

ANATOMY OF ANTERIOR WALL & INGUINAL REGION

أ.د. عبد الجبار الحبيطي

- A mid line canula through anterior abdominal wall passes through the following layers:

1-Skin

2-Superficial fascia

3-Linea alba

4-Transversalis fascia&extraperitoneal fat

5-The parietal peritoneum.

- The superficial inguinal ring : is triangular in shape located just above the pubic tubercle. It is related to the Conjoint tendon posteriorly , which forms part of the posterior wall of the inguinal canal (medial part) .The conjoint tendon reinforces the superficial inguinal ring.
- The Deep Inguinal Ring(D.I.R) is about half an inch above the mid point of inguinal ligament, it is a defect through the Transversalis fascia & the inferior epigastric artery runs just medial to it.

Deep to the inguinal ligament the following structures pass:

- 1-Iliacus & psoas major Ms
- 2-External iliac vessels (just below lig, become Femoral)
- 3-The Femoral nerve
- 4- The lateral cutaneous nerve of the thigh.

- The Cremaster muscle forms loops on the spermatic cord, it reaches the base of the scrotum. It is supplied by genital branch of genitofemoral nerve (cremasteric nerve), it elevates the testes , while cremasteric reflex is by ilioinguinal nerve .The cremaster muscle is absent in the female.

- The Conjoint tendon: It lies behind the S.I.R & reinforces it. It is formed by contributions from the aponeurosis of both internal oblique & transversus abdominis & is attached to the pubic crest. It forms part of posterior wall of the inguinal canal & supplied by ilioinguinal nerve.

- The following structures are seen at the level of the transpyloric plane:
- 1-Fundus of the gall bladder.
- 2-the upper limit of the hilum of right kidney.
- 3-The tip of the 9th costal cartilage.
- 4-The pylorus of stomach.
- 5-Body of L1 vertebra.
- 6-Origin of superior mesenteric artery.

- The Rectus Abdominis Muscle:
- 1- Helps in flexion of the trunk
- 2-Is supplied by lower 5 intercostal nerves
- 3-Shows three tendinous intersections on its anterior surface.
- 4-The rectus sheath is not attached to its posterior surface.

- On tapping Hydrocele (Tunica vaginalis is distended with fluid) the Canula passes through:
- 1-Skin
- 2- Dartos muscle(smooth m.fs) & membranous layer of the superficial fascia
- 3-External spermatic fascia
- 4-Cremaster fascia
- 5-Internal spermatic fascia
- 6- The parietal layer of Tunica Vaginalis .

- To withdraw fluid from peritoneal cavity a needle (just lateral to the inferior epigastric artery) should pass through the following layers:
- 1-Skin
- 2- Superficial fascia
- 3-External oblique M
- 4-Internal oblique M
- 5-Transversus abdominis M
- 6-Transversalis fascia
- 7-Extraperitoneal fat
- 8-Parietal peritoneum.

The Mid-inguinal point is the point located at •
the middle of the distance between the
Anterior superior iliac spine & Pubic
symphysis.

ANATOMY OF ANTERIOR ABDOMINAL WALL

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Abdomen

It is the region of trunk that lies between diaphragm above and pelvic inlet below.

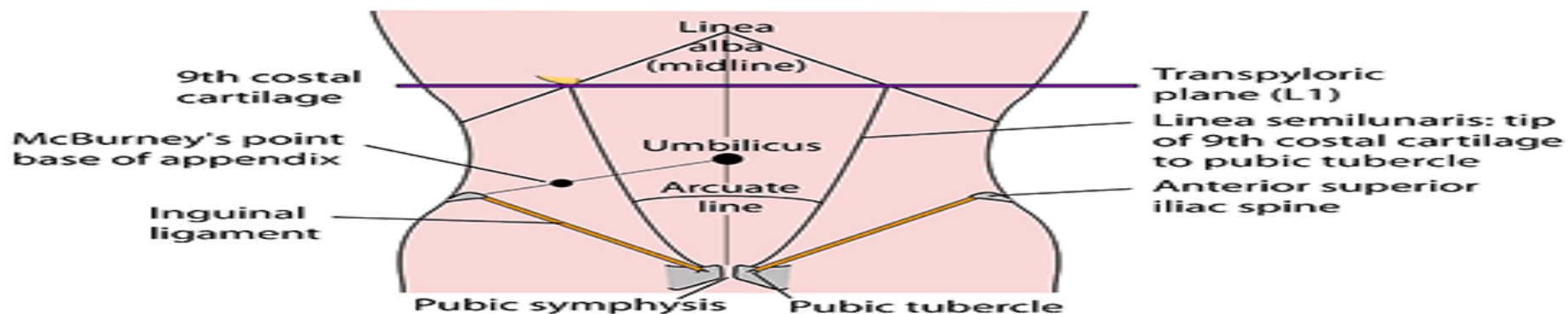
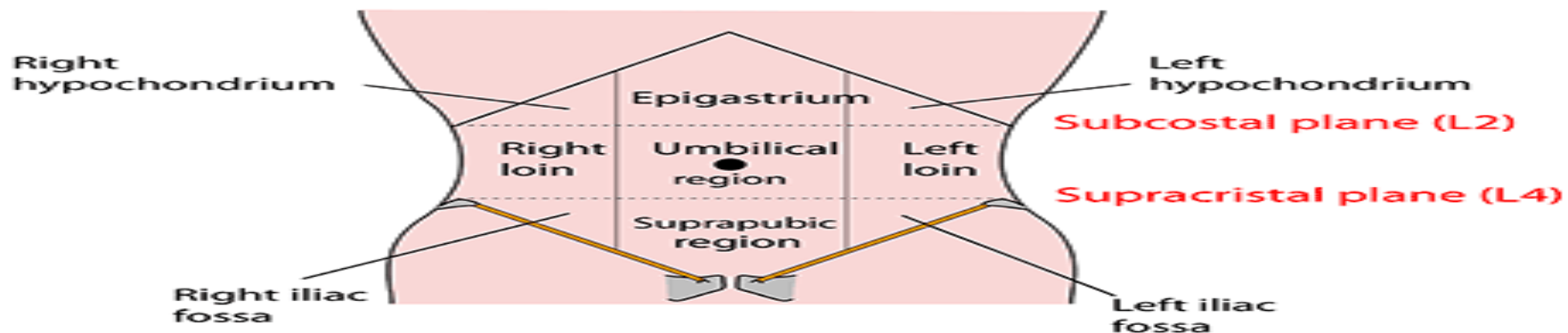
Circumferentially, it is bounded by abdominal wall. The abdominal wall is bordered as follows:

- **Superiorly** by xiphoid process and costal margins.
- **Posteriorly** by vertebral column.
- **Inferiorly** by upper parts of the pelvic bones.



SURFACE ANATOMY OF ABDOMINAL WALL

REGIONS OF THE ABDOMEN



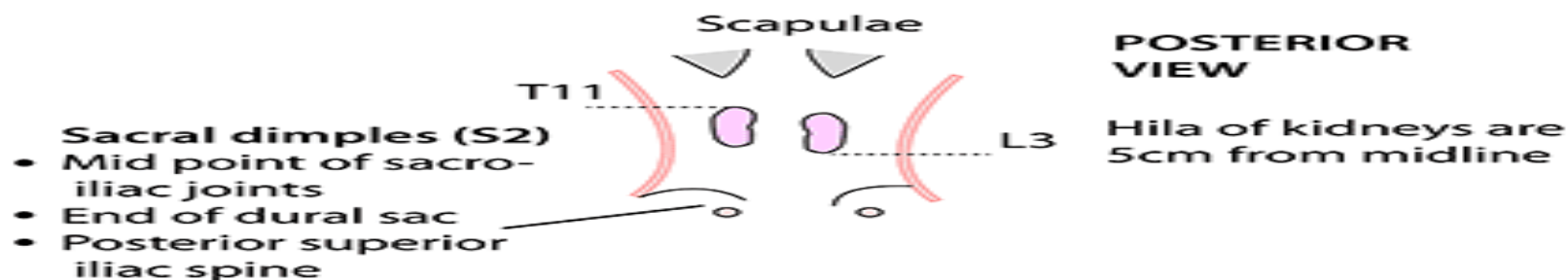
Transpyloric plane: half way between suprasternal notch & symphysis pubis

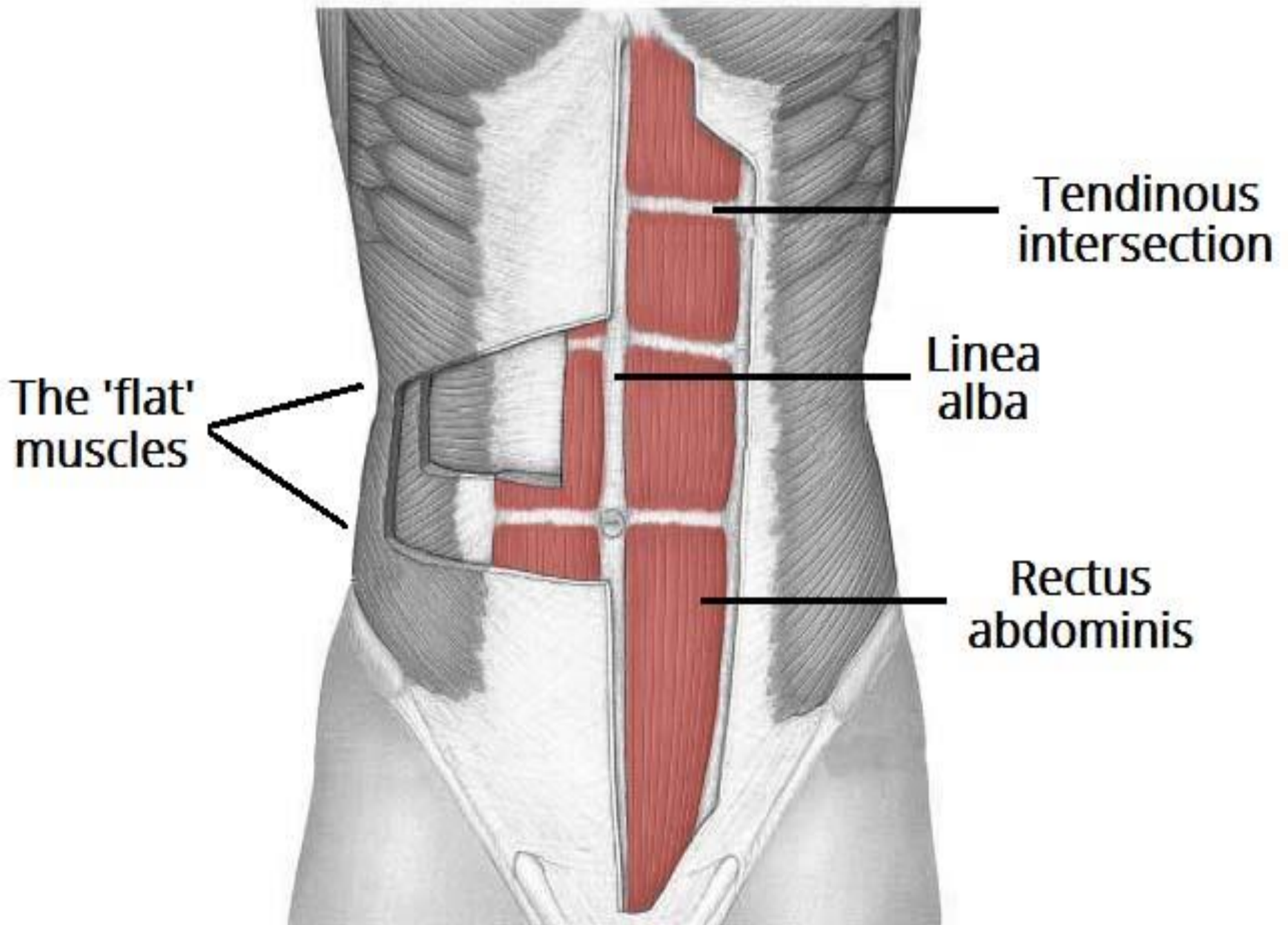
Inguinal ligament: anterior superior iliac spine to pubic tubercle

Arcuate line: 3-5cm inferior to umbilicus

Linea semilunaris: lateral edge of rectus sheath

McBurney's point: one third along a line from ASIS to umbilicus





Tendinous intersection

Linea alba

Rectus abdominis

The 'flat' muscles

Right Hypochondriac Region

Epigastric Region

Left Hypochondriac Region

Right Lumbar Region

Umbilical Region

Left Lumbar Region

Right Iliac Region

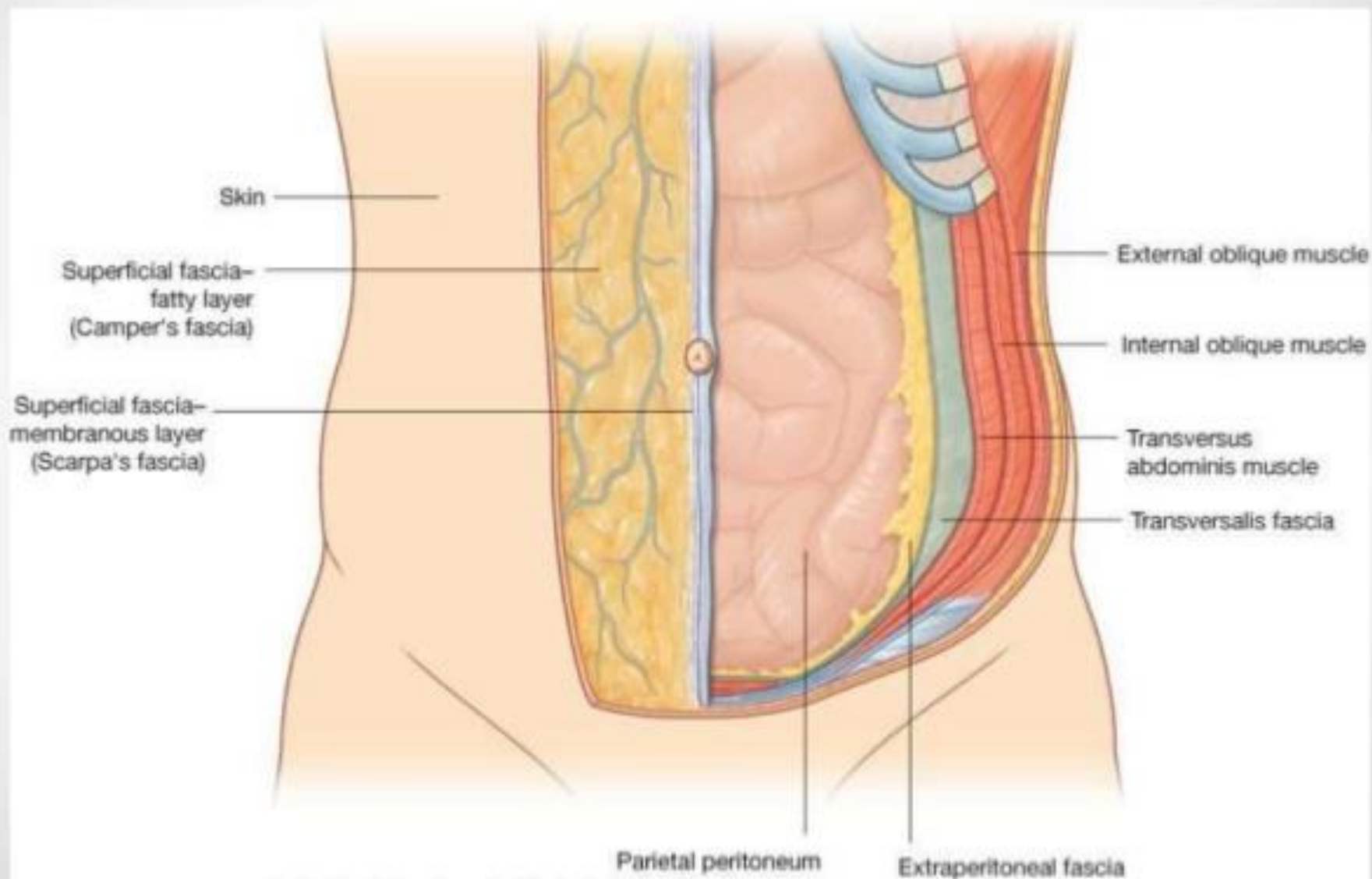
Hypogastric Region

Left Iliac Region

Layers of Anterior Abdominal Wall

1. Skin
 2. Camper (fatty)
 3. Scarpa (fibrous)
 4. Muscles
 - External Oblique
 - Internal Oblique
 - Transversus Abdominus
 5. Transversalis Fascia (fibrous)
 6. Extraperitoneal Fat
 7. Parietal Peritoneum
- Above the arcuate line, the aponeuroses of the abdominal muscles ensheath the rectus abdominus
 - Below the arcuate line, they pass in front of it

Layers of Anterior Abdominal Wall

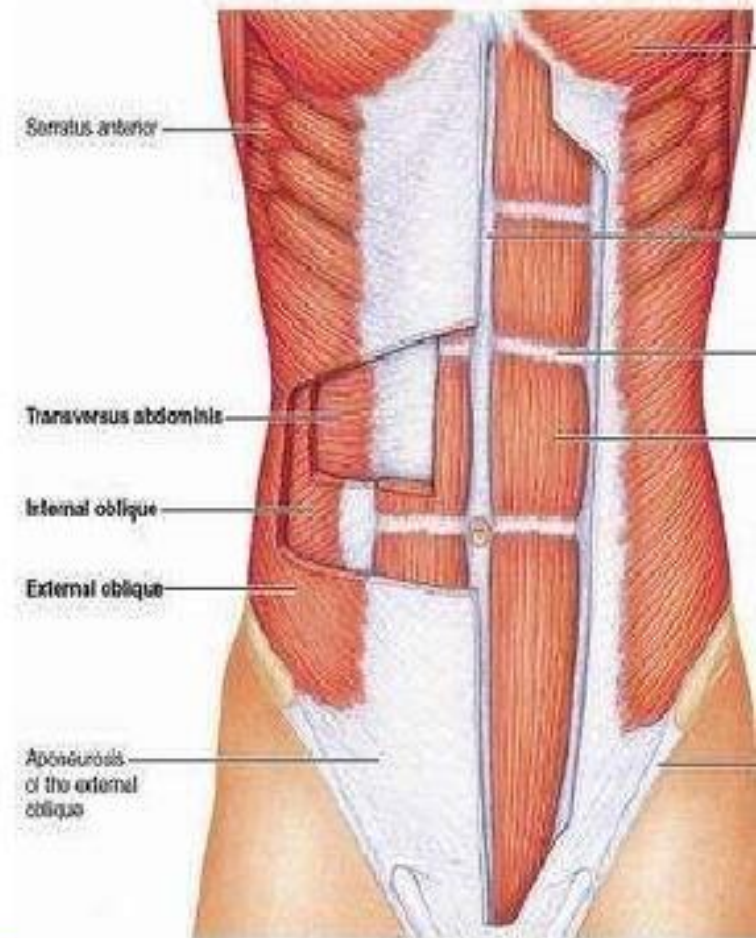


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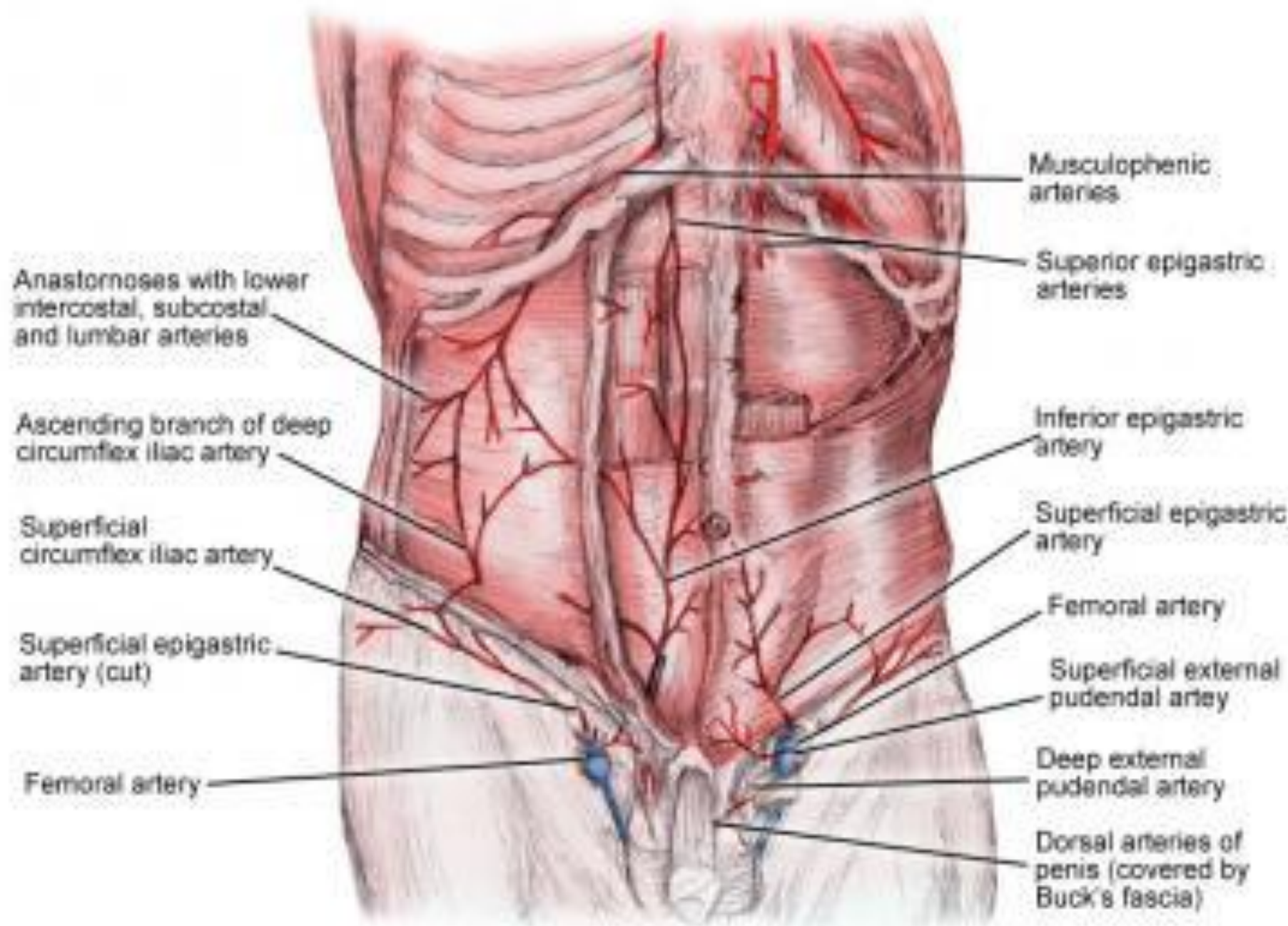
Layers of Abdo Wall- Laterally

- Skin
- Superficial fascia
 - Camper's (soft & spongy fat!)
 - Scarpa's (membranous)
- External Oblique (Aponeurosis)
- Internal Oblique
- Transversus Abdominis
- Transversalis Fascia
- Extraperitoneal fat
- Peritoneum

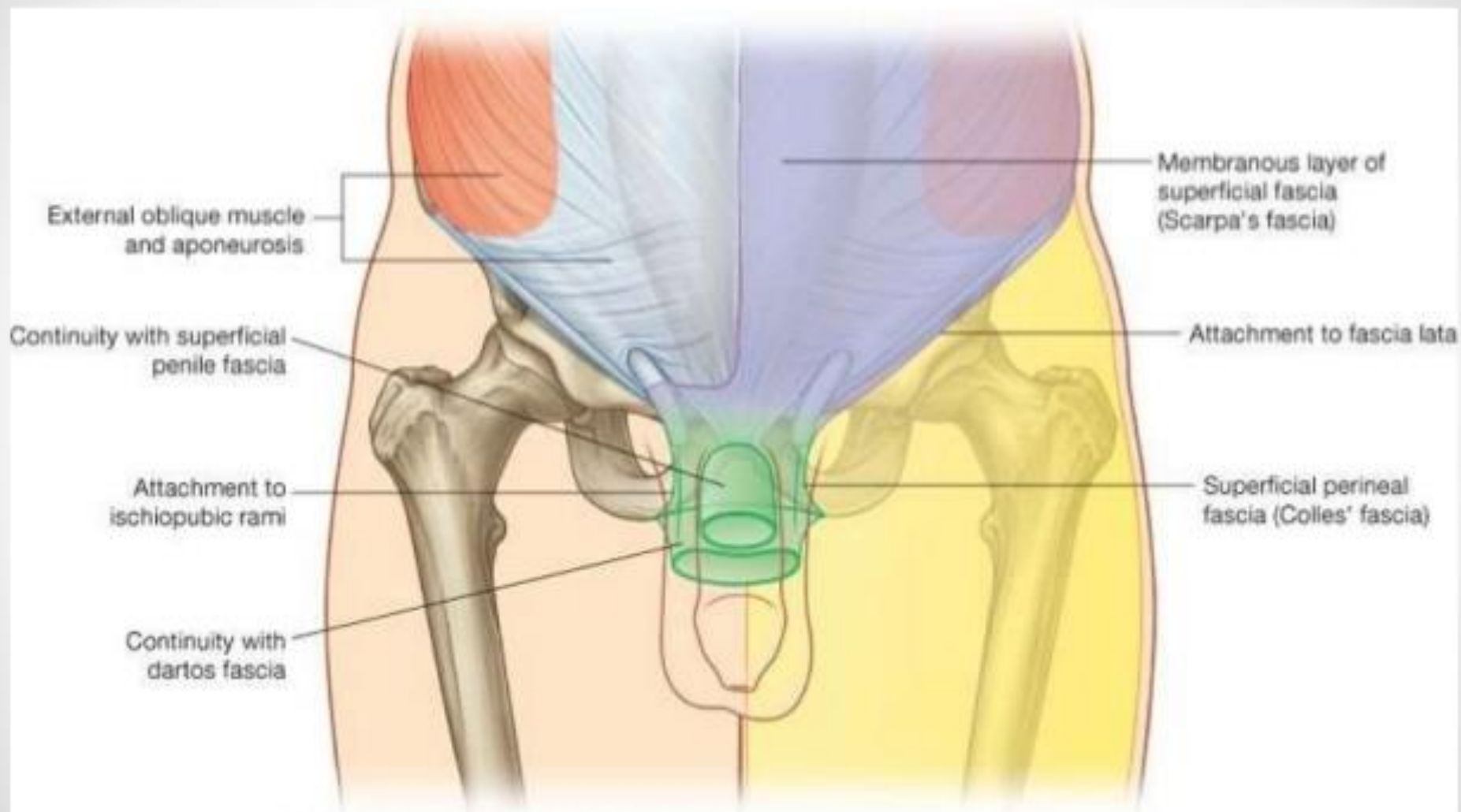


STRUCTURE OF THE ANTERIOR ABDOMINAL WALL :

- Skin .
- Superficial Fascia :
 - Superficial fatty layer (fascia of Camper) .
 - Deep membranous layer (Scarpa's-Fascia) .
- Deep fascia .
- Muscles of the Anterior Abdominal Wall :
 - External Oblique .
 - Internal Oblique .
 - Transversus .
 - Rectus Abdominis .
 - Pyramidalis (if present) .
- Fascia Transversalis .
- Extra Peritoneal fat .
- Parietal Peritoneum .

