioinguinal (skin of penile root)

Scrotum

Lumbar Plexus (anterior part)
Sacral Plexus (posterior part)

Prostate

Pelvic Splanchnic (parasympathetic)
Inferior Hypogastric Plexus (sympathetic)



Testes & Epididymis
Autonomic Testicular Plexus

Genital Innervation - Female

Vagina

Inferior Hypogastric Plexus (sympathetic (thoracolumbar)
+ parasympathetic (pelvic splanchnic nerves))

Pudendal nerve

Uterus

Pelvic Splanchnic nerves (parasympathetic)

Ovaries

Ovarian Nerve Plexus:

- Sympathetic - lesser splanchnic nerves (T10 - T11)
- Parasympathetic - pelvic splanchnic nerves (S2 - S4)

Uterine Tube

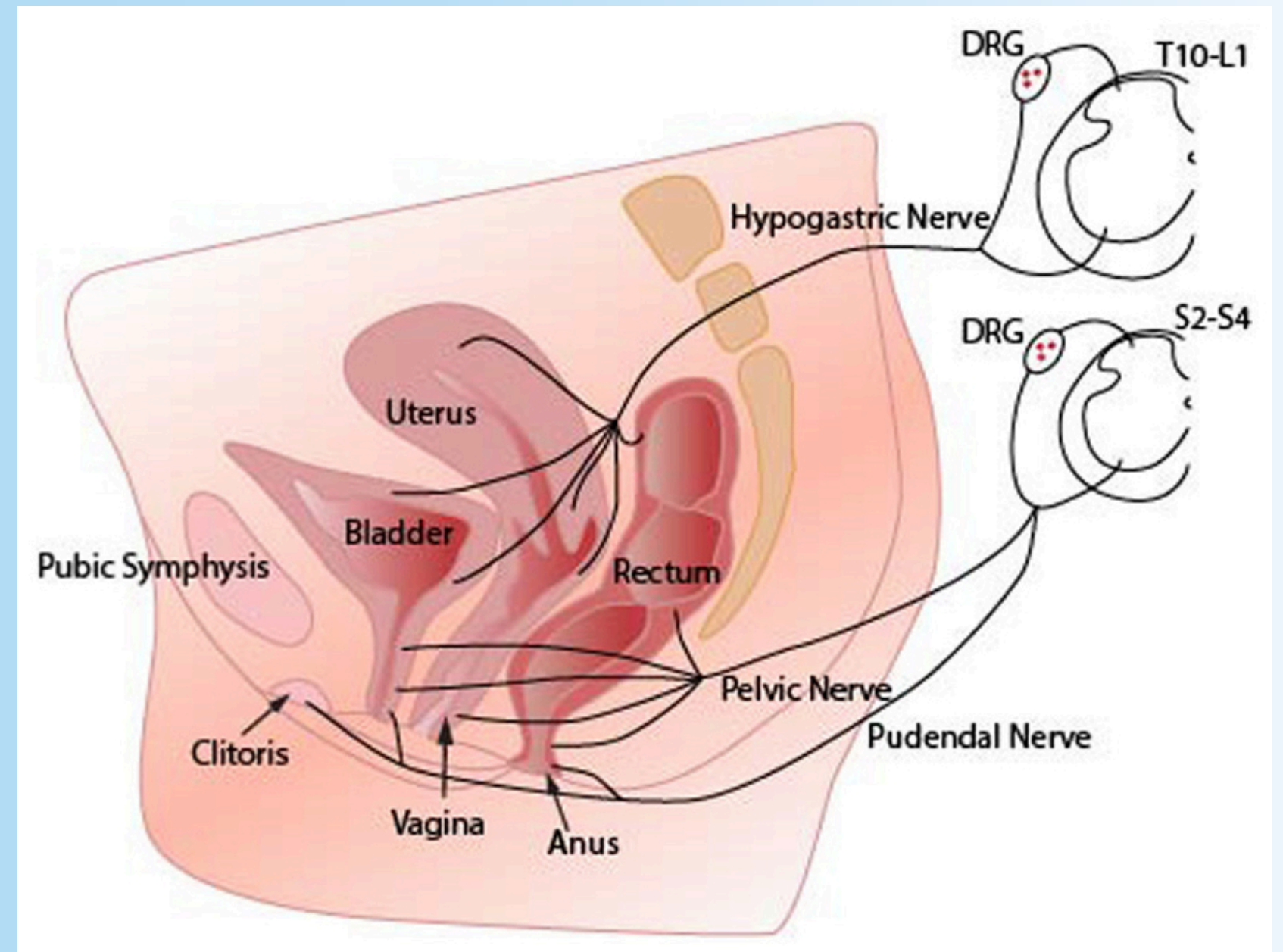
Superior Hypogastric Plexus (T10 - L2) (sympathetic)
Pelvic Splanchnic nerves + vagus nerve (parasympathetic)

Anterior Vulva

Ilioinguinal + genitofemoral nerve (sensory)

Posterior Vulva

Pudendal + posterior cutaneous nerve of thigh (sensory)



Bulb of Vestibule & Clitoris

Uterovaginal nerve plexus (parasympathetic)