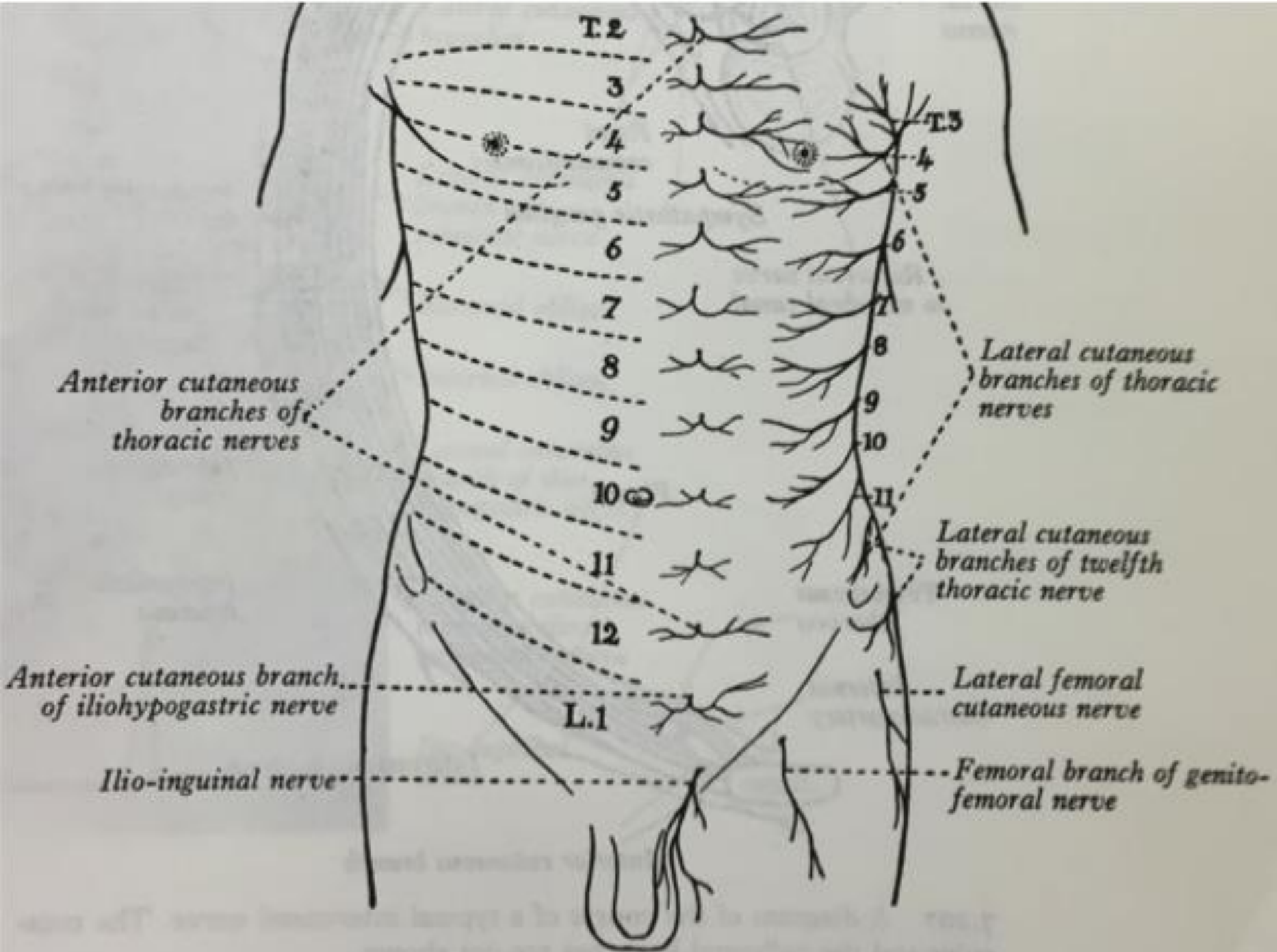


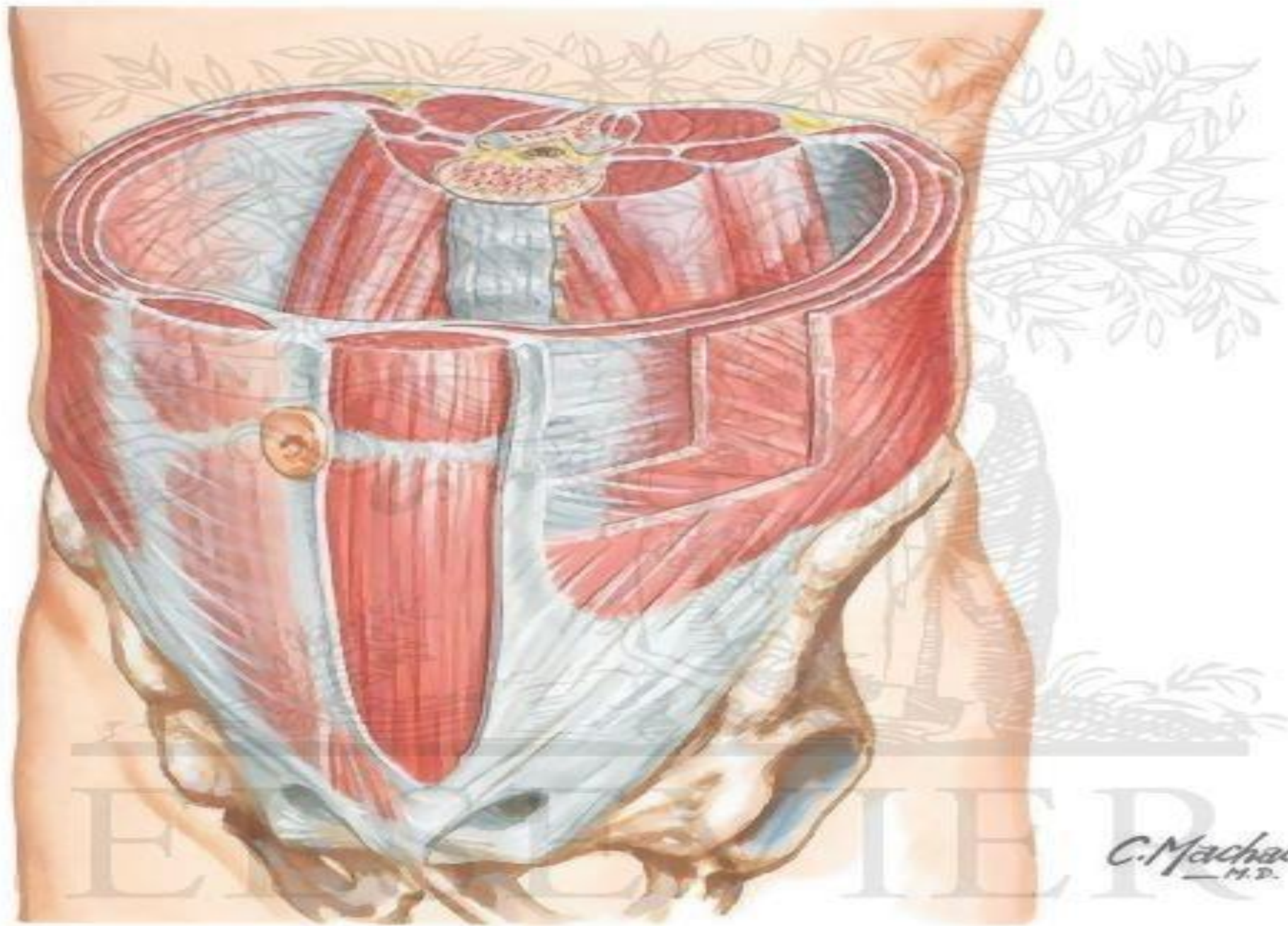
Superficial Fascia



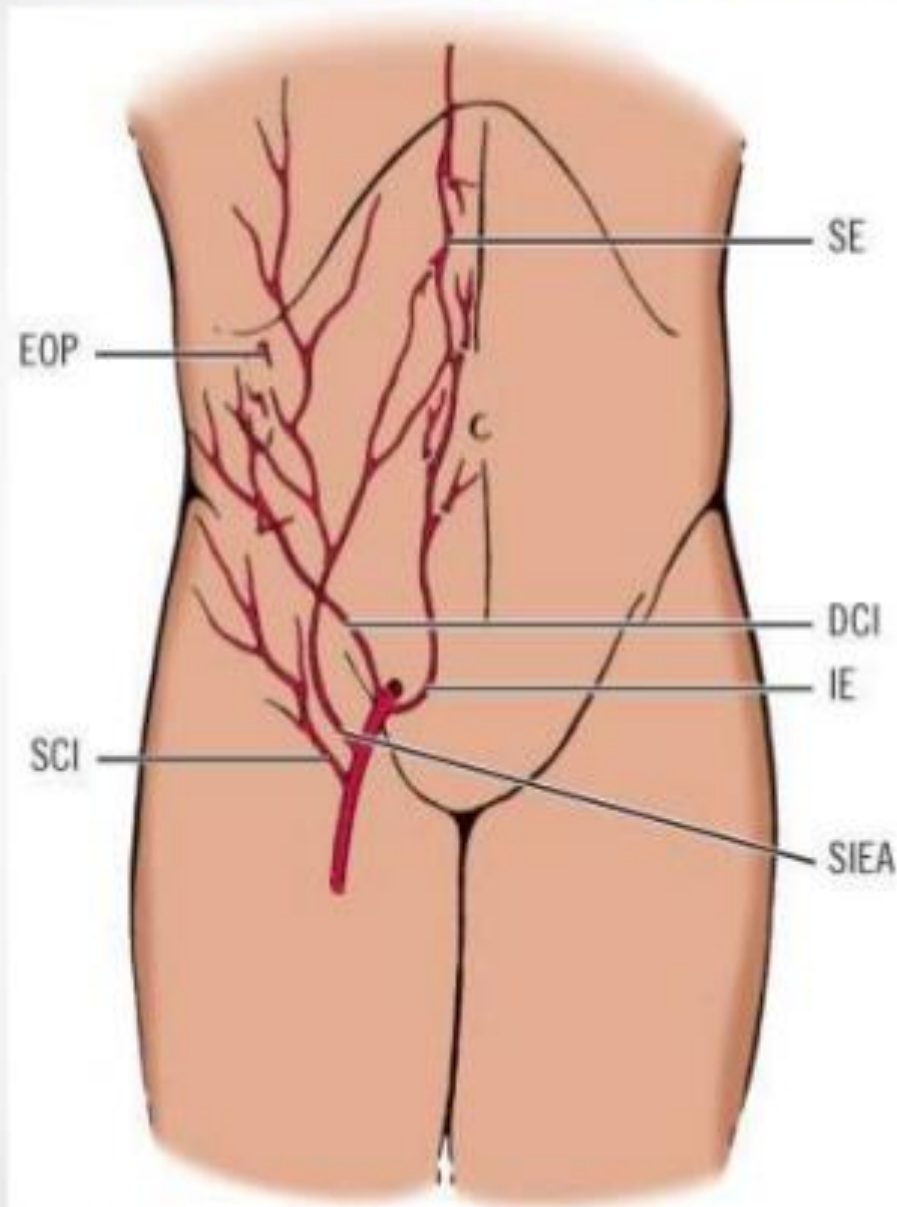
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Vessels of anterior abdominal wall



EOP- Ext Oblique Perforators

SCI- Superficial Circumflex Iliac

SE- Superior Epigastric

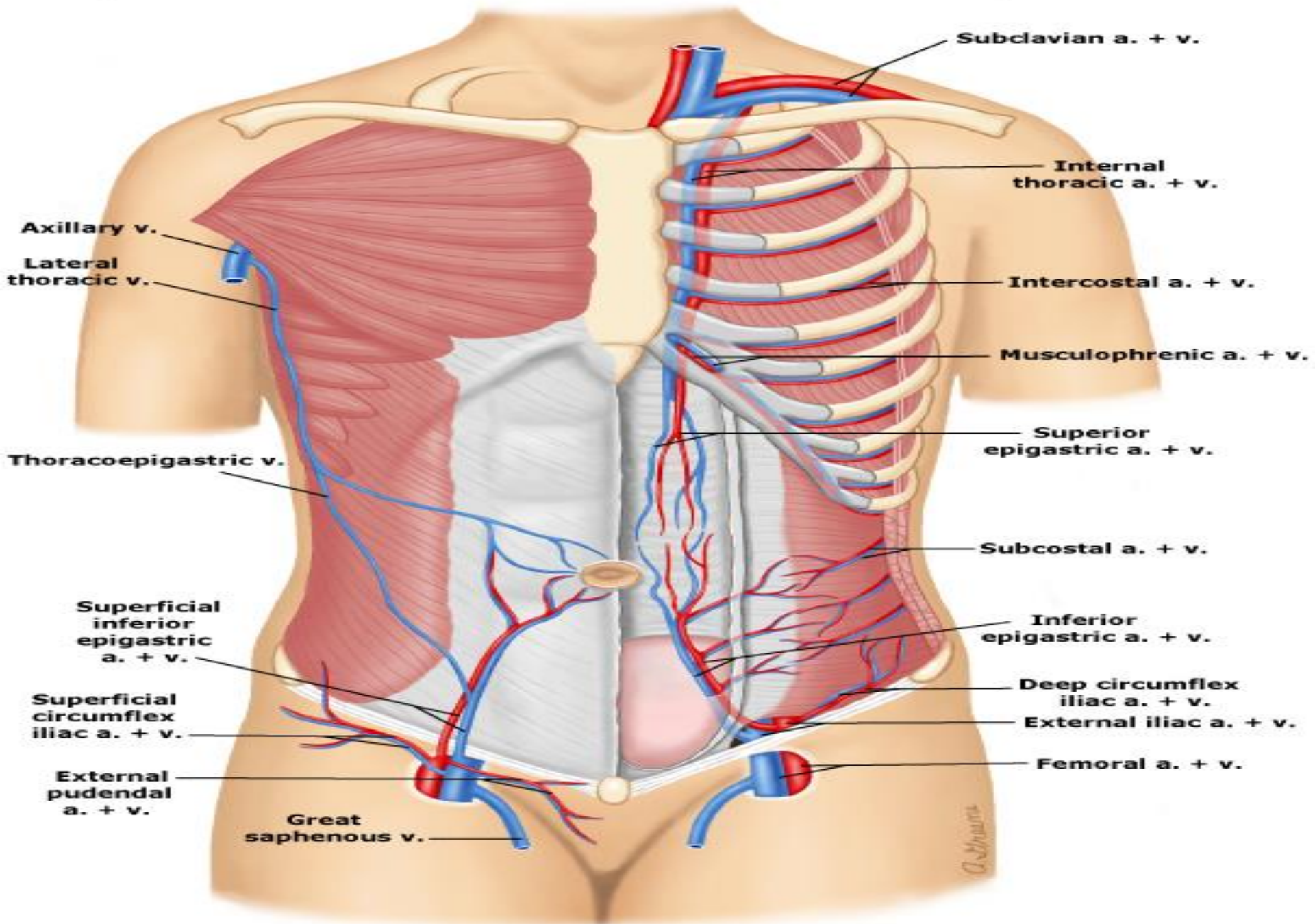
DCI- Deep Circumflex Iliac

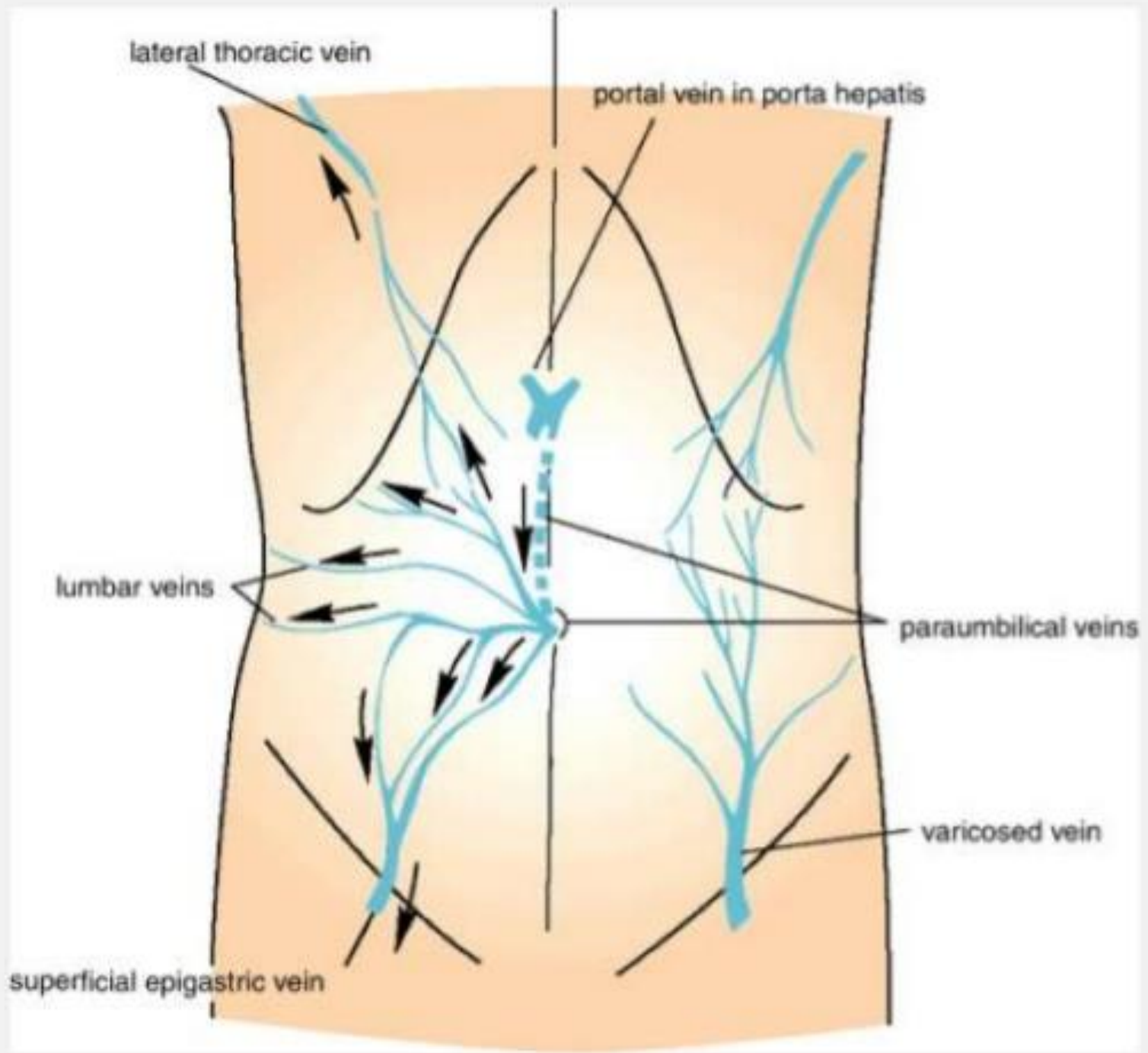
IE- Deep , inferior Epigastric Artery

SIEA- Superficial inferior Epigastric artery

Superficial vessels

Deep vessels





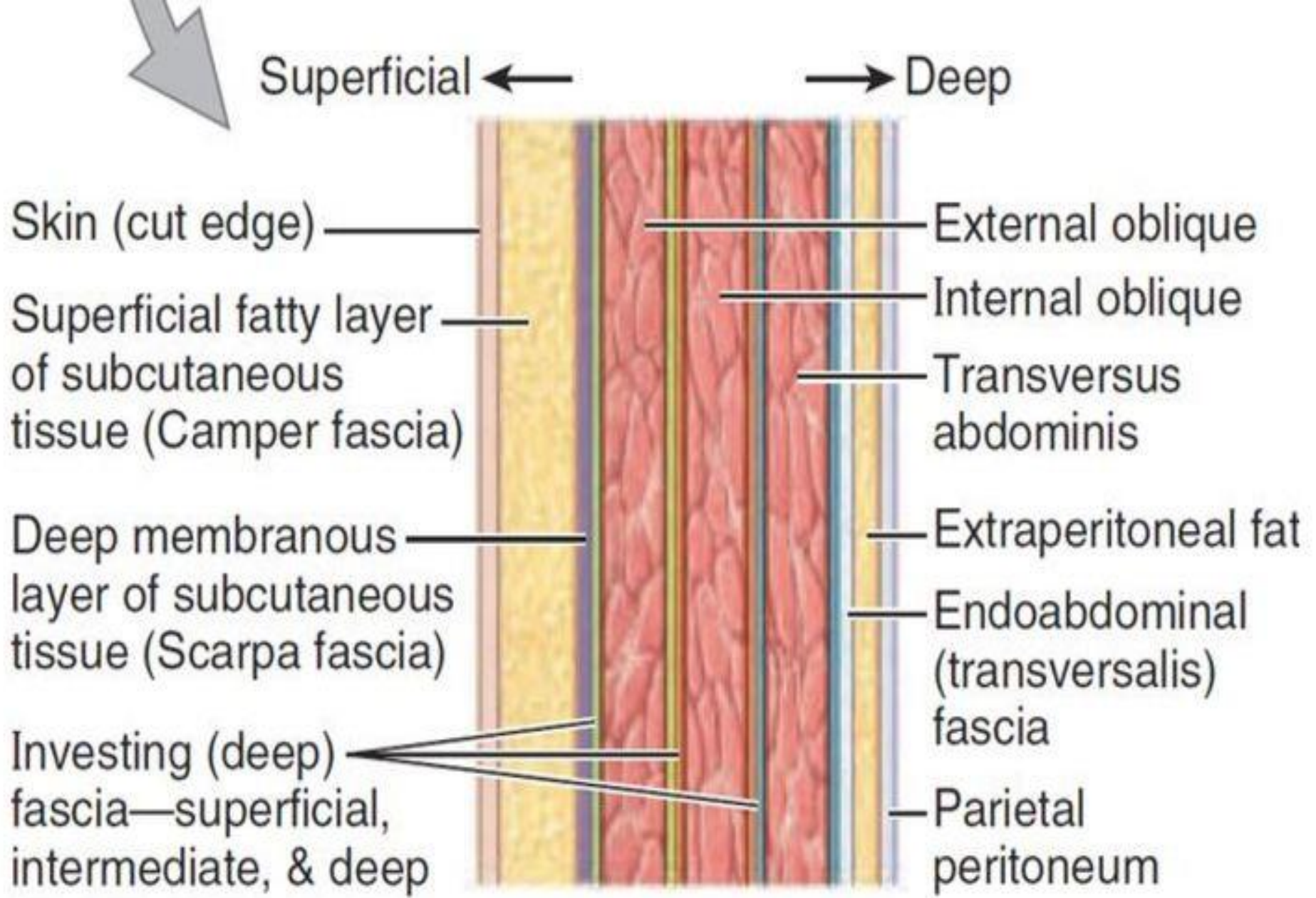
Muscles of Anterior Abdominal Wall



- **External Obliques**
 - O: lower 8 ribs
 - I: aponeurosis to linea alba
 - Function: Flex trunk, compress abd. wall (together)
Rotate trunk (separate sides)
- **Internal Obliques**
 - O: Lumbar fascia, iliac crest, inguinal ligament
 - I: Linea alba, pubic crest, last 3-4 ribs, costal margin
 - Function: Same as External obliques
- **Transversus Abdominis**
 - O: same as Internals, plus last 6 ribs
 - I: Xiphoid process, costal cart. 5-7
 - Function: Compress abdomen
- **Rectus Abdominis**
 - O: Pubic crest, pubic symphysis
 - I: Xiphoid, cost cart 5-7
 - Function: Flex, rotate trunk, compress abdomen, fix ribs

II. MUSCLES OF THE ANTERIOR ABDOMINAL WALL (Table 5-1) P185

Muscle	Origin	Insertion	Nerve	Action
External oblique	External surface of lower eight ribs (5–12)	Anterior half of iliac crest; anterior–superior iliac spine; pubic tubercle; linea alba	Intercostal (T7–T11); subcostal (T12)	Compresses abdomen; flexes trunk; active in forced expiration
Internal oblique	Lateral two-thirds of inguinal ligament; iliac crest; thoracolumbar fascia	Lower four costal cartilages; linea alba; pubic crest; pectineal line	Intercostal (T7–T11); subcostal (T12); iliohypogastric and ilioinguinal (L1)	Compresses abdomen; flexes trunk; active in forced expiration
Transverse	Lateral one-third of inguinal ligament; iliac crest; thoracolumbar fascia; lower six costal cartilages	Linea alba; pubic crest; pectineal line	Intercostal (T7–T12); subcostal (T12); iliohypogastric and ilioinguinal (L1)	Compresses abdomen; depresses ribs
Rectus abdominis	Pubic crest and pubic symphysis	Xiphoid process and costal cartilages fifth to seventh	Intercostal (T7–T11); subcostal (T12)	Depresses ribs; flexes trunk
Pyramidal	Pubic body	Linea alba	Subcostal (T12)	Tenses linea alba
Cremaster	Middle of inguinal ligament; lower margin of internal oblique muscle	Pubic tubercle and crest	Genitofemoral	Retracts testis



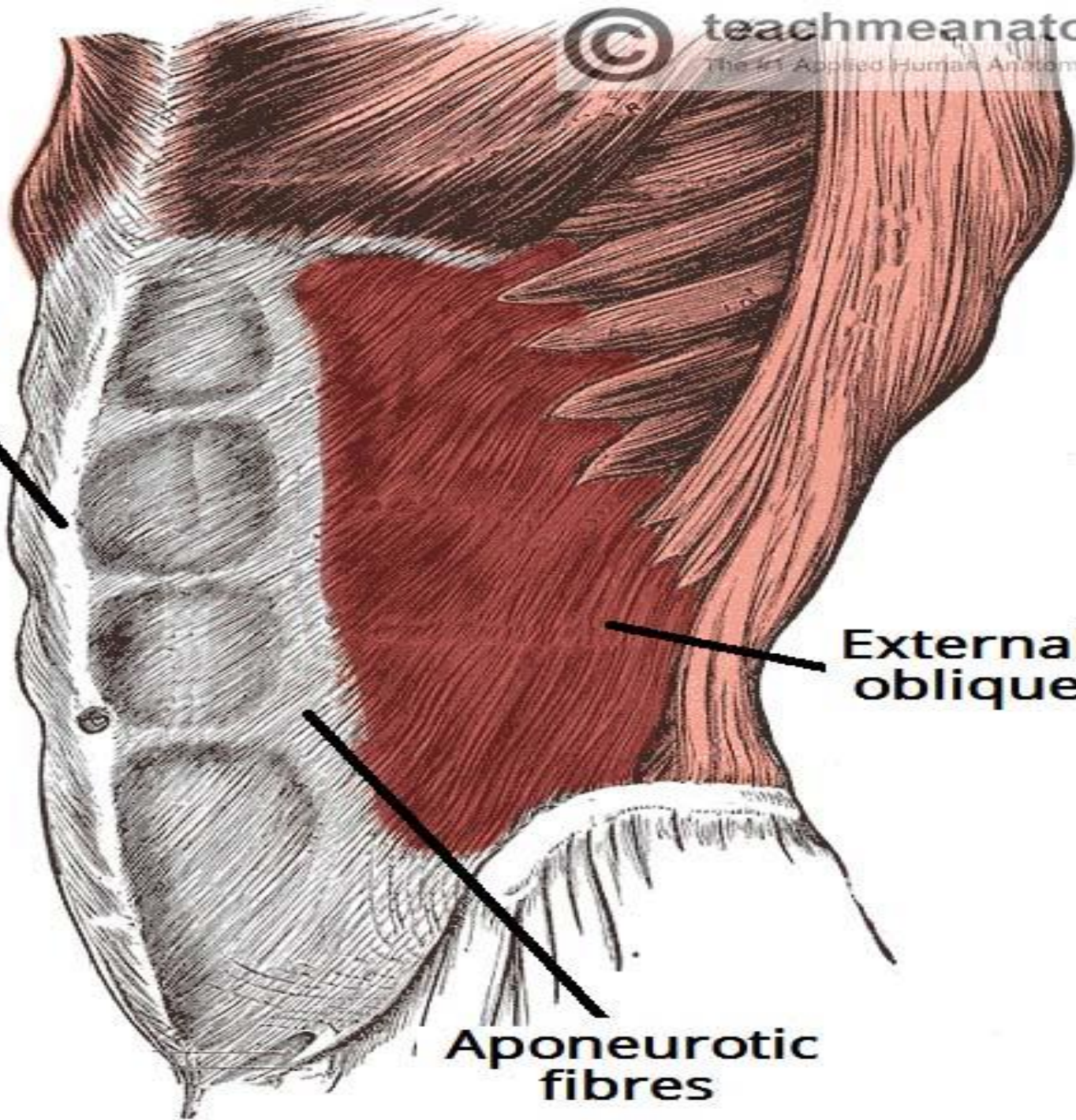
(B) Longitudinal section



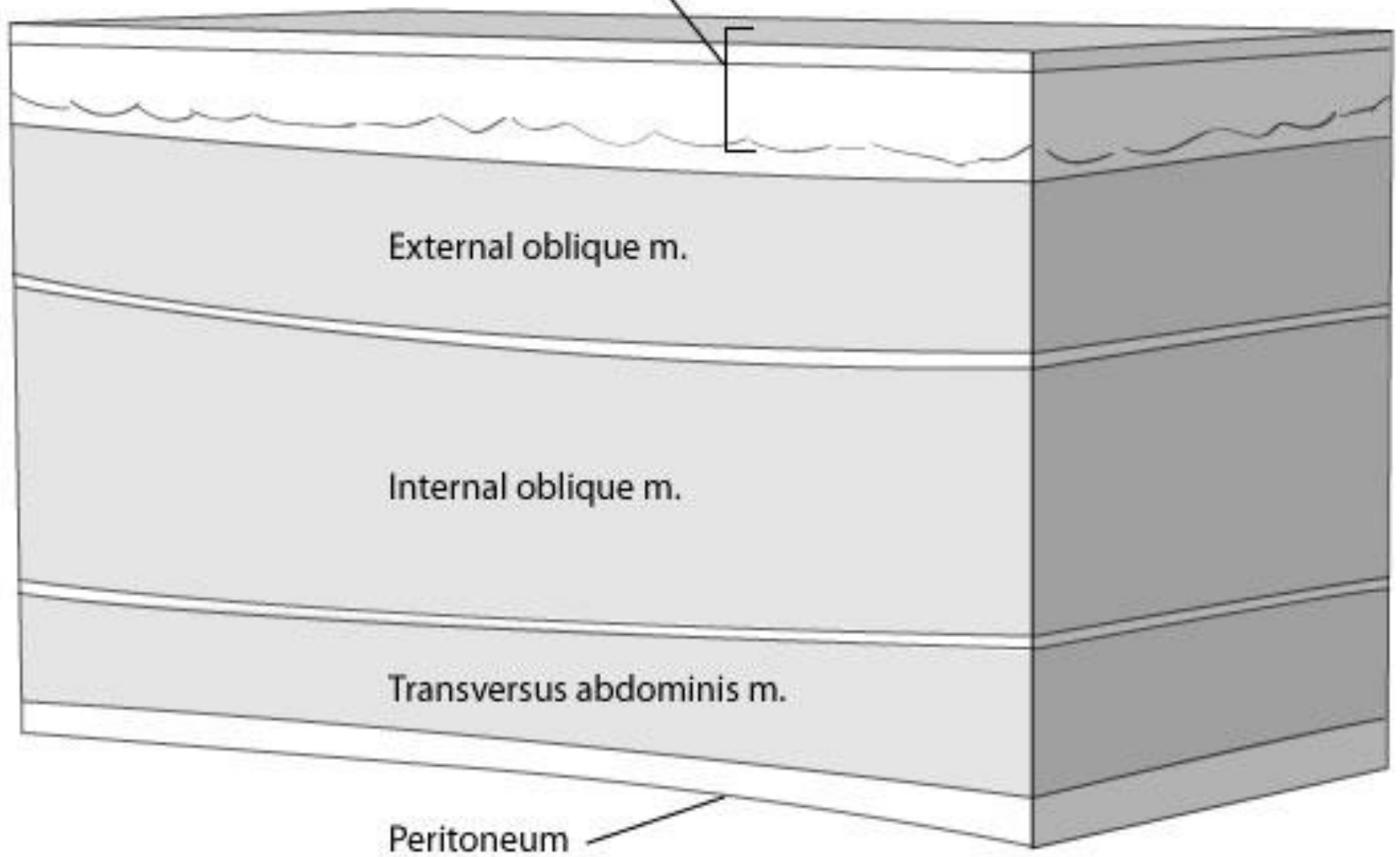
Linea
alba

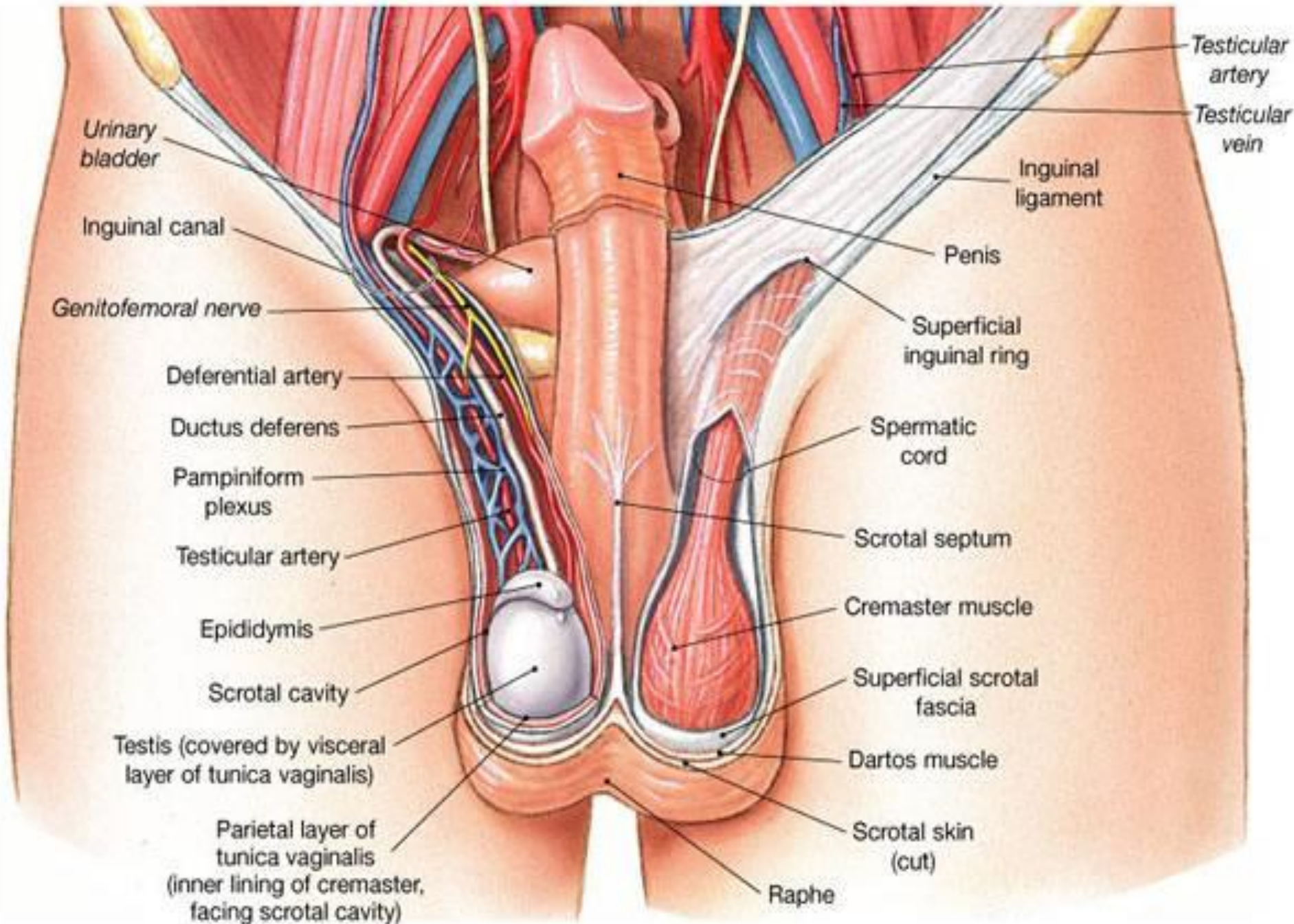
External
oblique

Aponeurotic
fibres

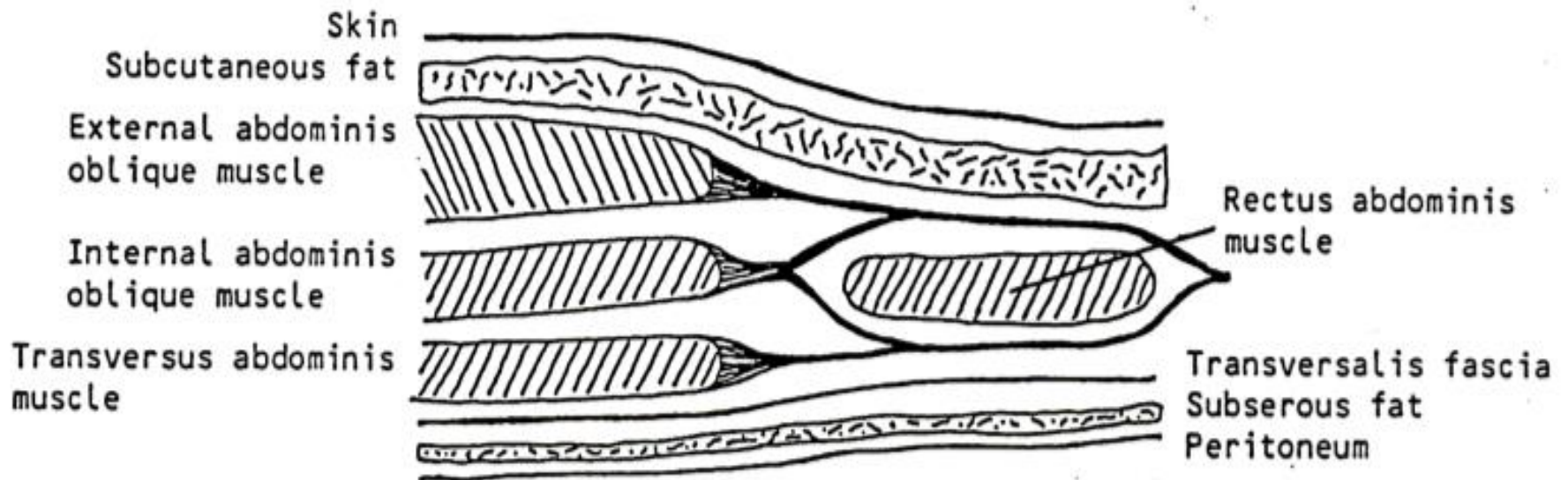


Skin and subcutaneous tissue

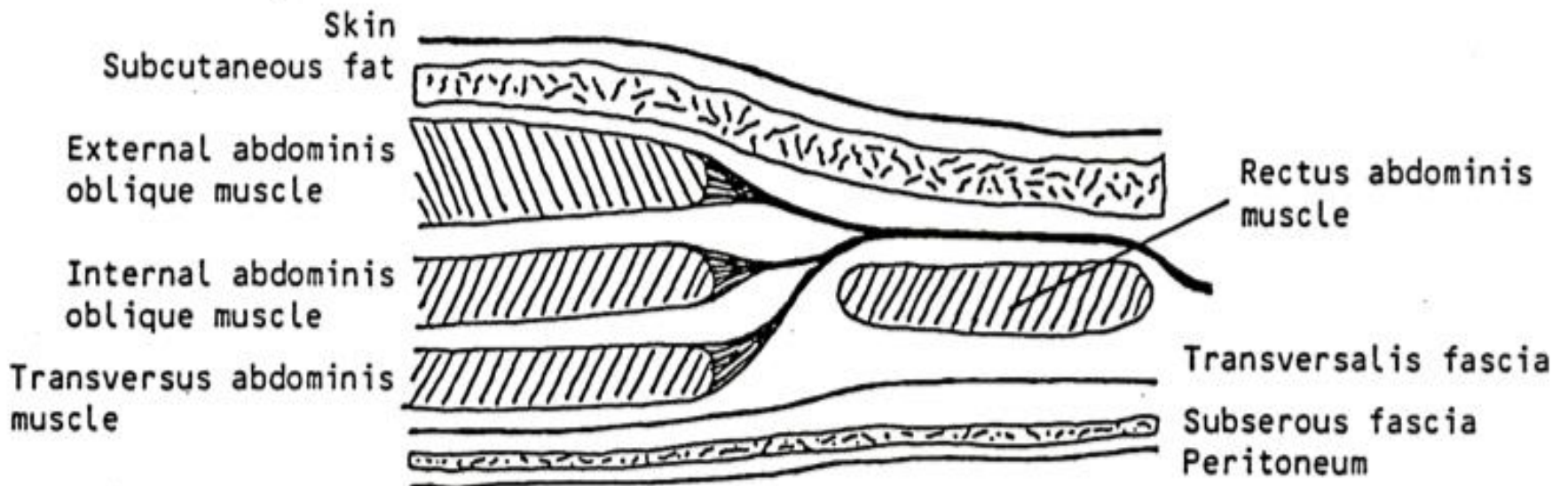




ABOVE ARCUATE LINE



BELOW ARCUATE LINE



Rectus abdominis

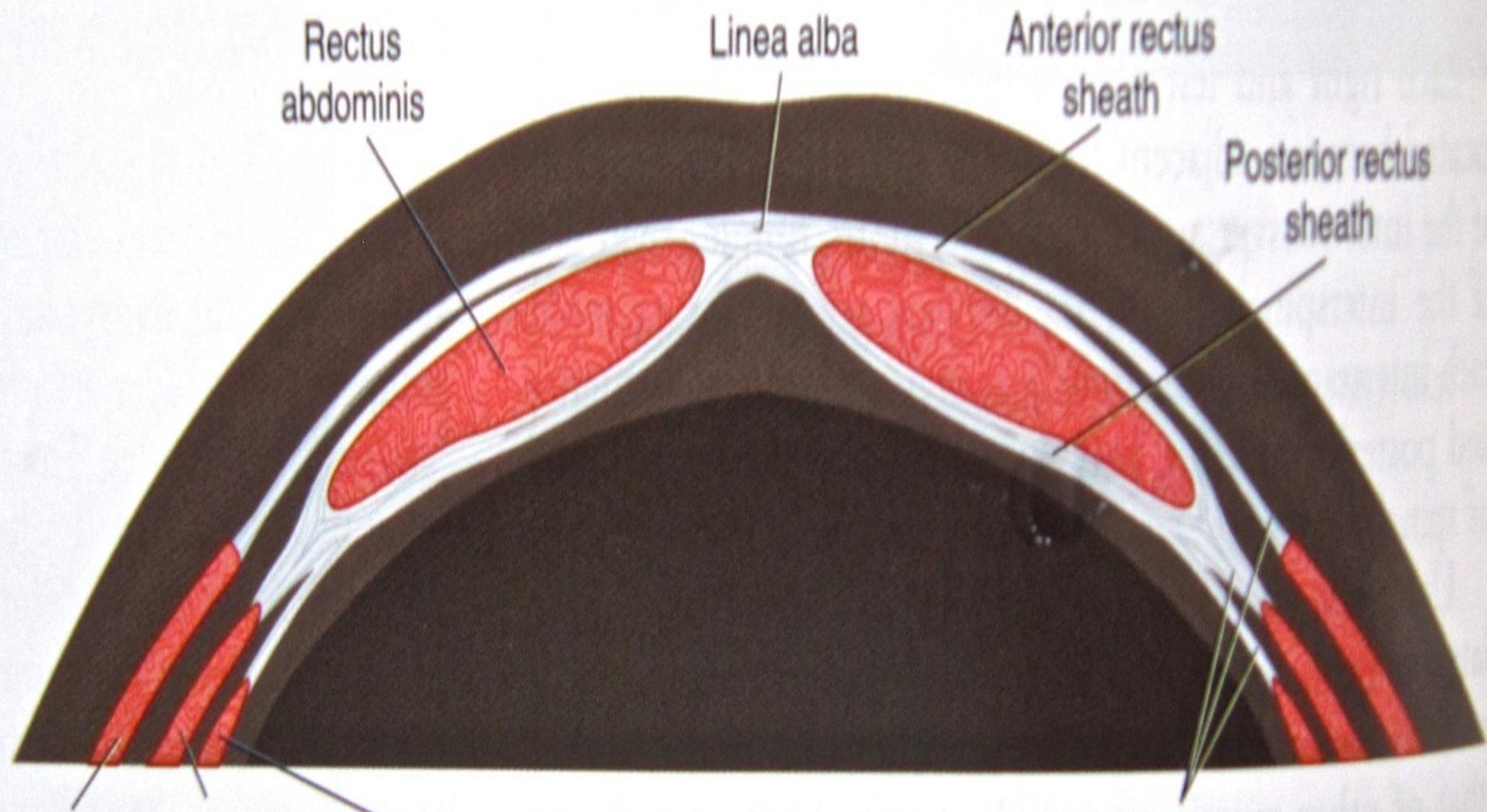
Linea alba

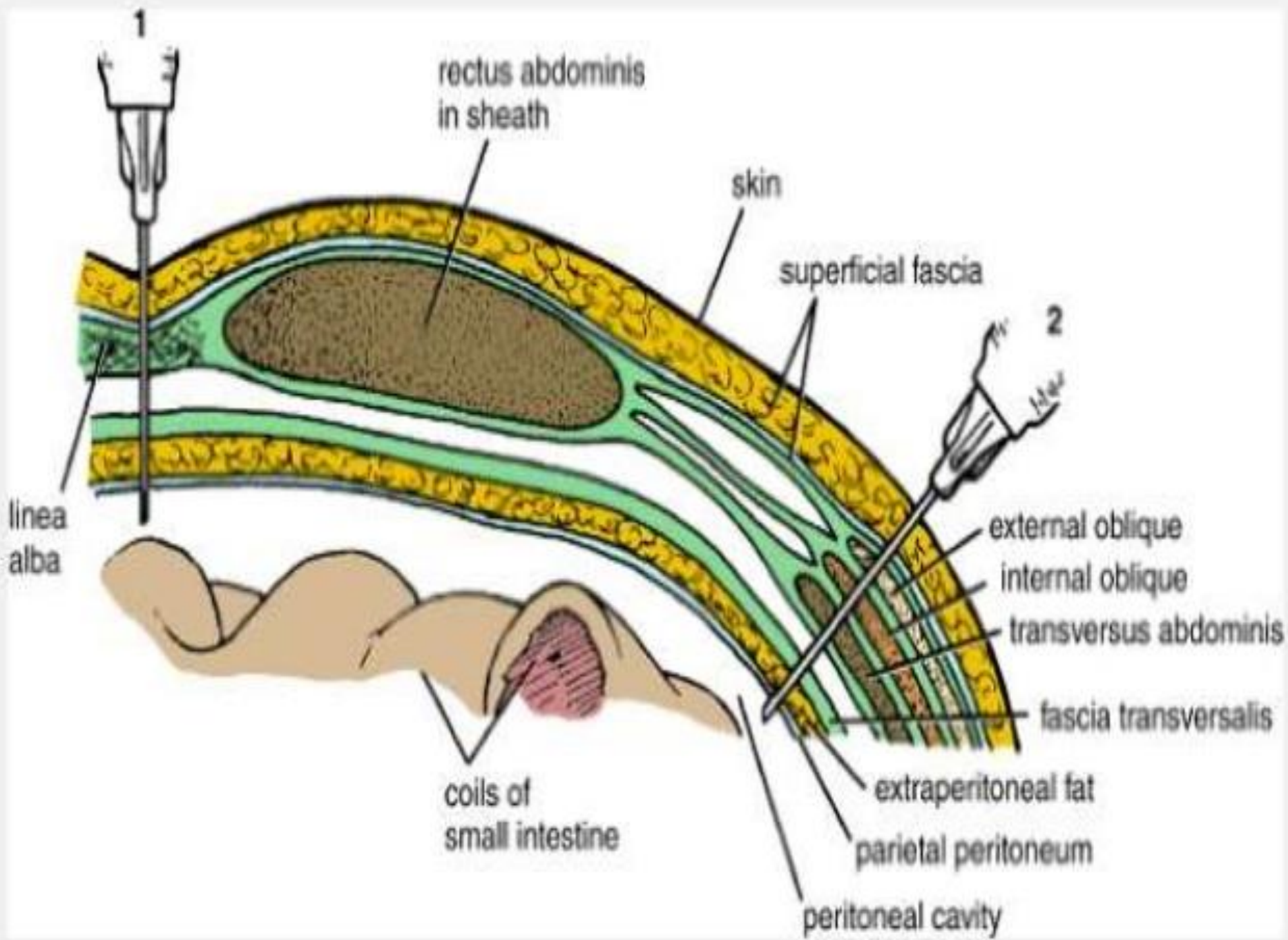
Anterior rectus sheath

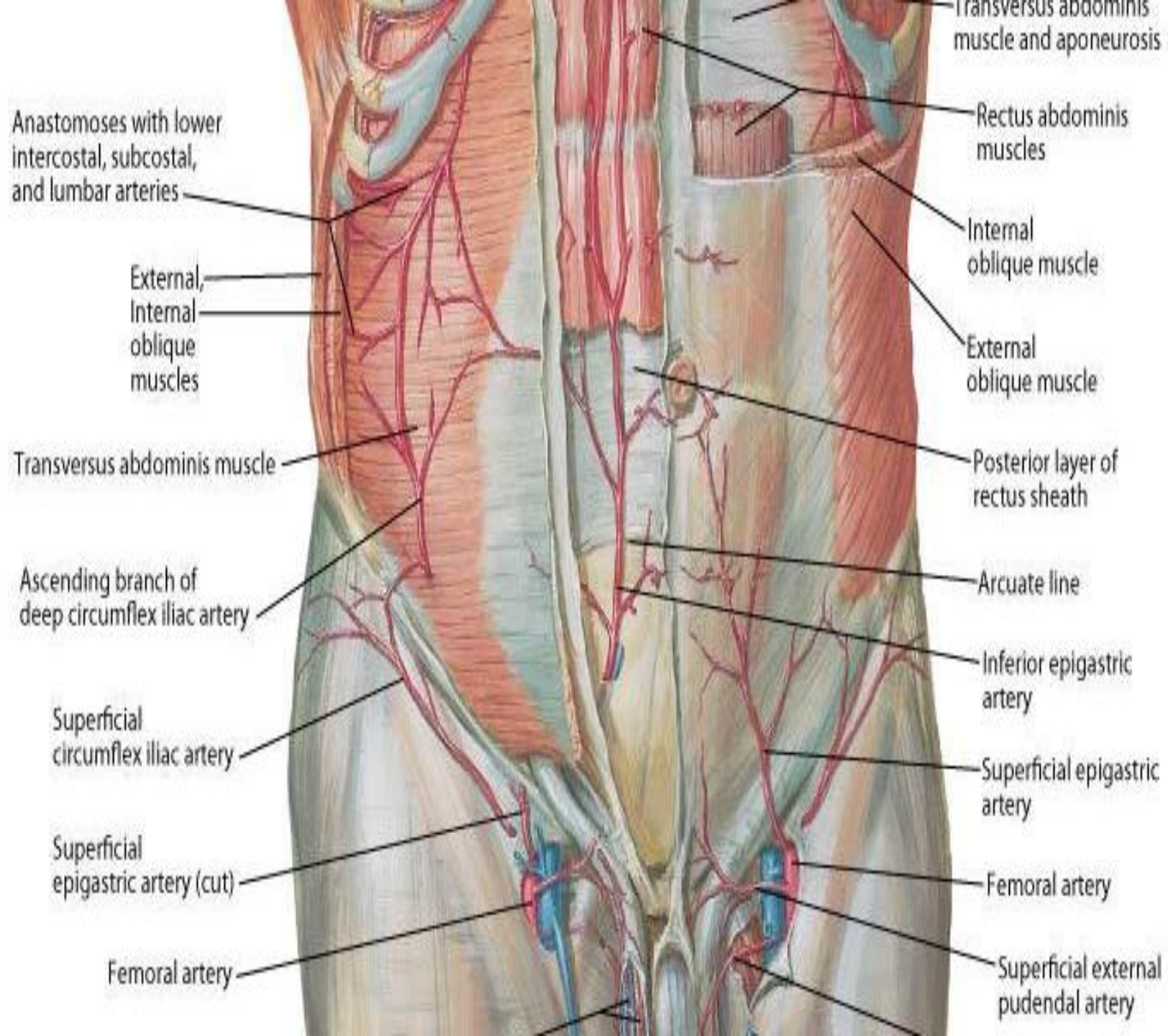
Posterior rectus sheath

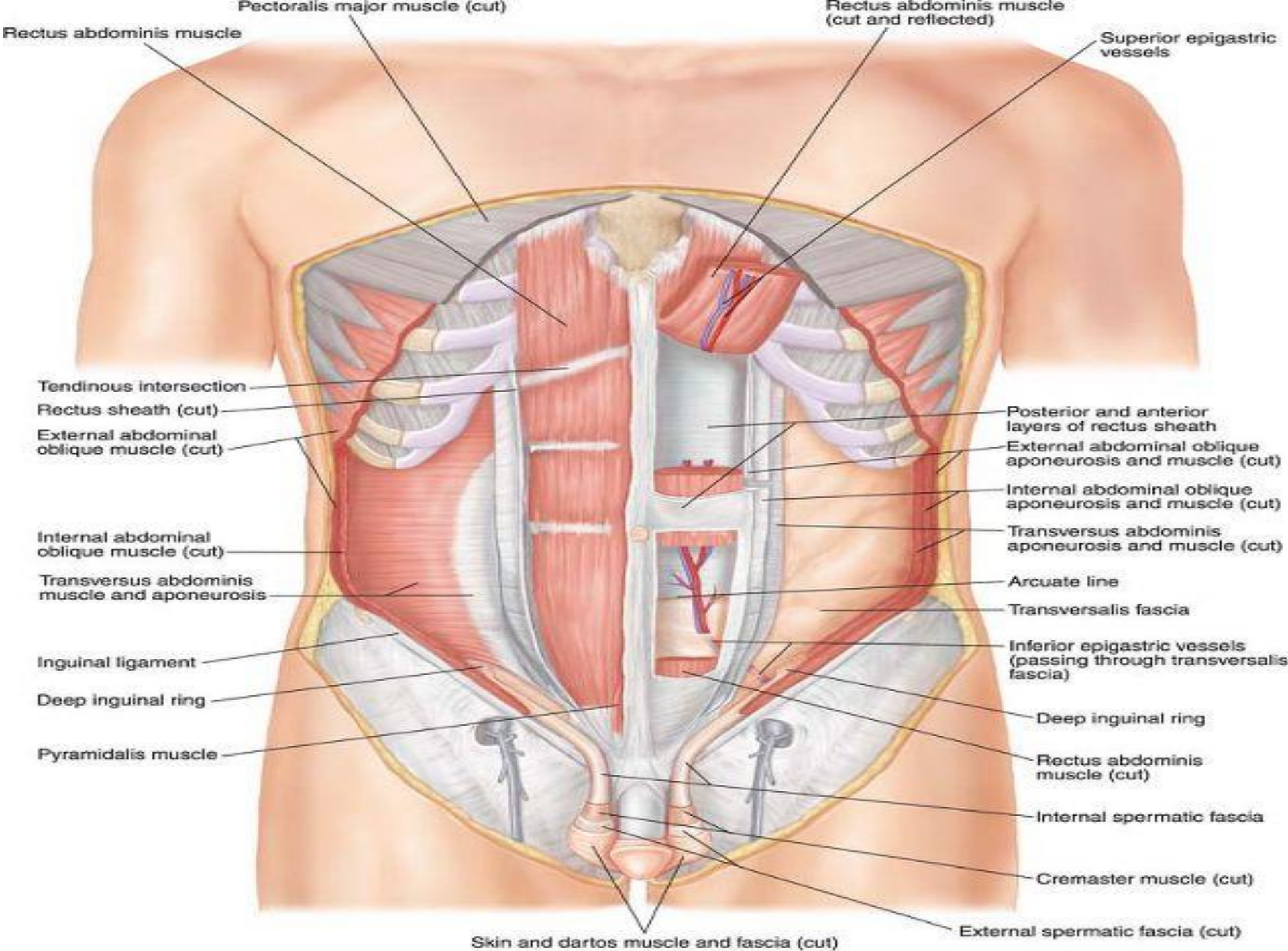
Obliquus externus abdominis
Obliquus internus abdominis
Transversus abdominis

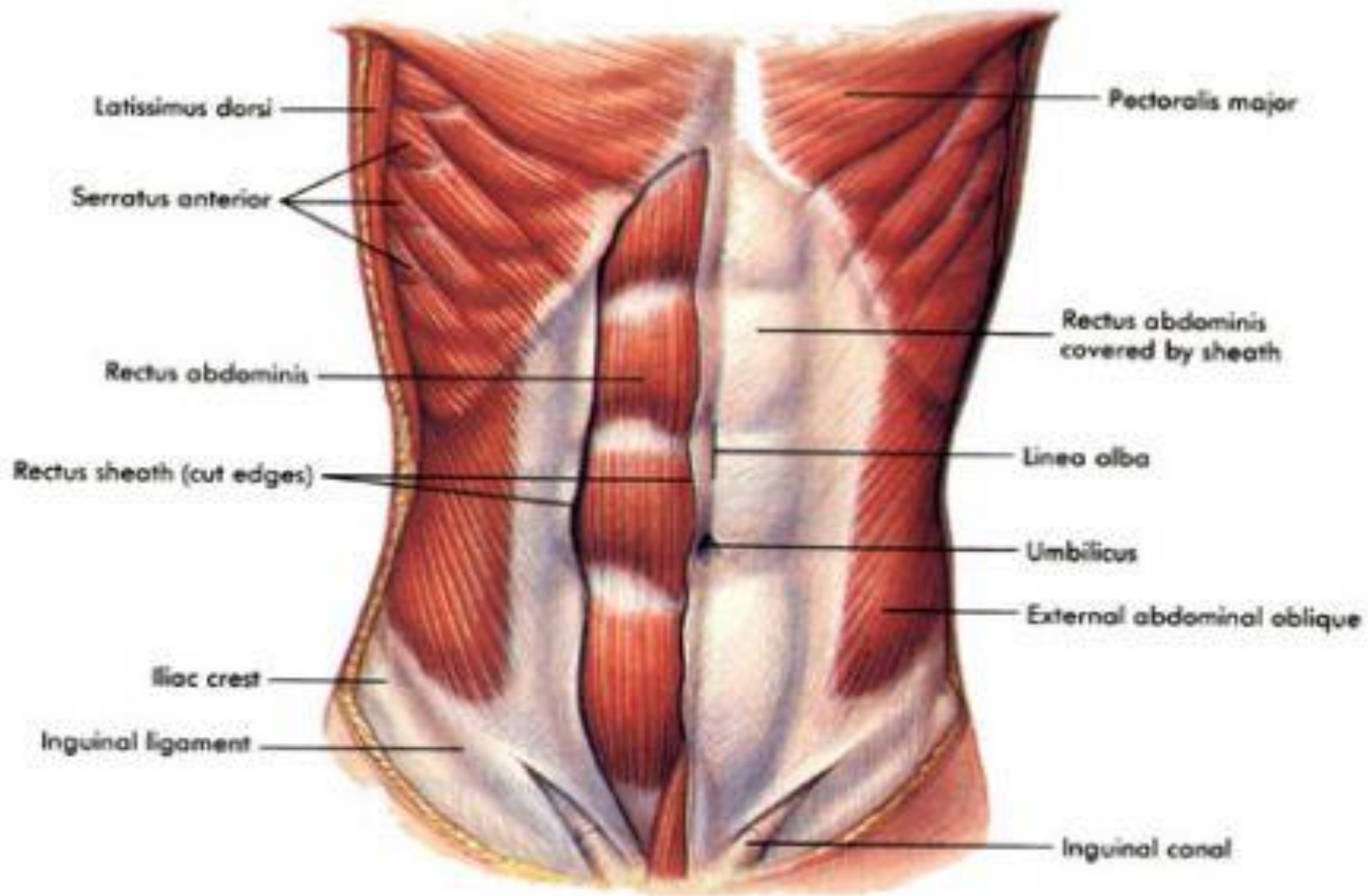
Connective tissues from lateral abdominal muscles



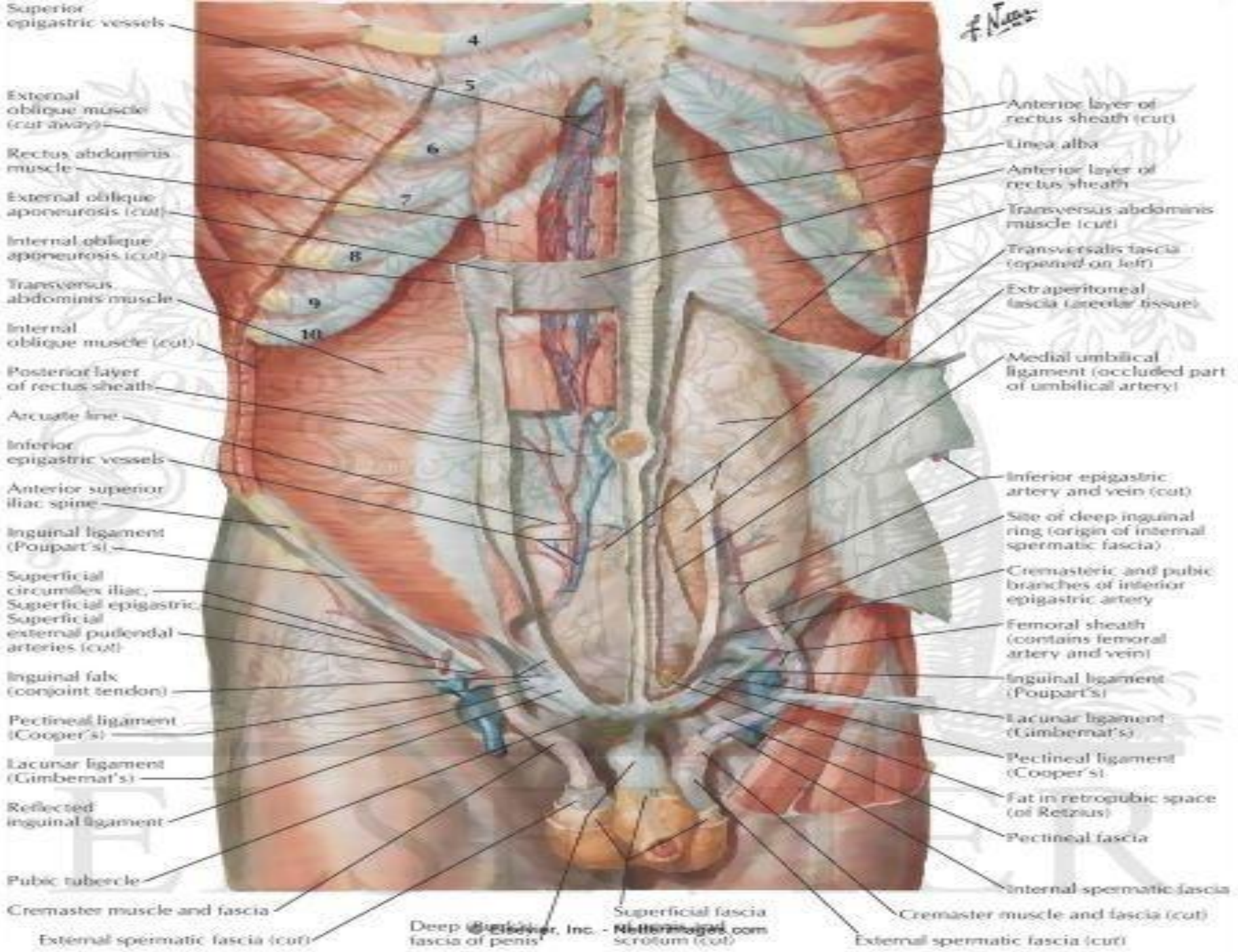






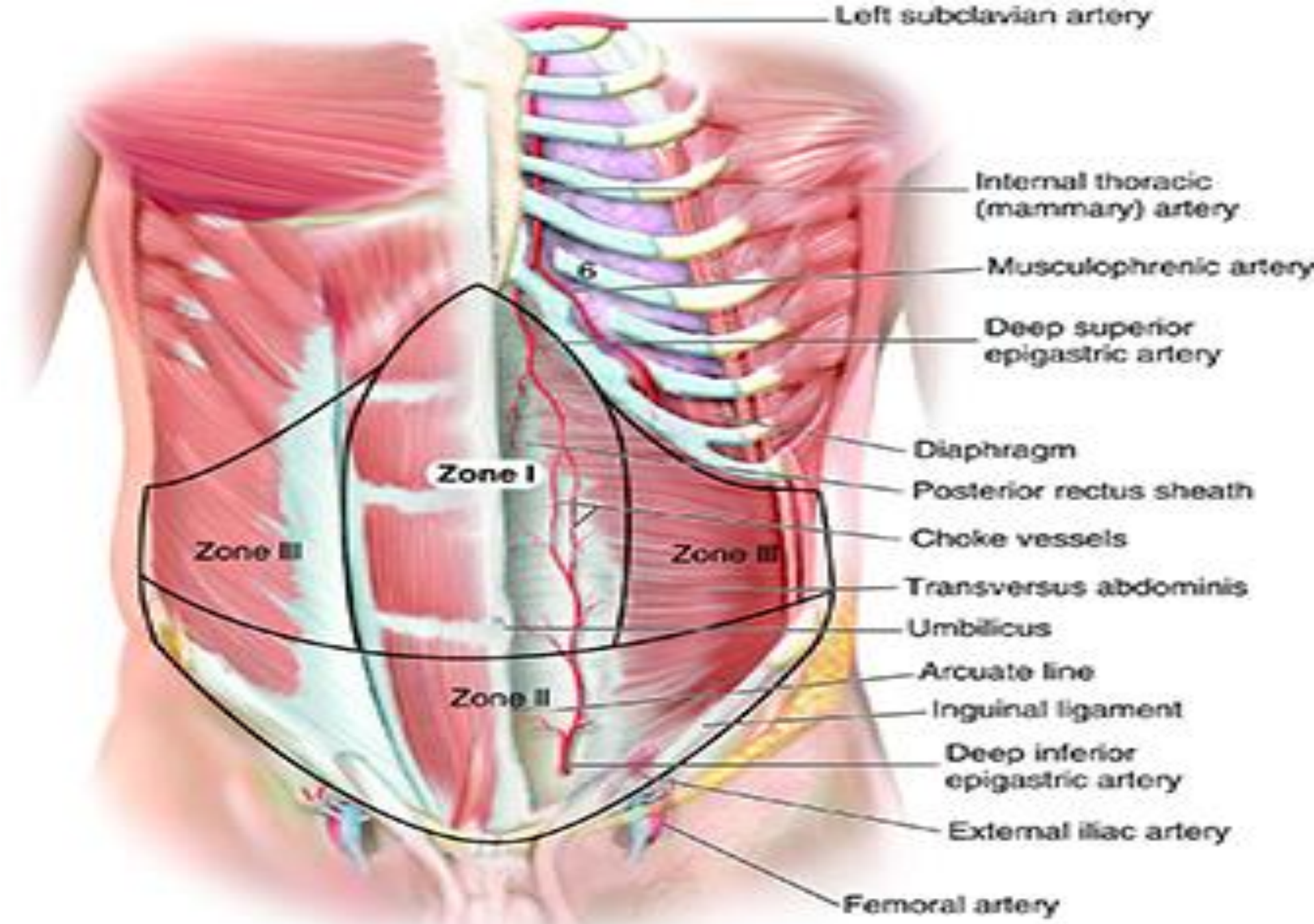


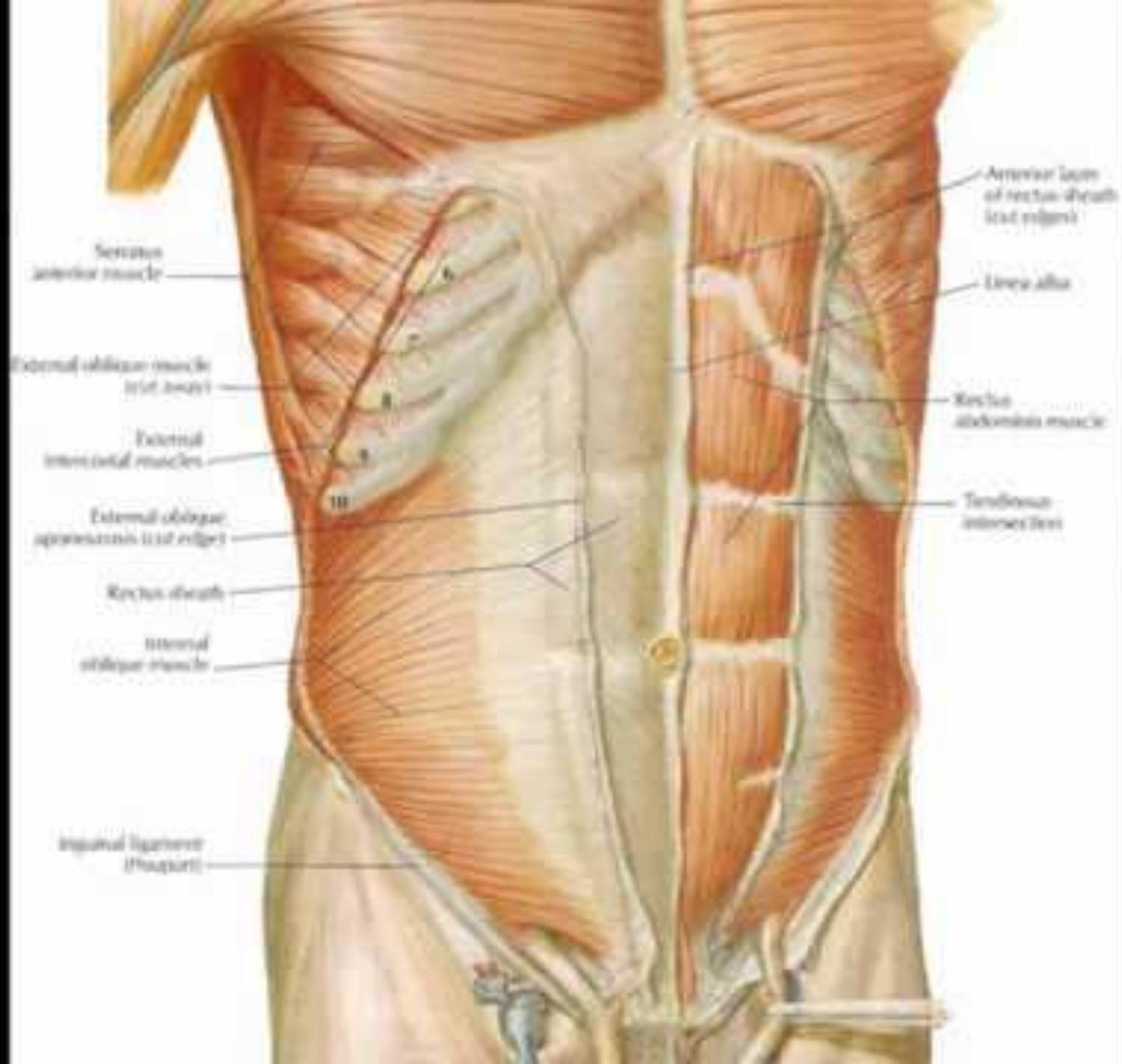
f. Netter



- Superior epigastric vessels
- External oblique muscle (cut away)
- Rectus abdominis muscle
- External oblique aponeurosis (cut)
- Internal oblique aponeurosis (cut)
- Transversus abdominis muscle
- Internal oblique muscle (cut)
- Posterior layer of rectus sheath
- Arcuate line
- Inferior epigastric vessels
- Anterior superior iliac spine
- Inguinal ligament (Poupart's)
- Superficial circumflex iliac, Superficial epigastric, Superficial external pudendal arteries (cut)
- Inguinal falk (conjoint tendon)
- Pectineal ligament (Cooper's)
- Lacunar ligament (Gimbernat's)
- Reflected inguinal ligament
- Pubic tubercle
- Cremaster muscle and fascia
- External spermatic fascia (cut)

- Anterior layer of rectus sheath (cut)
- Linea alba
- Anterior layer of rectus sheath
- Transversus abdominis muscle (cut)
- Transversalis fascia (opened on left)
- Extraperitoneal fascia (areolar tissue)
- Medial umbilical ligament (occluded part of umbilical artery)
- Inferior epigastric artery and vein (cut)
- Site of deep inguinal ring (origin of internal spermatic fascia)
- Cremasteric and pubic branches of inferior epigastric artery
- Femoral sheath (contains femoral artery and vein)
- Inguinal ligament (Poupart's)
- Lacunar ligament (Gimbernat's)
- Pectineal ligament (Cooper's)
- Fat in retrogubric space (of Retzius)
- Pectineal fascia
- Internal spermatic fascia
- Cremaster muscle and fascia (cut)





Serratus anterior muscle

External oblique muscle (cut away)

External intercostal muscles

External oblique (superior part) (cut away)

Rectus abdominis

Internal oblique muscle

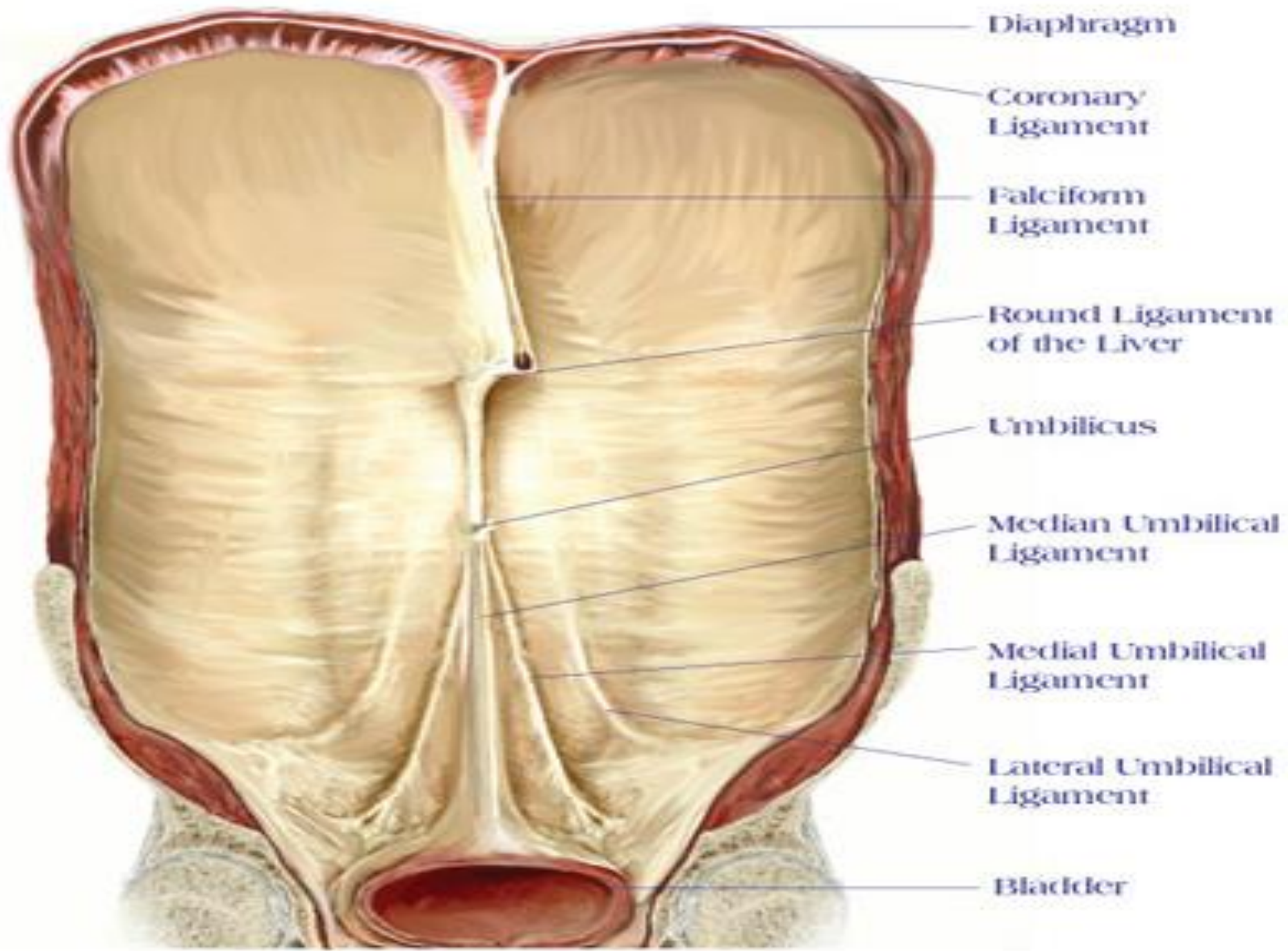
Inguinal ligament (thrust)

Anterior lamina of rectus abdominis (cut away)

Linea alba

Rectus abdominis muscle

Transverse intercostal line



Diaphragm

Coronary Ligament

Falciform Ligament

Round Ligament of the Liver

Umbilicus

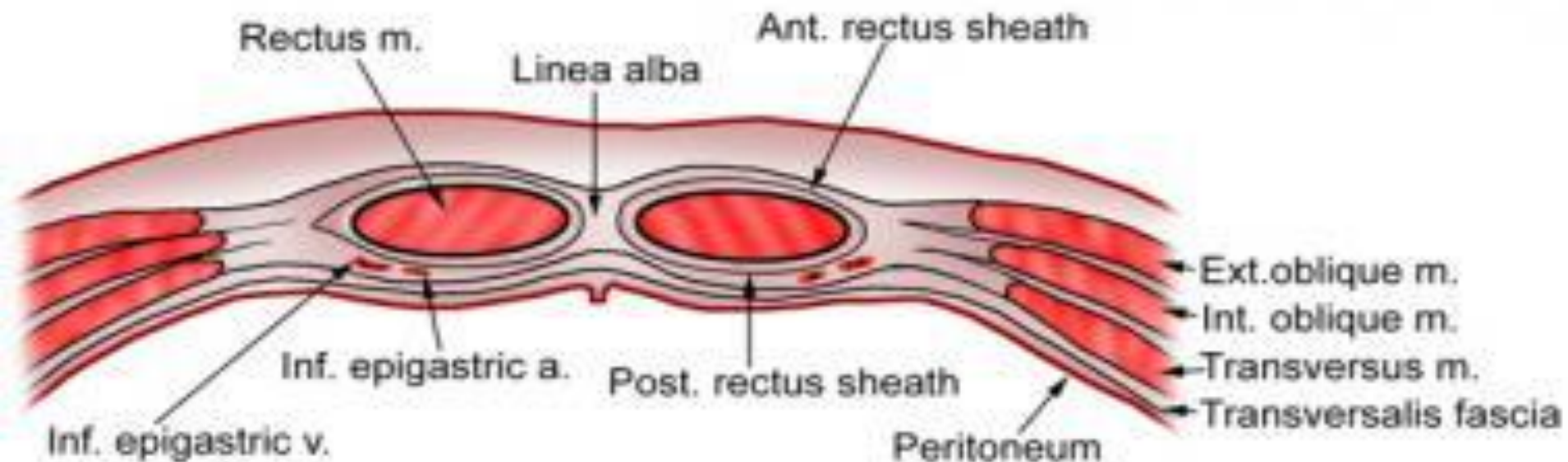
Median Umbilical Ligament

Medial Umbilical Ligament

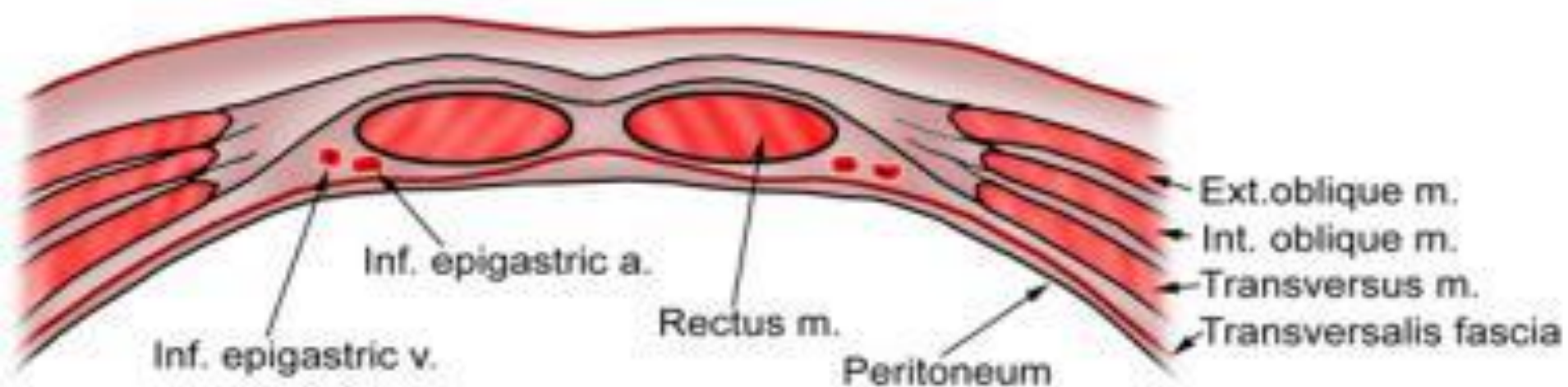
Lateral Umbilical Ligament

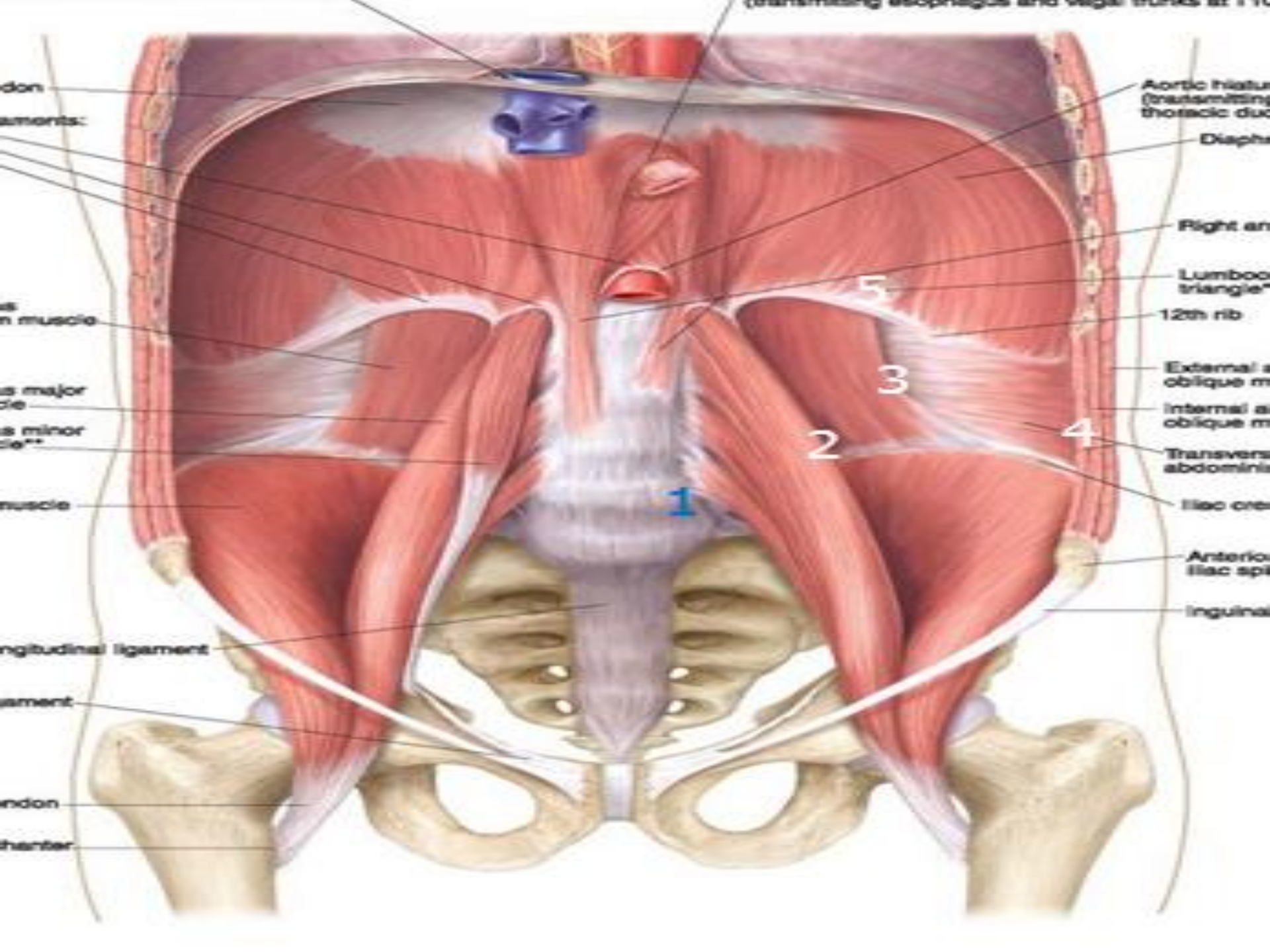
Bladder

Above Arcuate Line



Below Arcuate Line





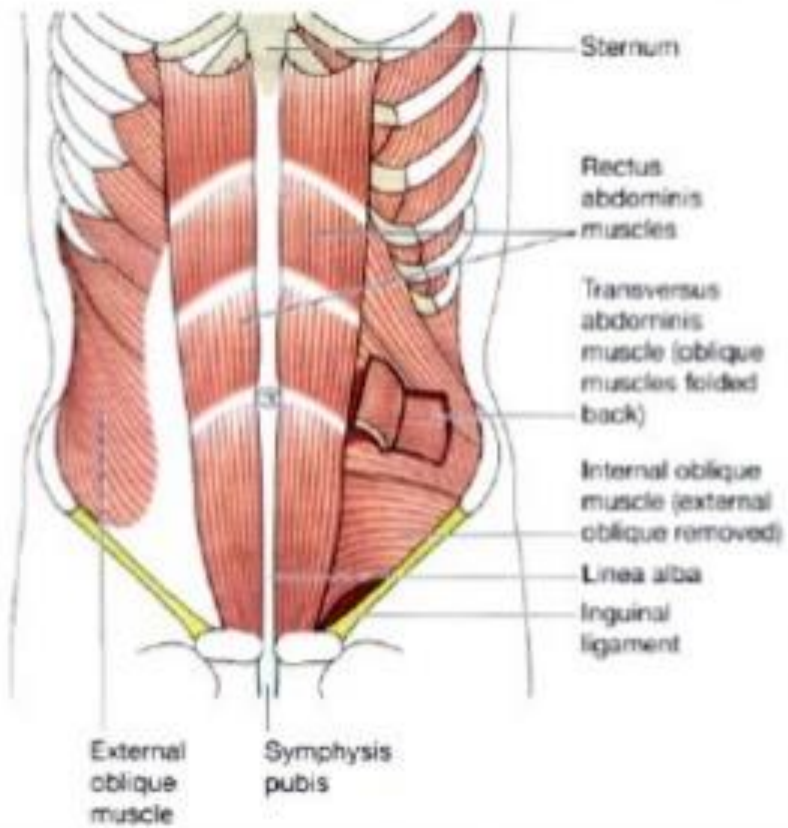


Fig: Anterior abdominal wall muscles

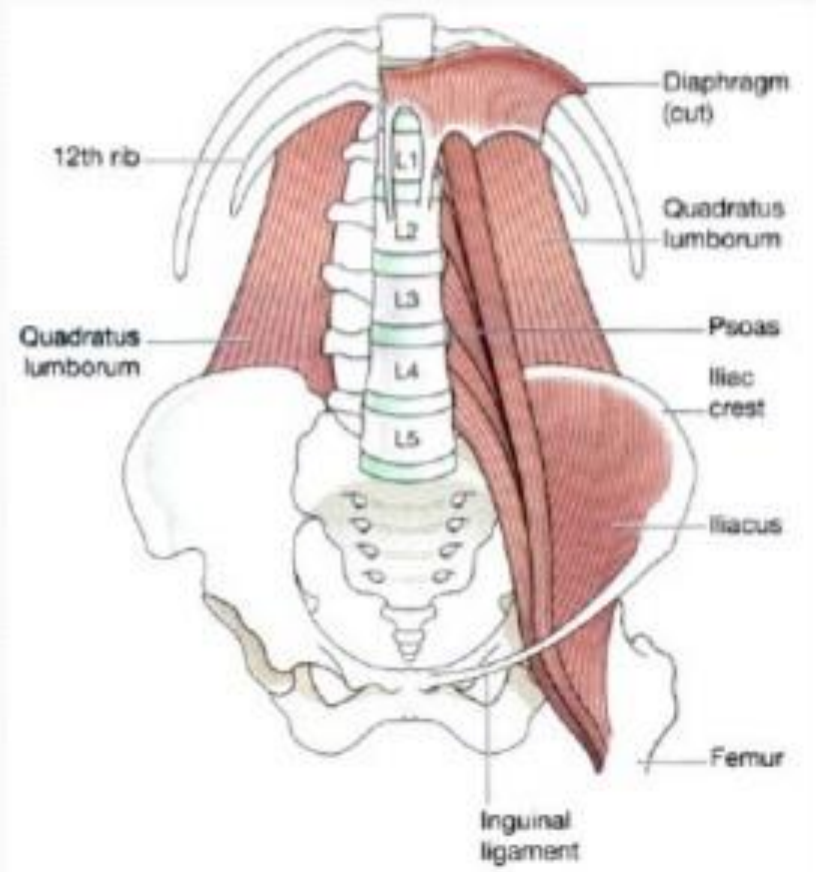


Fig: Posterior abdominal wall muscles

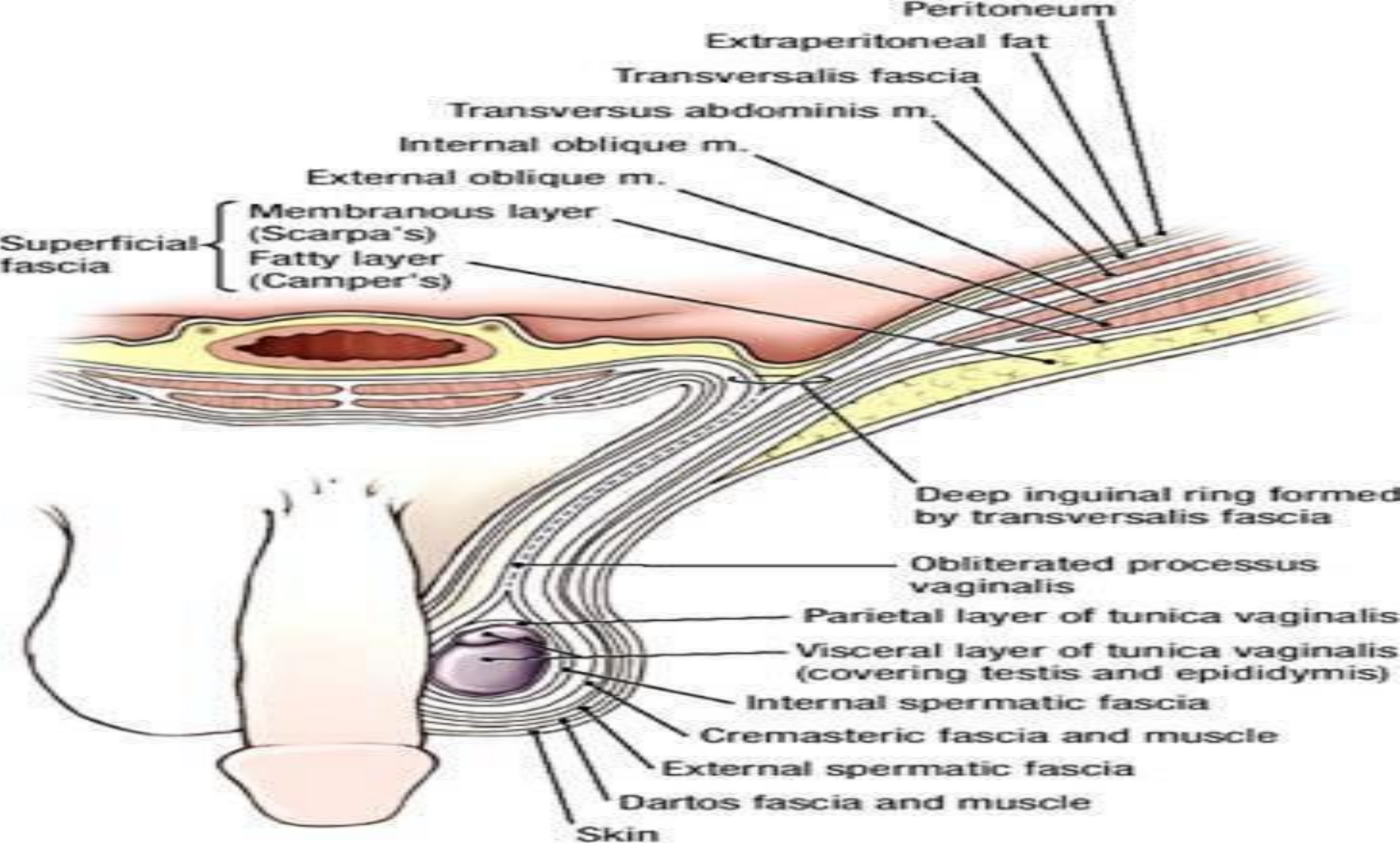
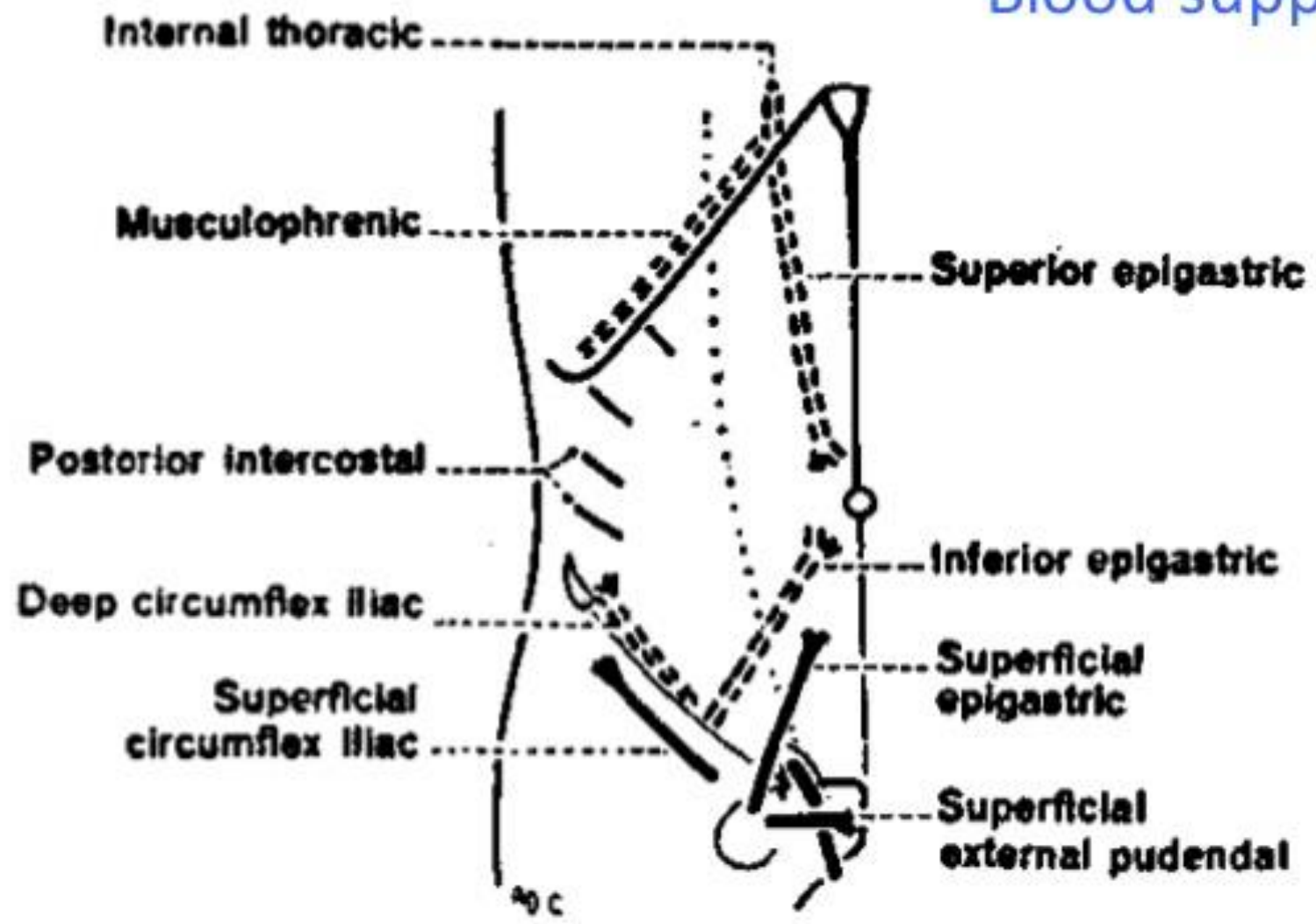


Figure 5.7. Contributions of the anterior abdominal wall to the coverings of the scrotum, spermatic cord, and testis.

Blood supply



Arteries of the anterior abdominal wall .

Regions of Abdominal Area

Right
hypochoondriac
region

Epi-
gastric
region

Left
hypochoondriac
region

Right
lumbar
region

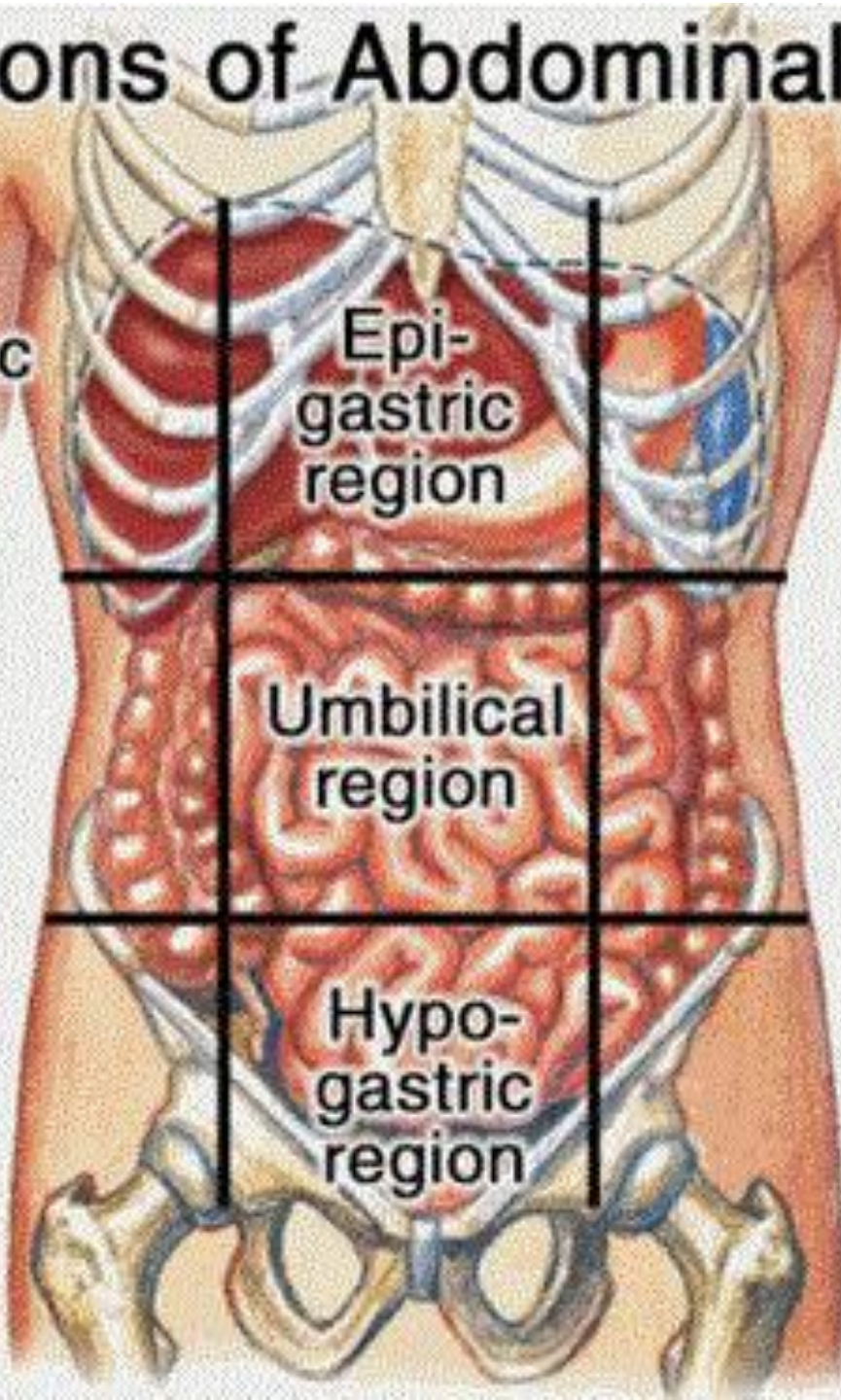
Umbilical
region

Left
lumbar
region

Right
iliac
region

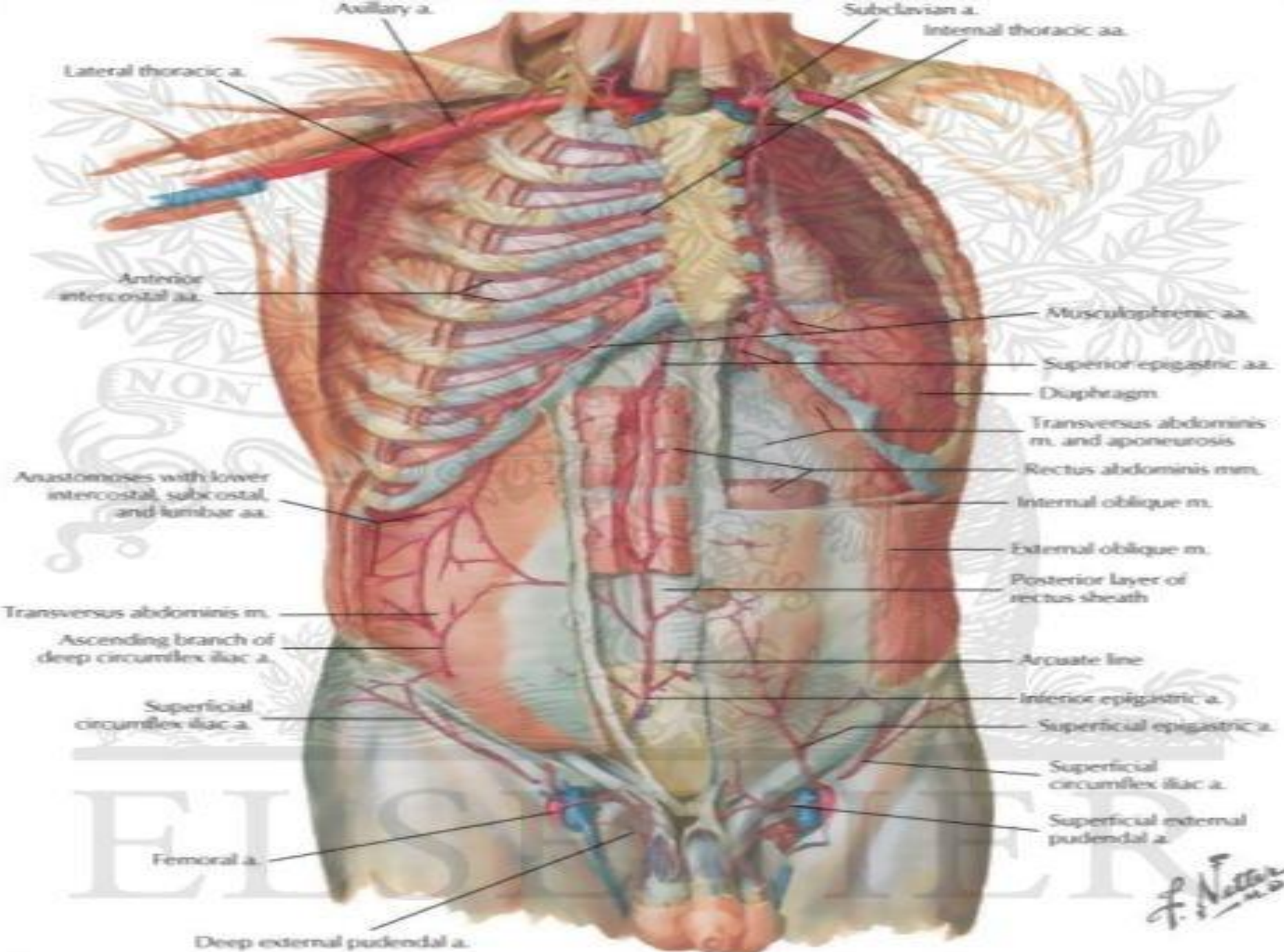
Hypo-
gastric
region

Left
iliac
region



Umbilicus

- A fibrous cicatrix, the umbilicus, lies a little below the midpoint of the linea alba, and is covered by an adherent area of skin.
- In the fetus, the umbilicus transmits the umbilical vessels, urachus and, up to the third month, the vitelline or yolk stalk.
- It closes a few days after birth, but the vestiges of the vessels and urachus remain attached to its deep surface.
- The remnant of the fetal left umbilical vein forms the round ligamentum of the liver.
- The obliterated umbilical arteries form the medial umbilical ligaments, enclosed in peritoneal folds of the same name.
- The partially obliterated remains of the urachus persist as the median umbilical ligament.



Anterior Abdominal Wall

B- Medial:

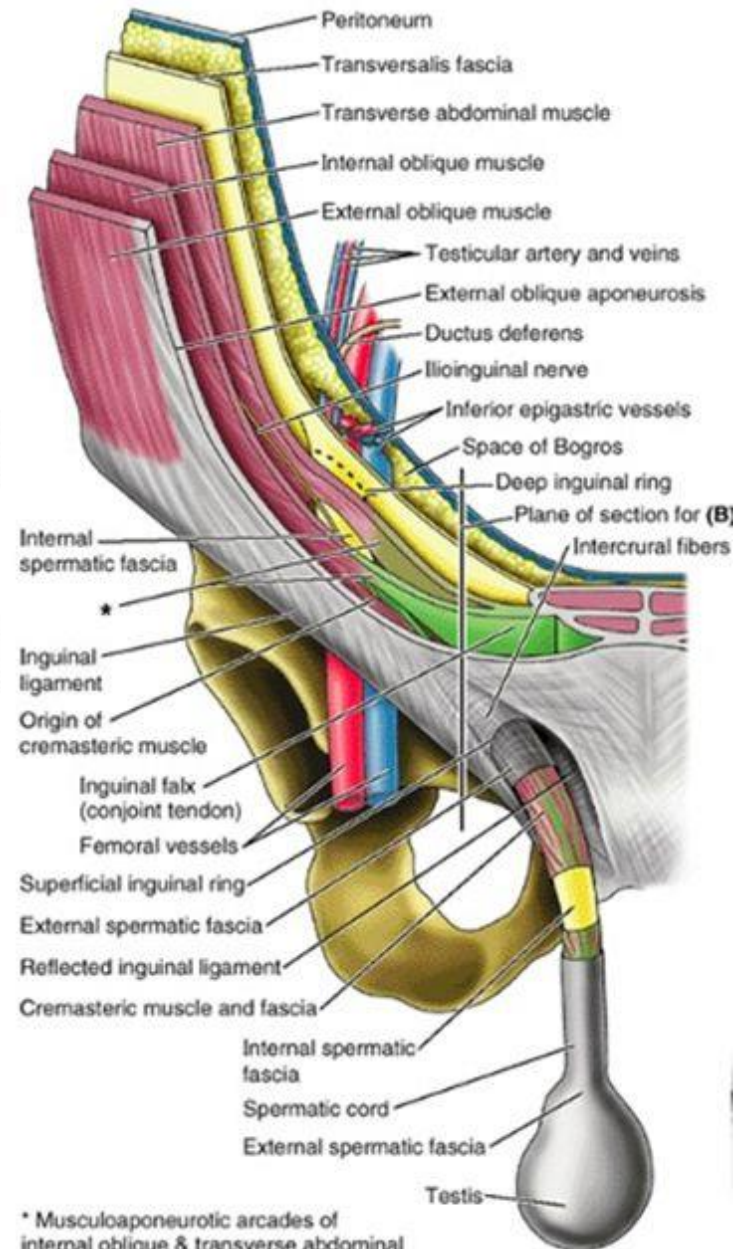
- 1- Skin.
- 2- Superficial fascia.
- 3- Anterior wall of rectus sheath.
- 4- Rectus muscle.
- 5- Posterior wall of rectus sheath.
- 6- Peritoneum.

ANATOMY
OF
INGUINAL REGION

أ.د. عبد الجبار الحبيطي

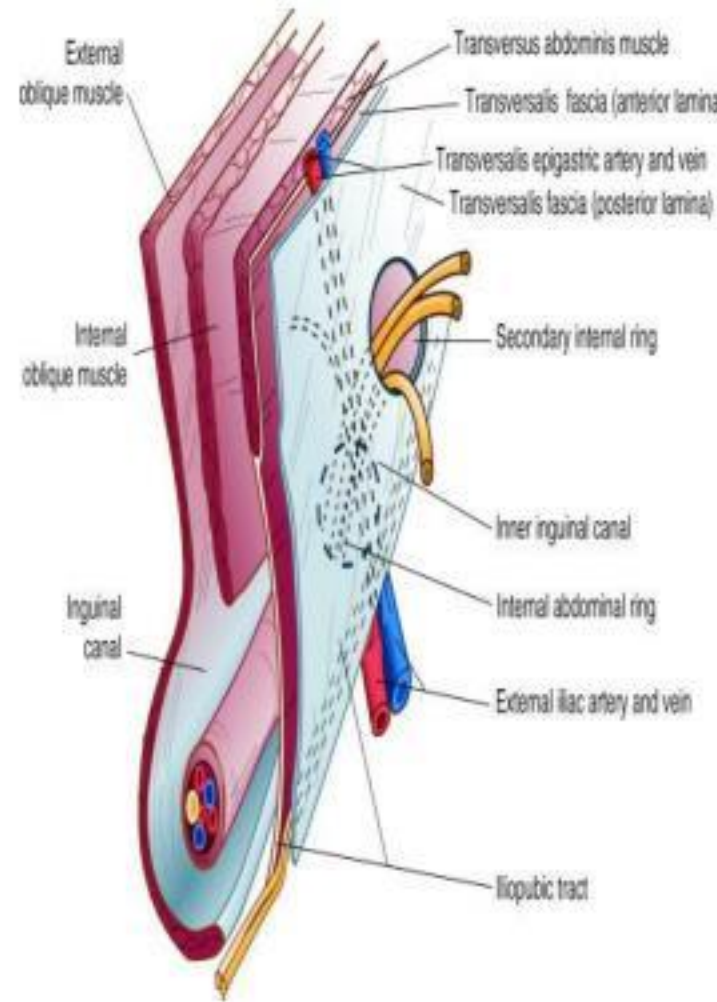
Inguinal Canal

It is an oblique passage through the lower part of the anterior abdominal wall. It is about 4 cm long in adult and extends from the deep inguinal ring, downward and medially to the superficial inguinal ring. It lies parallel to and immediately above the inguinal ligament.



Anatomy of the inguinal canal

- The inguinal canal is approximately 4 cm in length and is located 2 to 4 cm cephalad to the inguinal ligament. In infants, the superficial and deep inguinal rings are almost superimposed and the obliquity of the canal is slight
- The canal extends between the internal (deep) inguinal and the external (superficial) inguinal rings.
- *The superficial inguinal ring is a triangular aperture in the aponeurosis of the external oblique muscle and lies 1.25 cm above the pubic tubercle.*
- *The deep inguinal ring is a U-shaped condensation of the transversalis fascia and it lies 1.25 cm above the inguinal (Poupart's) ligament, midway between the symphysis pubis and the anterior superior iliac spine.*
- The anterior boundary comprises mainly the external oblique aponeurosis with the conjoined muscle laterally.
- The posterior boundary is formed by the fascia transversalis and the conjoined tendon (internal oblique and transversus abdominis medially).
- The inferior epigastric vessels lie posteriorly and medially to the deep inguinal ring.
- The superior boundary is formed by the conjoined muscles (internal oblique and transversus)
- and the inferior boundary is the inguinal ligament.



Walls of Inguinal Canal

Anterior wall:

External oblique aponeurosis, reinforced laterally by the origin of internal oblique from the inguinal ligament. It contains superficial inguinal ring medially.

Posterior wall:

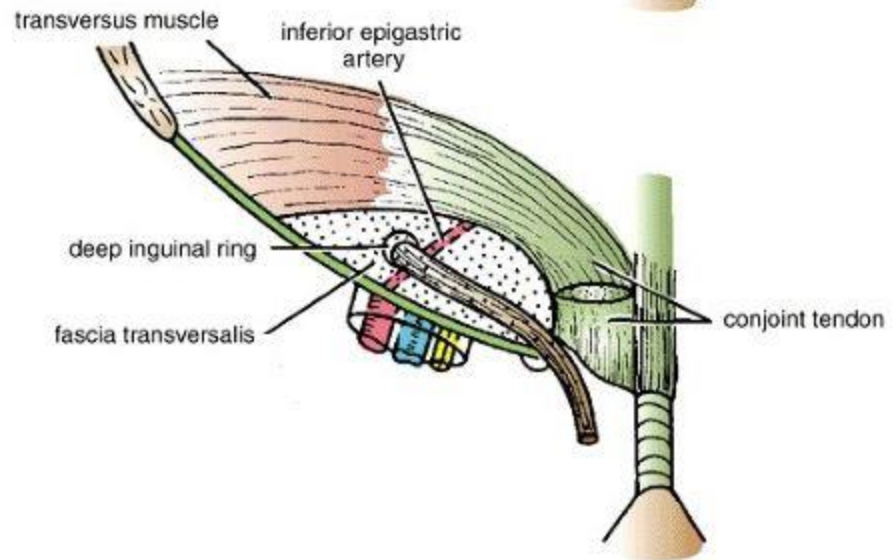
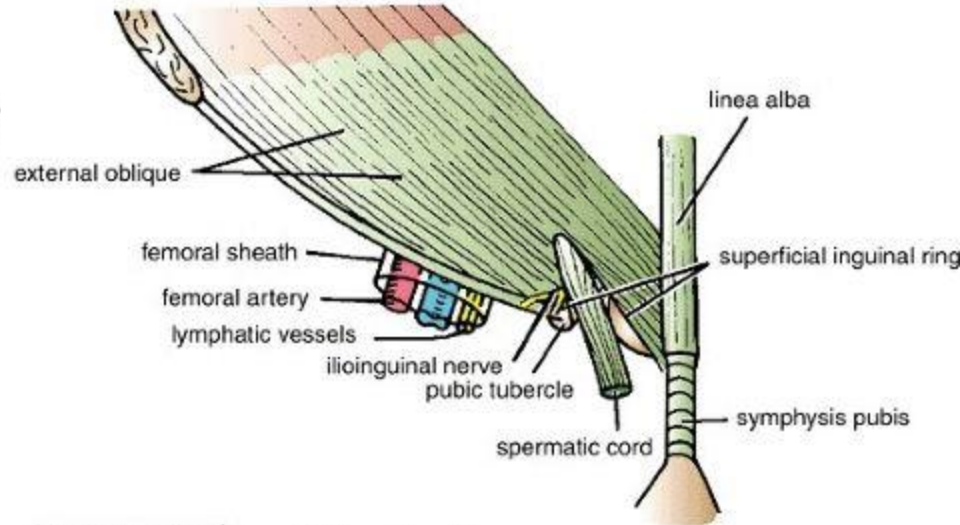
Conjoint tendon medially, fascia transversalis laterally. It contains deep inguinal ring laterally.

Roof or superior wall:

Arching lowest fibers of internal oblique & transversus abdominis

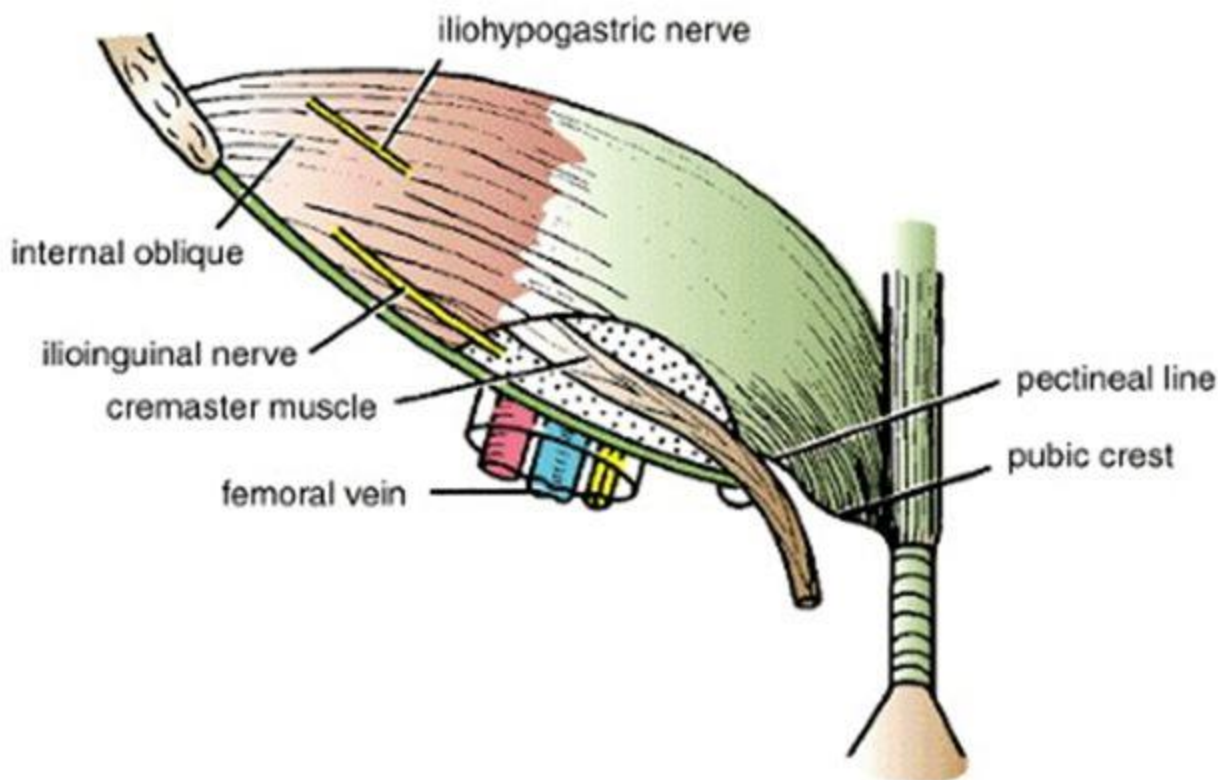
Floor or inferior wall:

Uprturned lower edge of inguinal ligament and lacunar ligament medially.



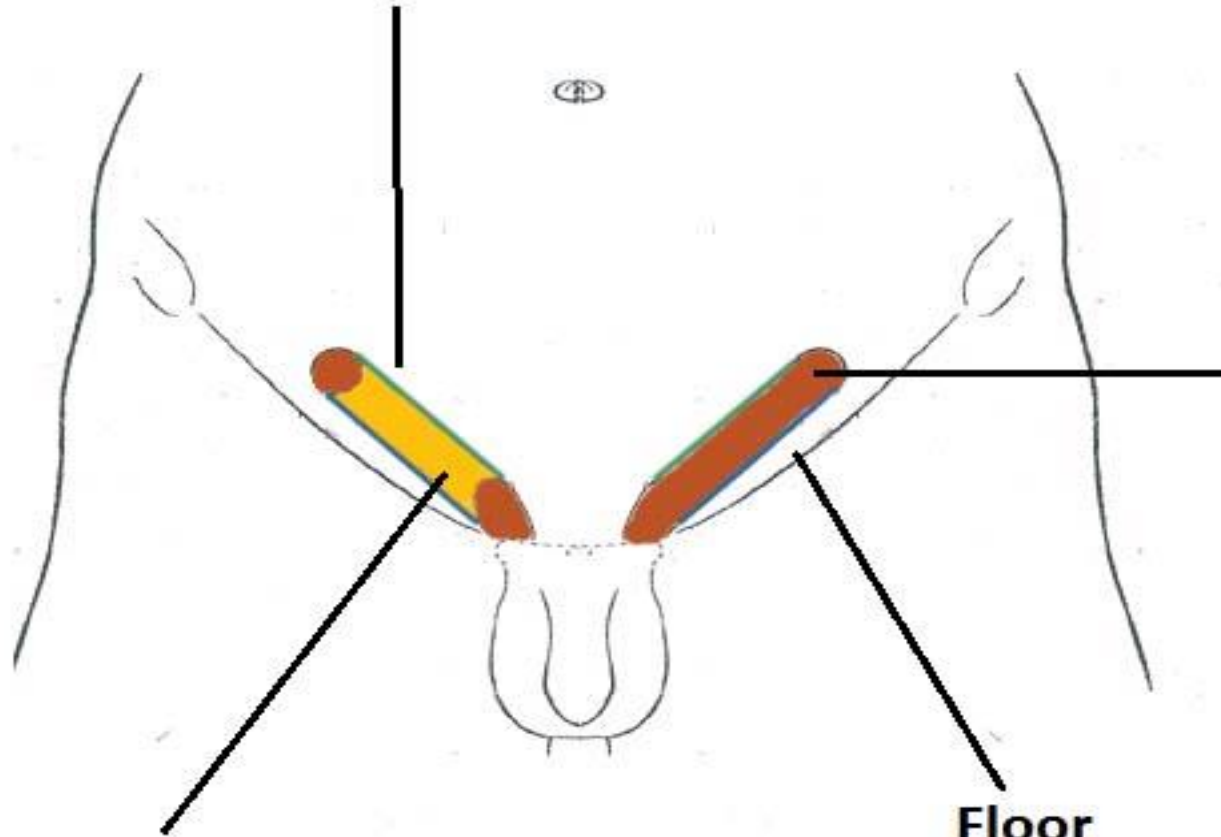
Contents of inguinal canal

- 1- Genital branch of the genitofemoral nerve.
- 2- ilio-inguinal nerve passes through part of the canal, exiting through the superficial inguinal ring
- 3- Spermatic cord in men and the round ligament of the uterus in women.



Roof

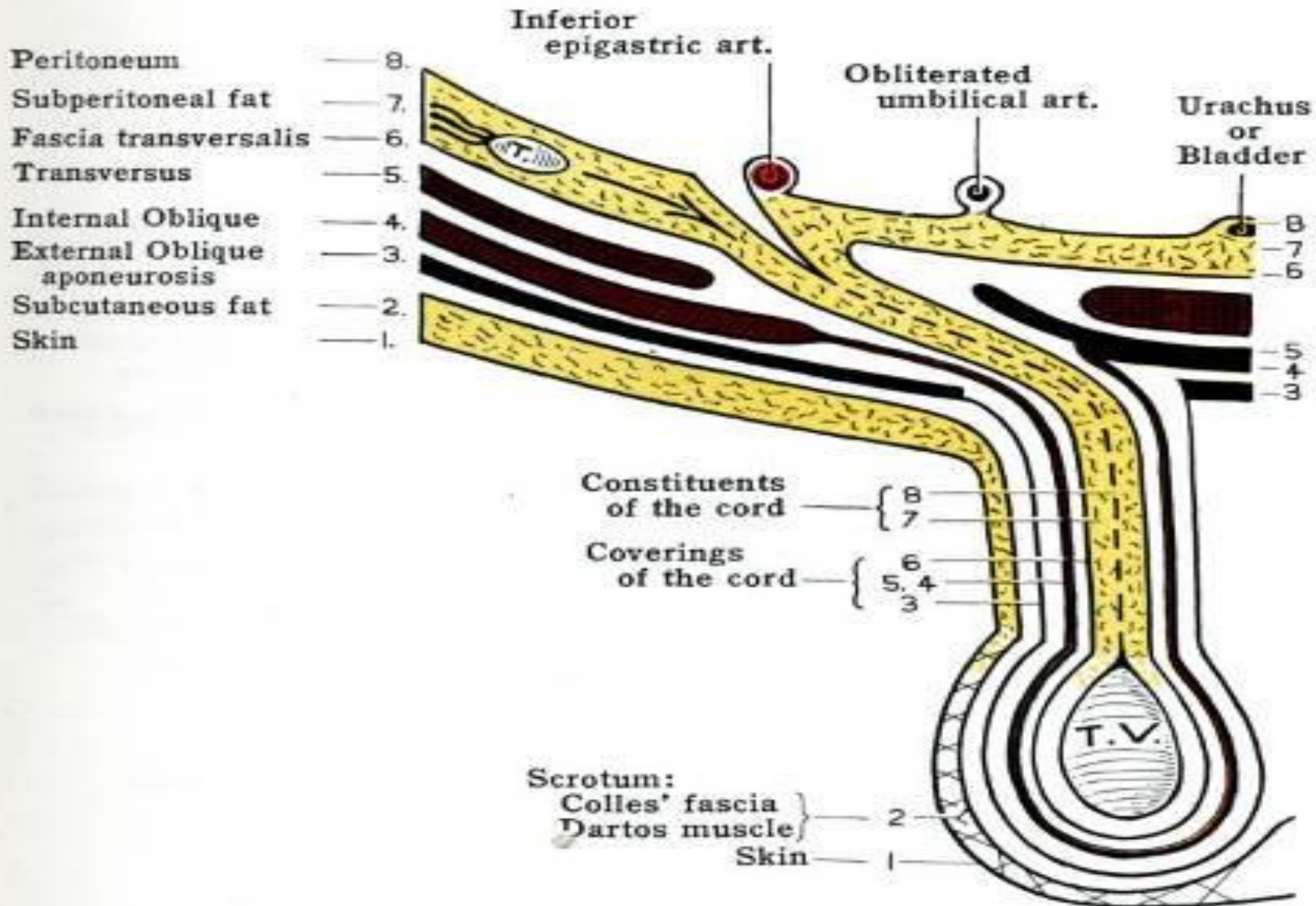
Transversalis fascia
Internal oblique
Transversus abdominus



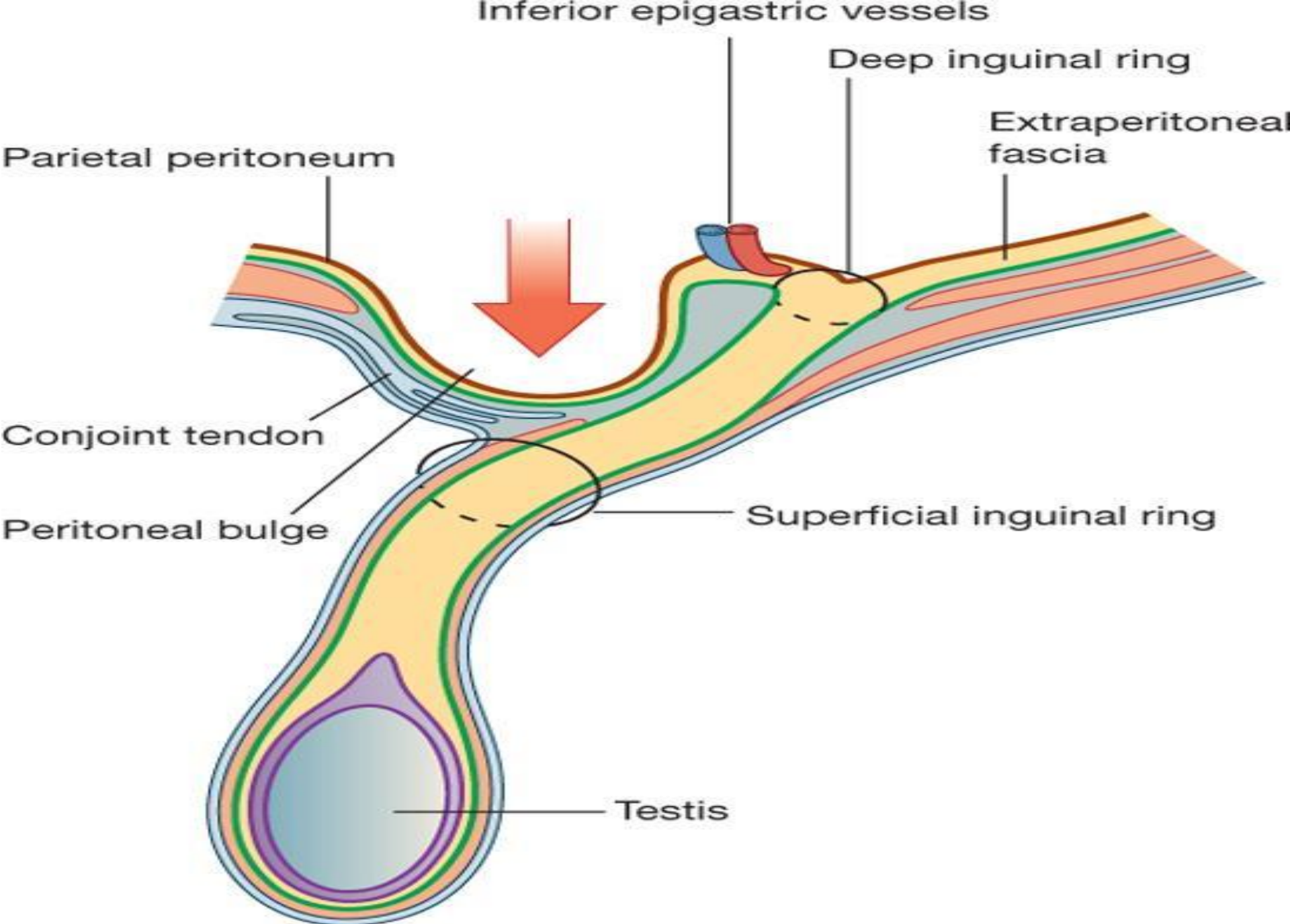
Posterior Wall
Transversalis fascia

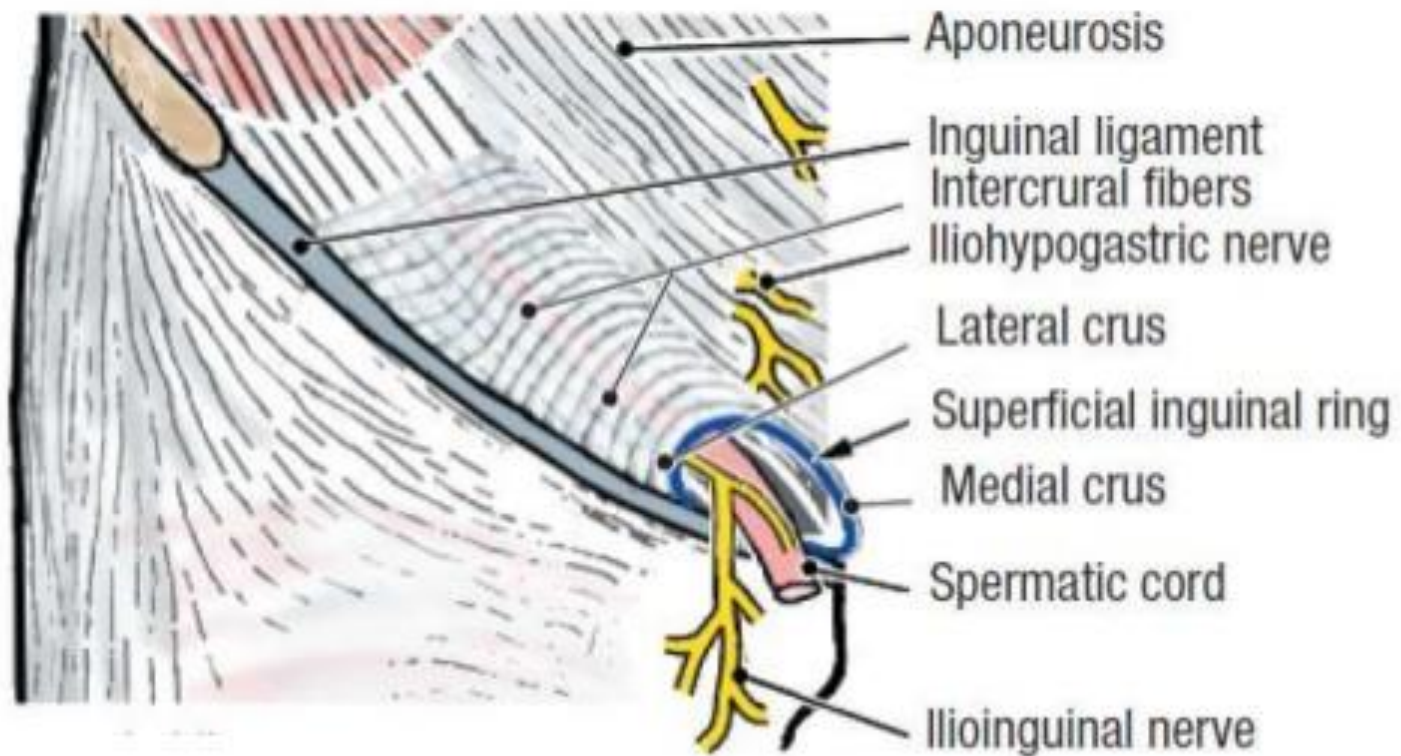
Anterior Wall
Aponeurosis of the external oblique
Internal oblique

Floor
Inguinal ligament
Lacunar ligament



SCHEME OF THE INGUINAL CANAL



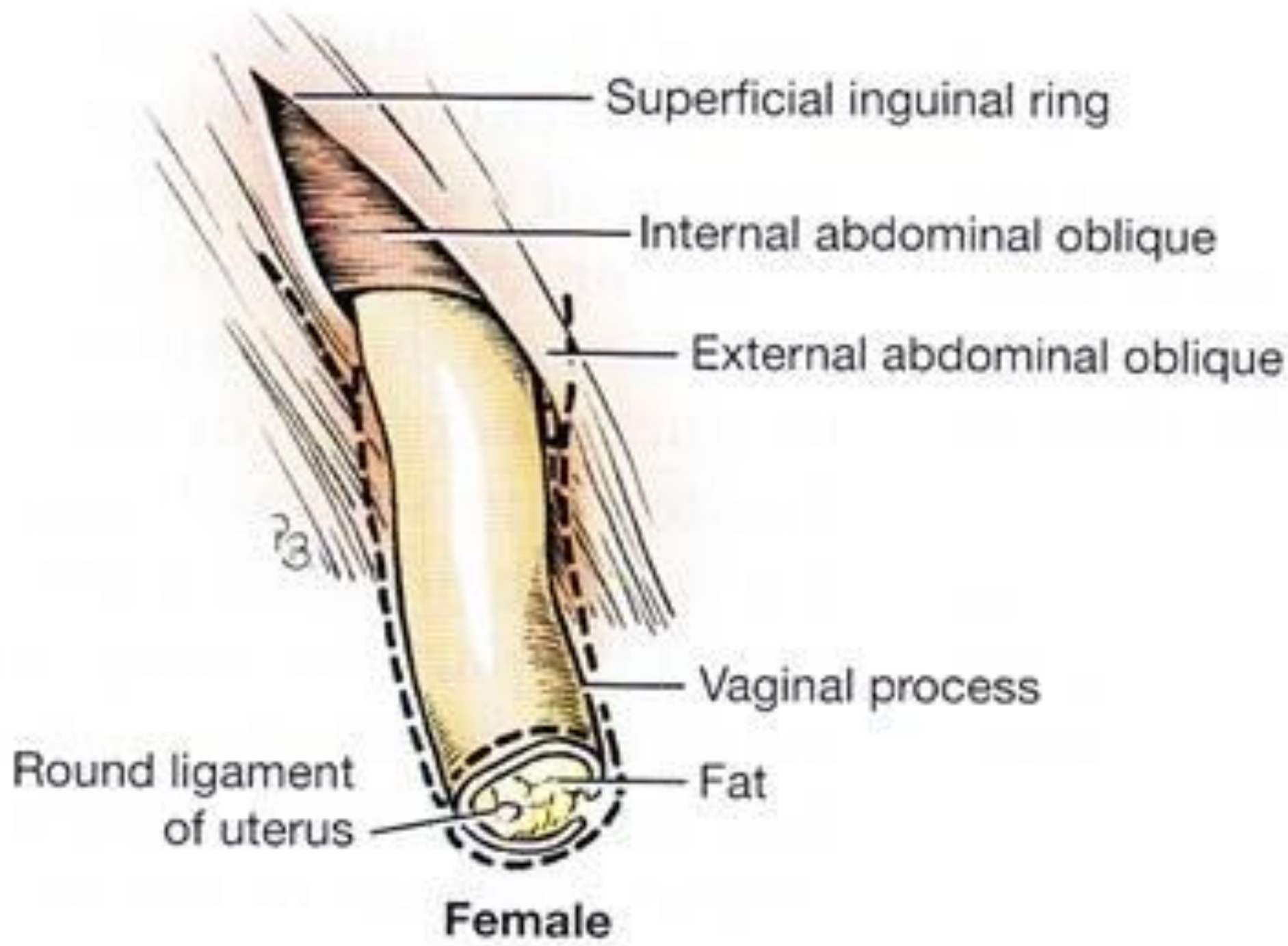


INGUINAL CANAL

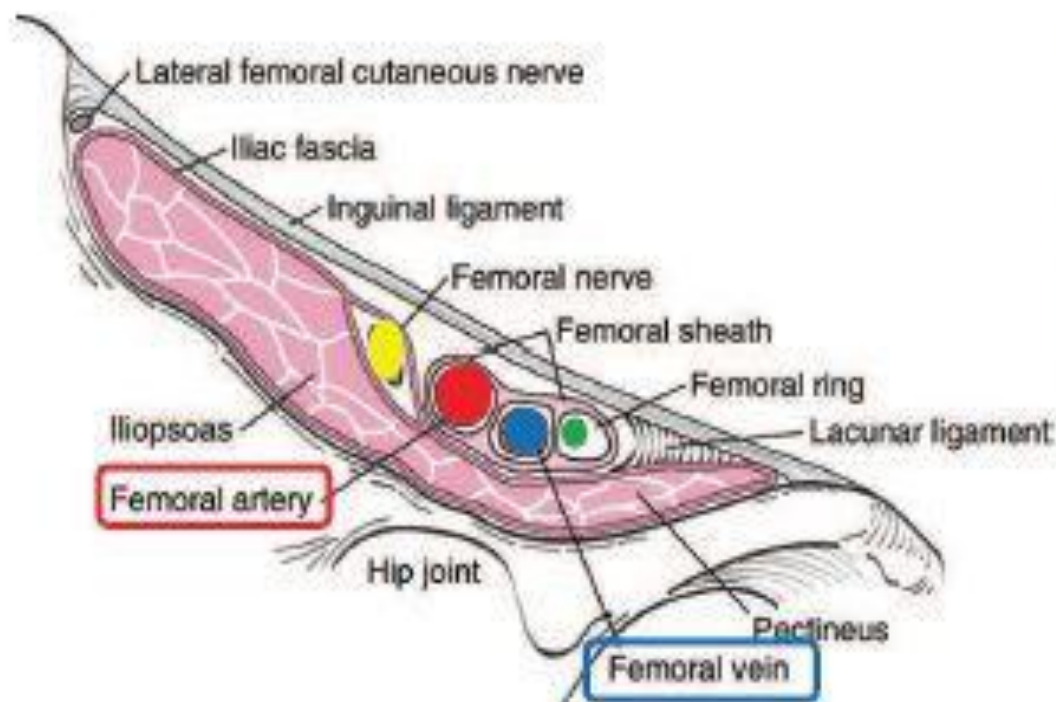
Spermatic cord

The classic and memorable description of the contents of spermatic cord in the male are:

- **3 arteries:** cremasteric, differential and testicular art.
- **3 nerves:** genital branch of the genitofemoral nerve (L1/2), autonomic and visceral afferent fibres, ilioinguinal nerve (N.B. outside spermatic cord but travels next to it)
- **3 fascial layers:** external spermatic, cremasteric, and internal spermatic fascia.
- **3 other structures:** pampiniform plexus, vas deferens (ductus deferens), testicular lymphatics



16. Structures under inguinal ligament:



- From lateral to medial side:
- Iliopsoas muscle
- Femoral nerve w/ circumflexes &
- Femoral artery perforating br
- Femoral vein & great saphenous v
- Femoral canal
- Deep inguinal lymph nodes

Femoral Triangle: Superior inguinal ligament, Medially adductor longus m, laterally sartorius m, it lies on top of pectinius m and iliopsoas ms
Inguinal lig serves as flexor retinaculum. Psoas m and Femoral n pass from pelvis to anterior thigh, External iliac becomes femoral vessels
The inguinal canal runs perpendicular to the femoral canal

INGUINAL CANAL

- **Hesselbach's Triangle**

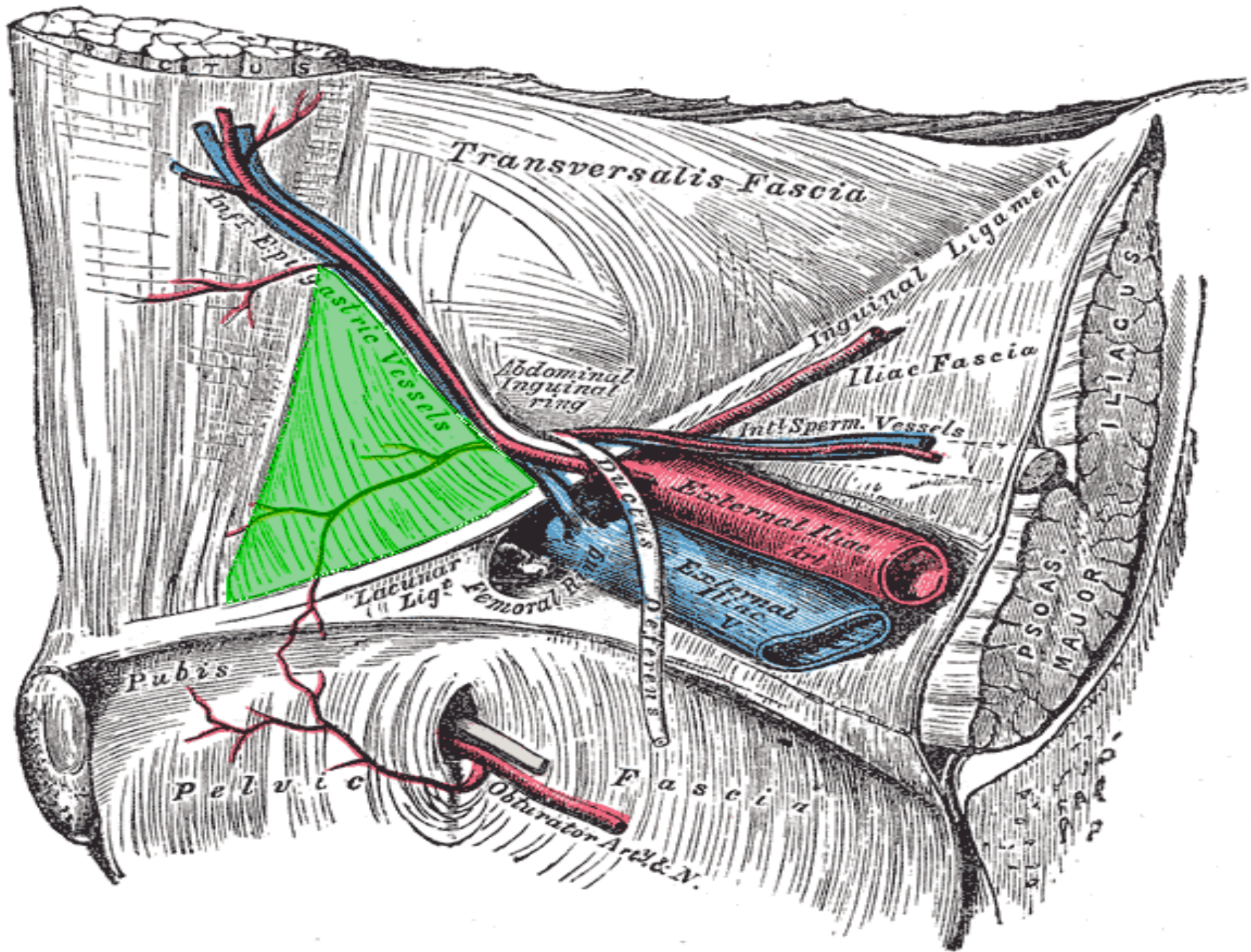
The triangular part of the posterior wall of the inguinal canal.

- ***Boundaries***

- Inferior: Medial half of inguinal ligament
- Medial: Linea semilunaris(lateral border of rectus abdominis)
- Lateral : Inferior epigastric artery

- ***Surgical importance***

- Not reinforced by conjoint tendon
- Potentially weak area
- Direct Inguinal hernias protrude through it



Transversalis Fascia

Inguinal Ligament

Inf. Epi-gastric Vessels

Abdominal Inguinal ring

Iliac Fascia

Int. Sperm. Vessels

Lacunar Lig. femoral Ring

External Iliac Ar. & V.

Pubis

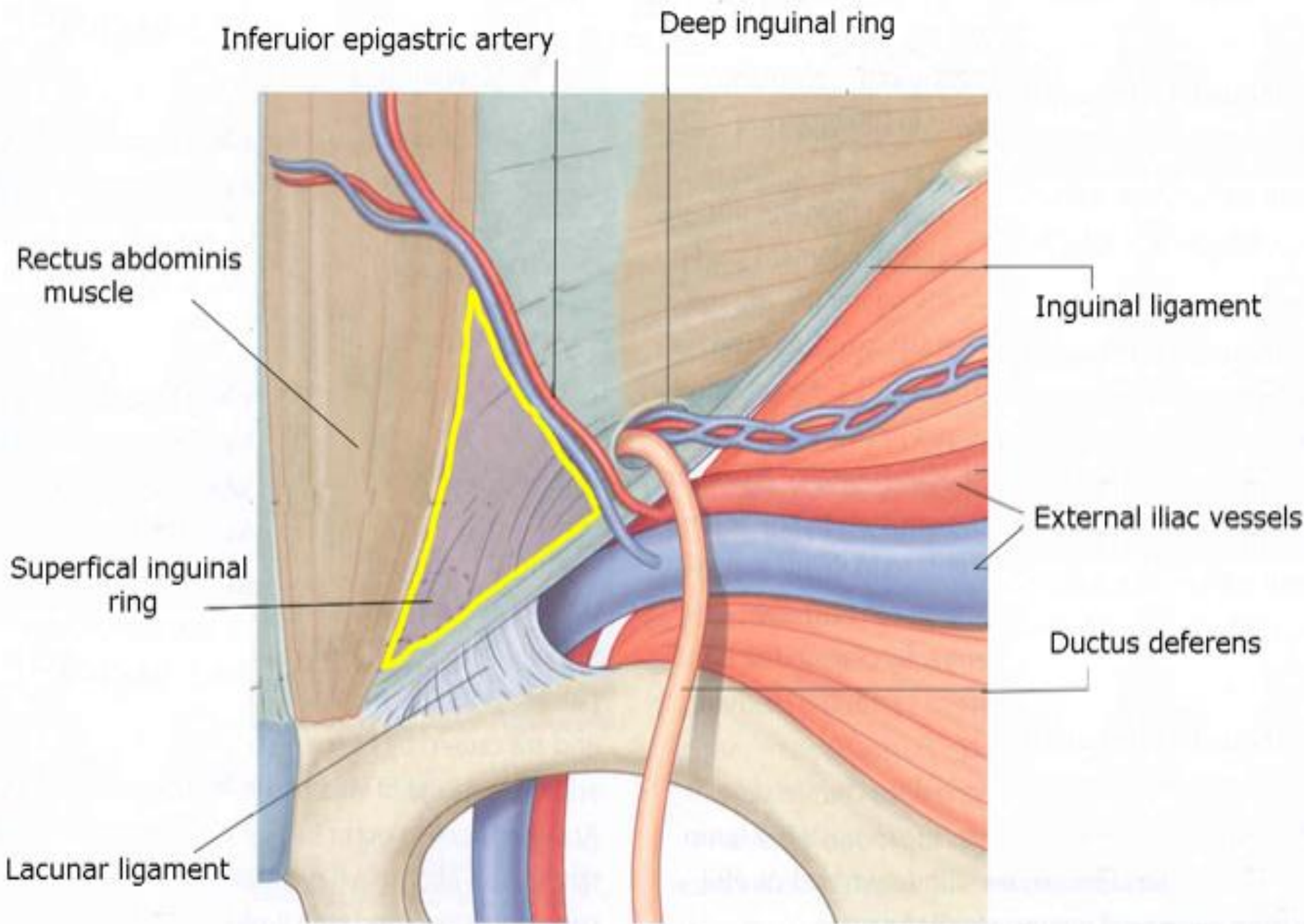
Pelvic

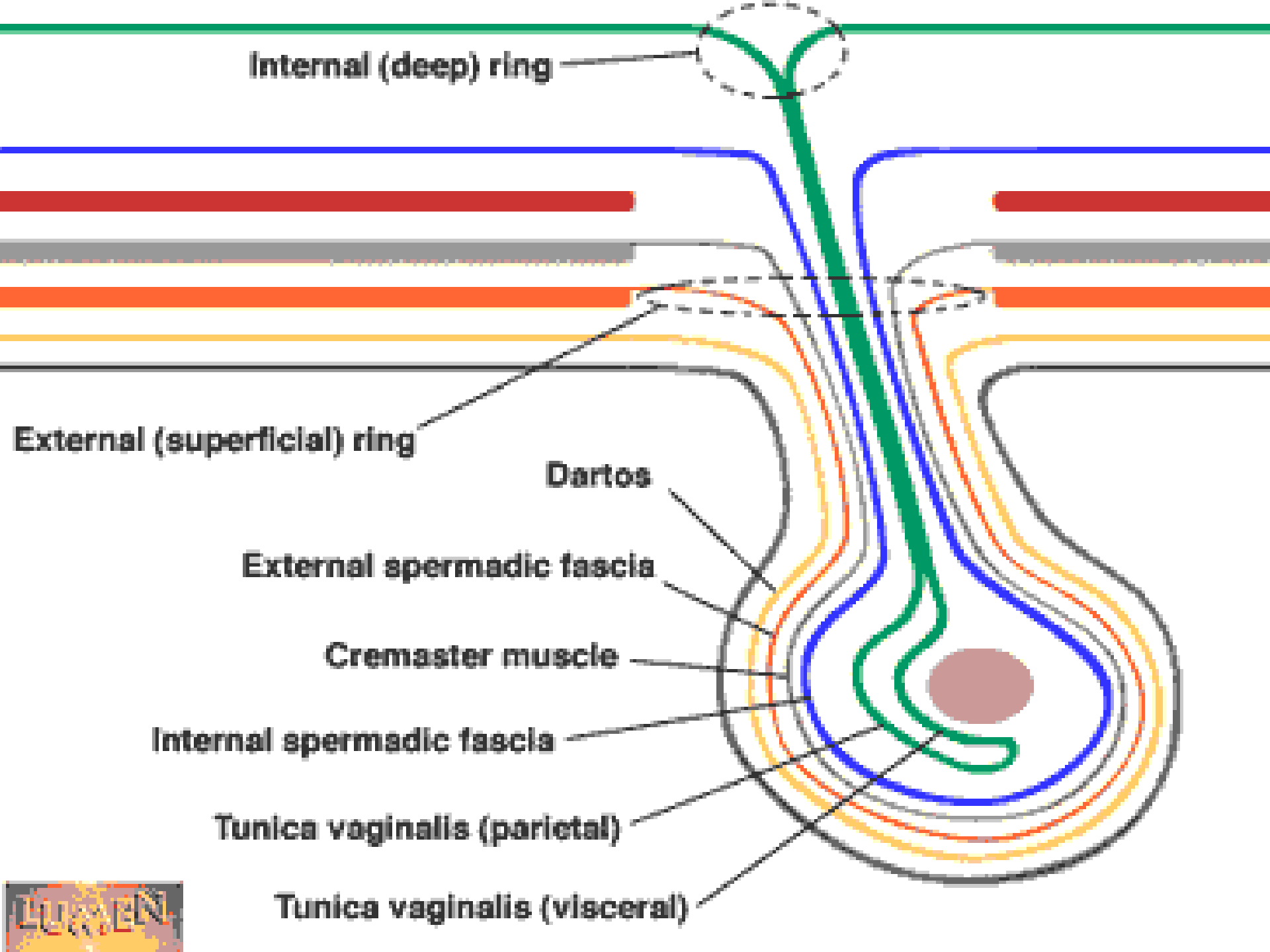
Fascia

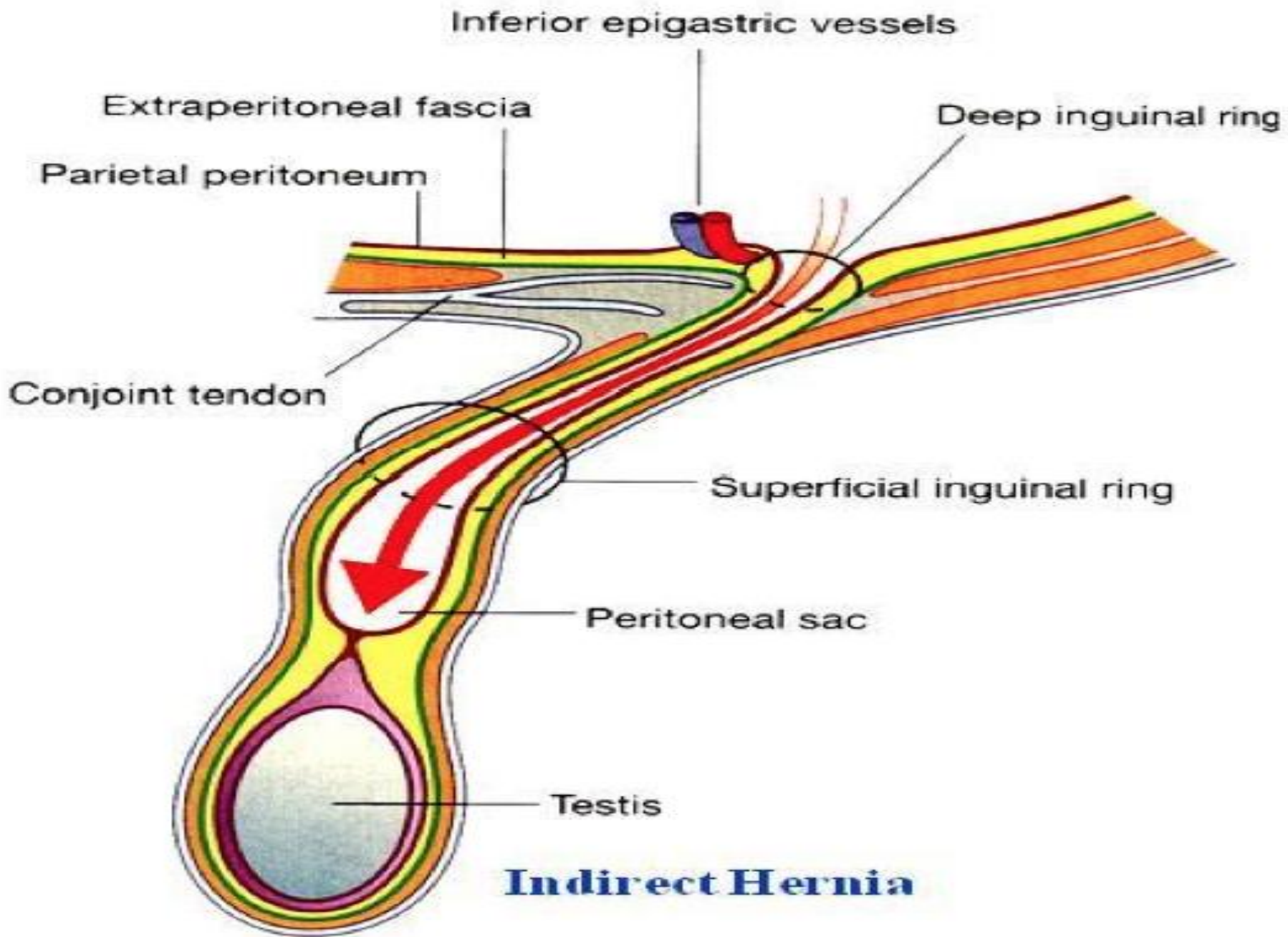
Obturator Ar. & N.

PSOAS MAJOR

ILIACUS





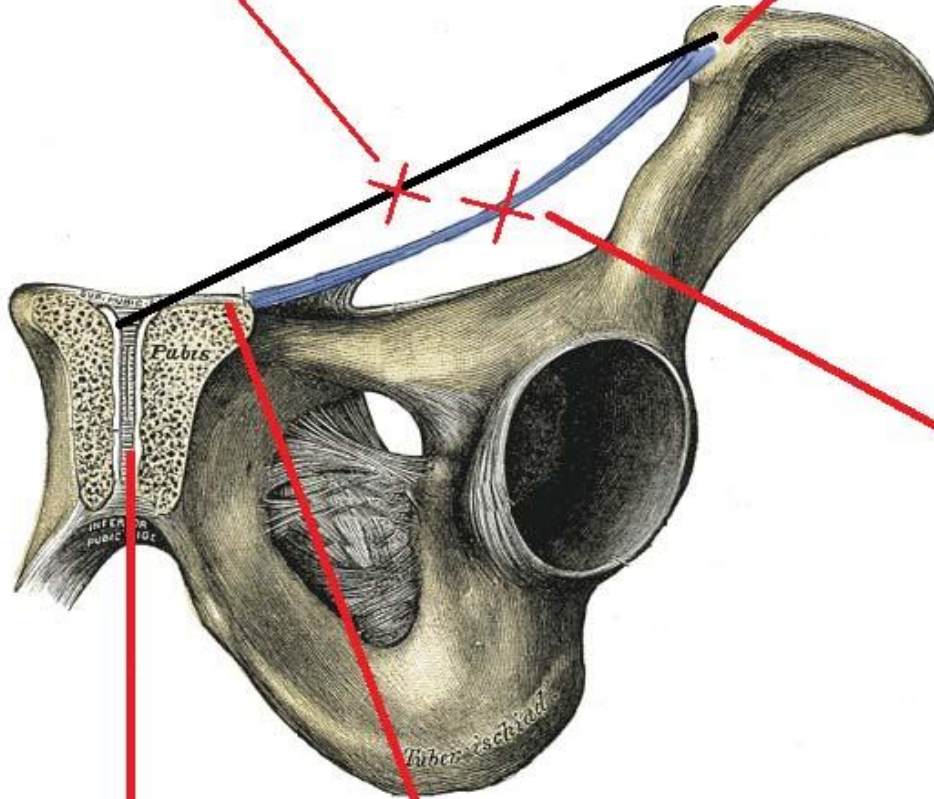


Differences

pathway of protrusion	coming down the inguinal canal, may enter the scrotum	pass through Hesselbach's triangle, rarely enter the scrotum
contours of sac	elliptic, pear-shaped	semispheric, wide base
compress the internal ring after reduced	controlled	not controlled
Relationship of sac neck with inferior epigastric artery	Sac neck is lateral to it	Sac neck is medial to it
Incarcerated incidence	high	low

Mid-inguinal point

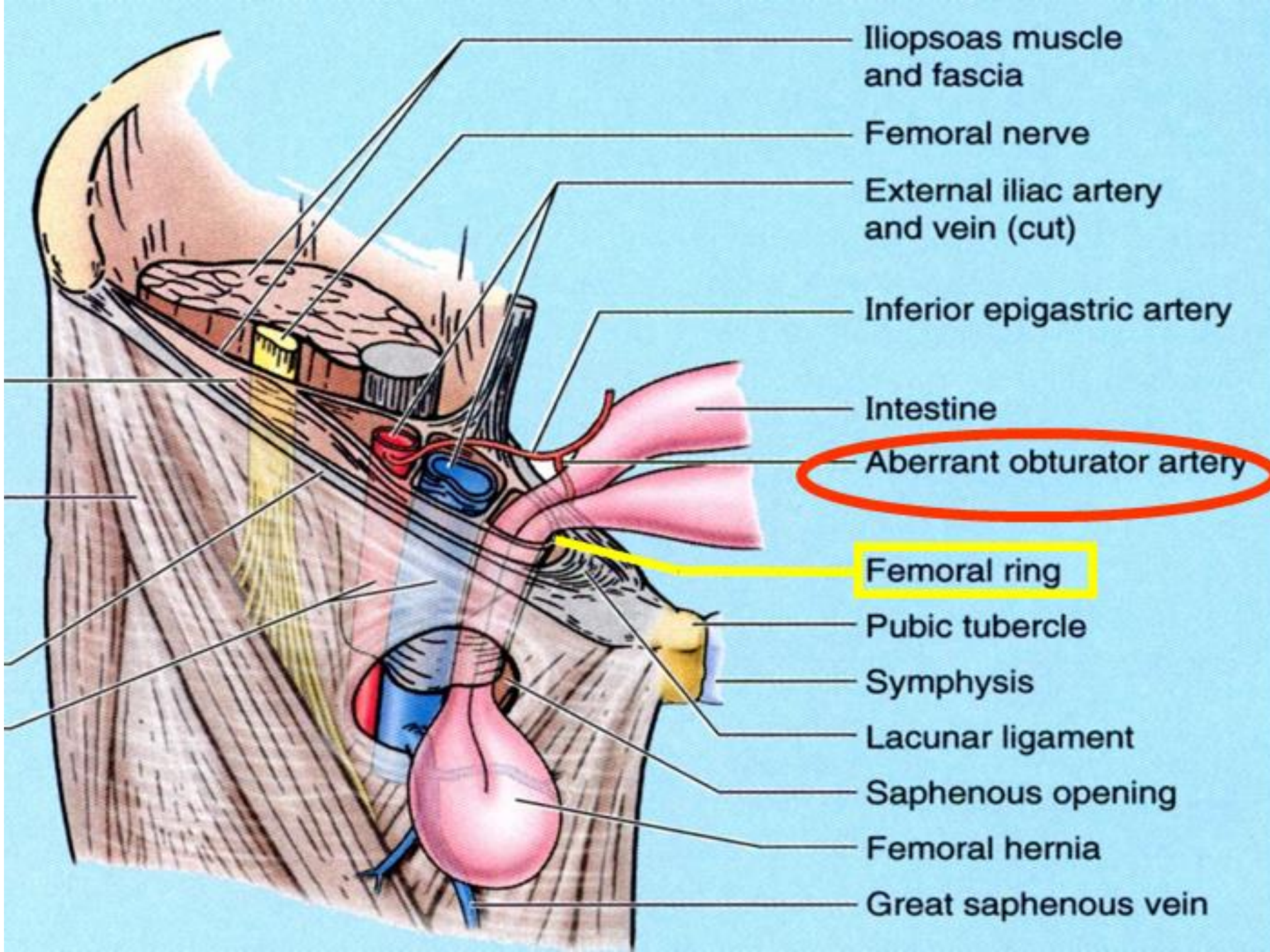
ASIS of the pelvis



Midpoint of the inguinal ligament

Pubic symphysis

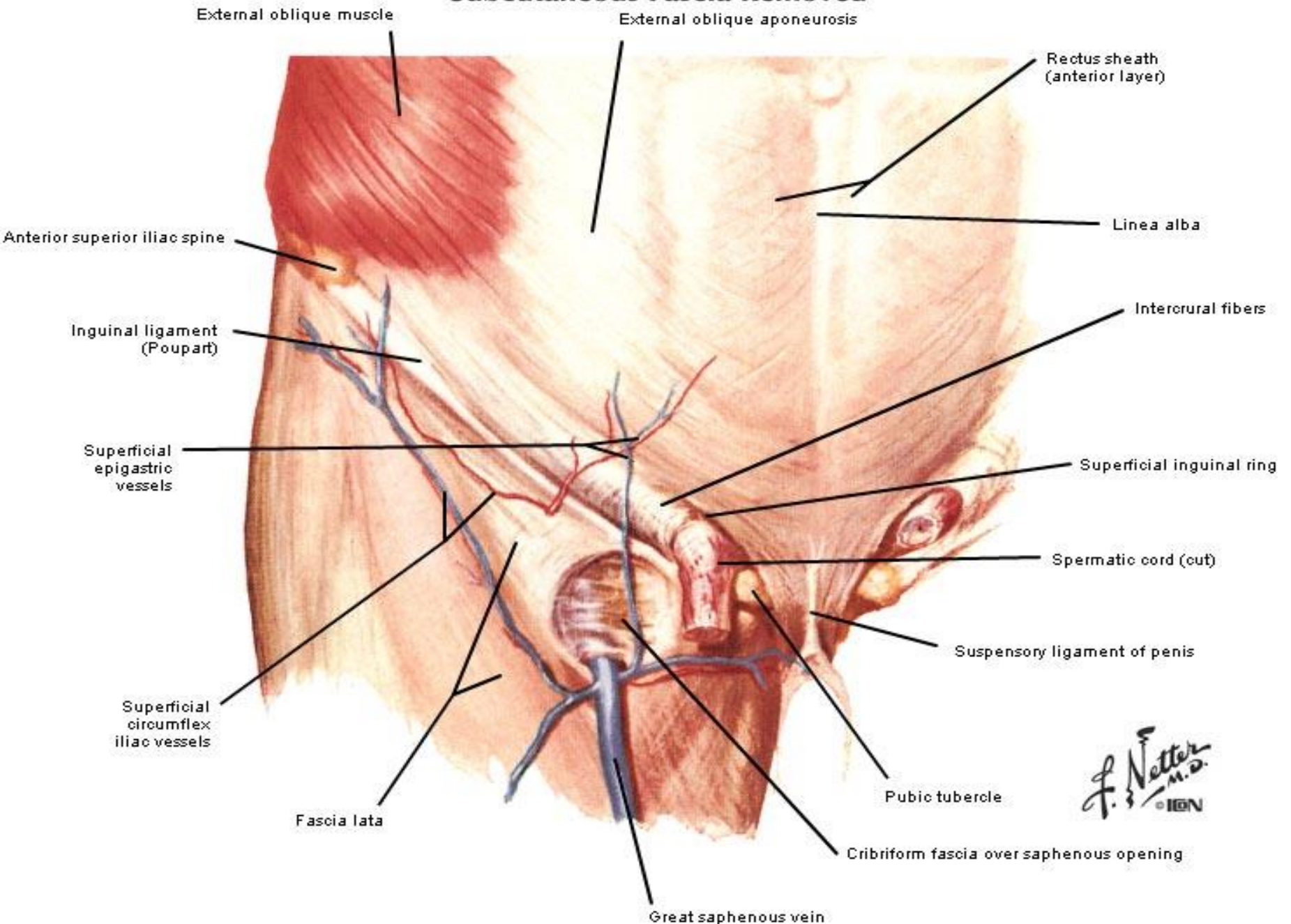
Pubic tubercle



- Iliopsoas muscle and fascia
- Femoral nerve
- External iliac artery and vein (cut)
- Inferior epigastric artery
- Intestine
- Aberrant obturator artery
- Femoral ring
- Pubic tubercle
- Symphysis
- Lacunar ligament
- Saphenous opening
- Femoral hernia
- Great saphenous vein

Inguinal and Femoral Regions

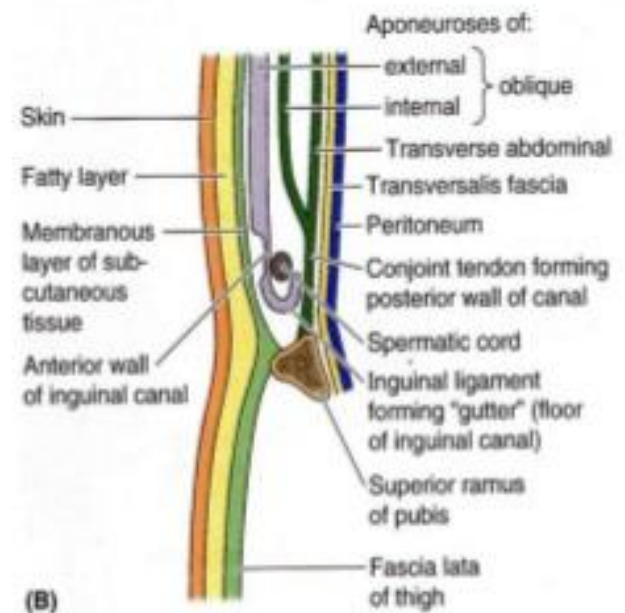
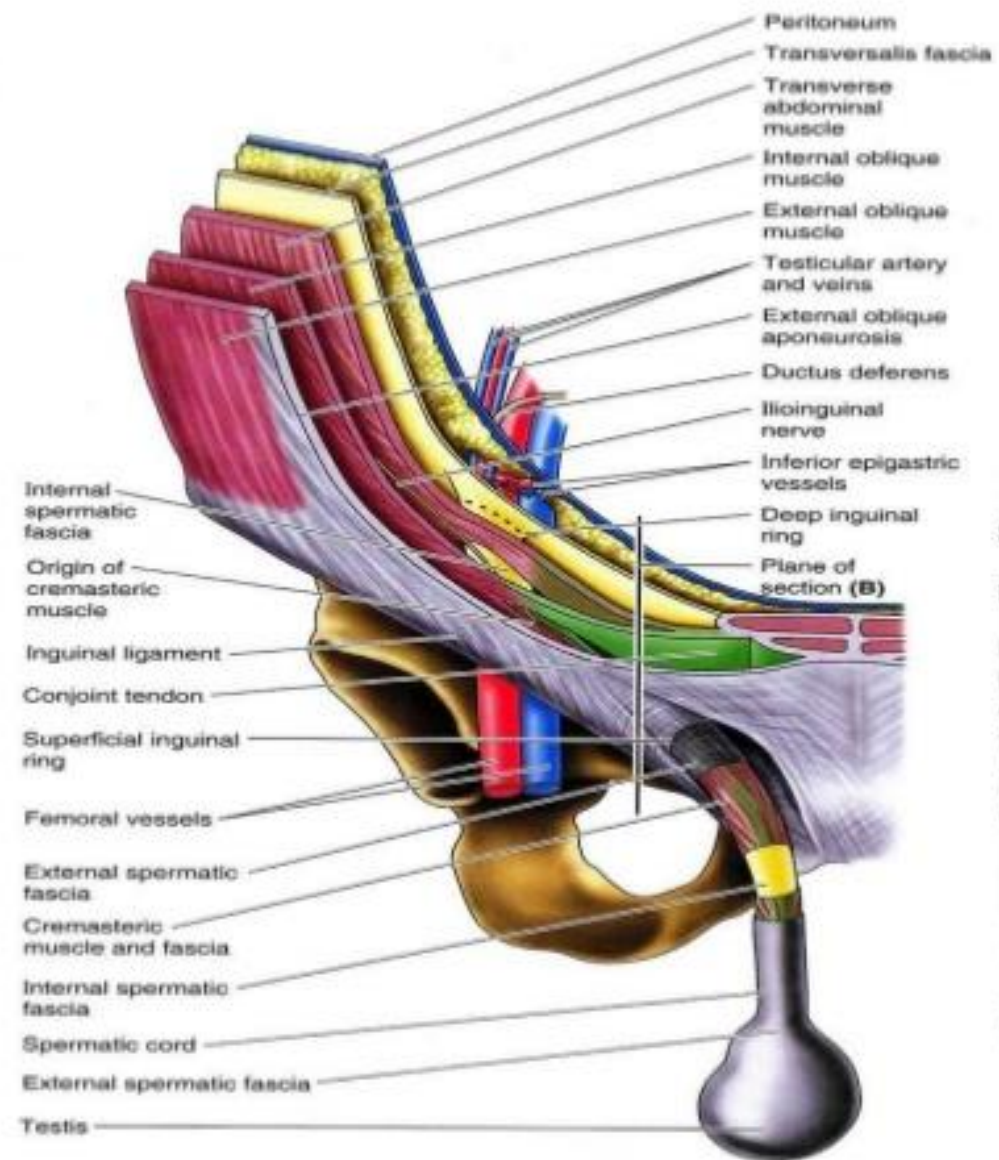
Subcutaneous Fascia Removed



F. Netter
M.D.
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Inguinal Canal



(B)

ASIS

Rt. External oblique muscle

Deep (internal)
Inguinal ring

Inguinal ligament

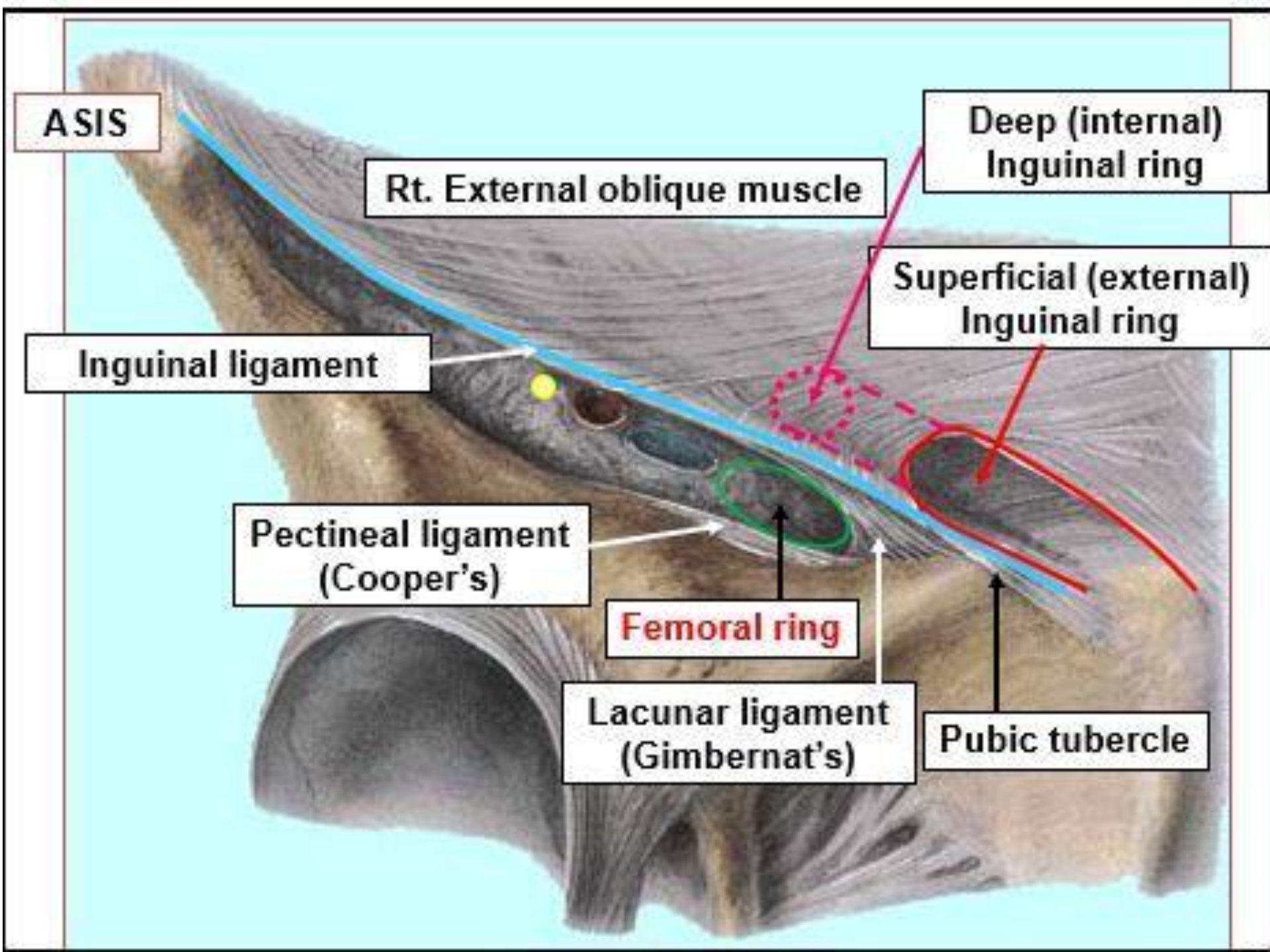
Superficial (external)
Inguinal ring

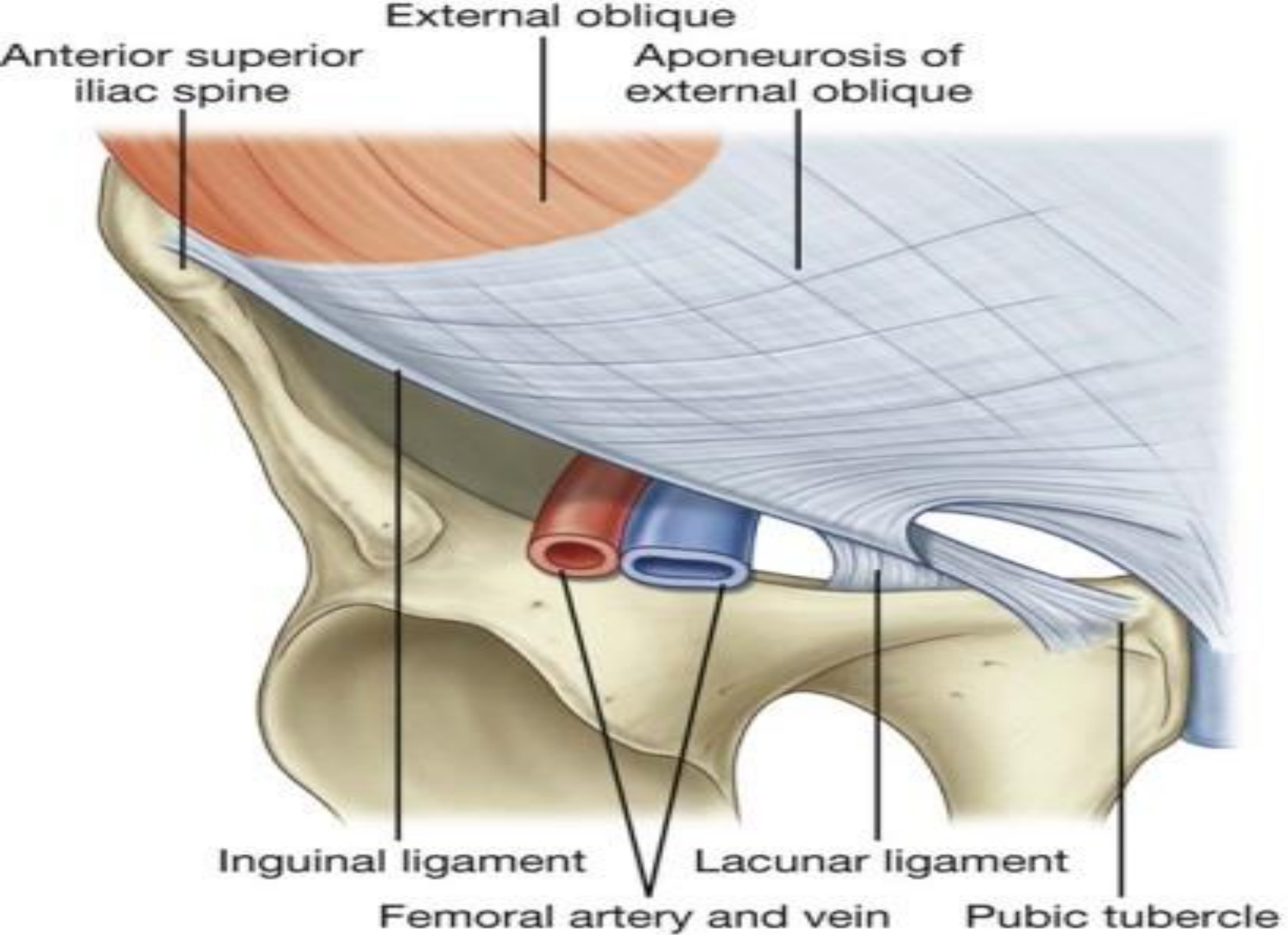
Pectineal ligament
(Cooper's)

Femoral ring

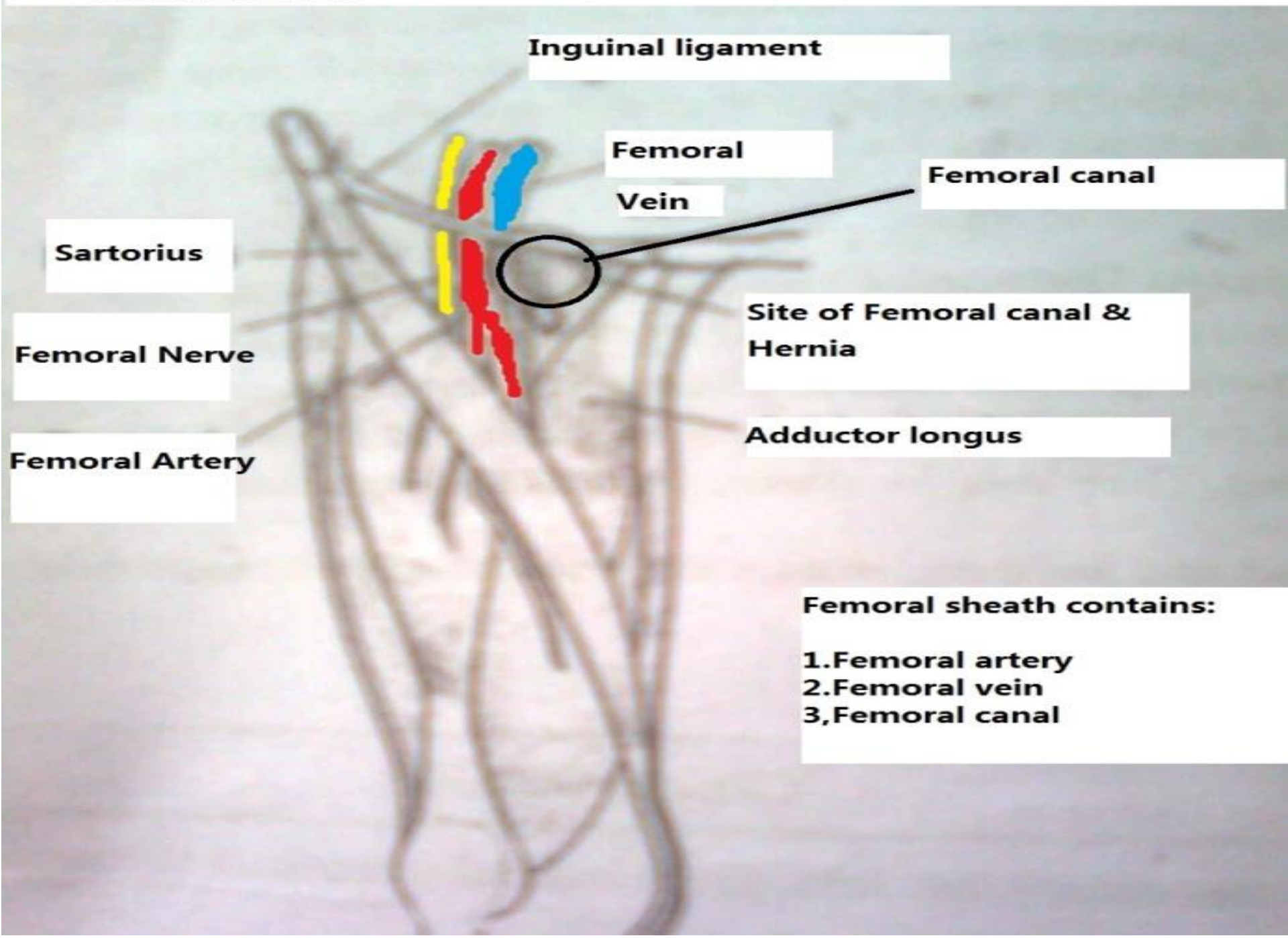
Lacunar ligament
(Gimbernath's)

Pubic tubercle





Femoral Hernia



Inguinal ligament

Femoral
Vein

Femoral canal

Sartorius

Site of Femoral canal &
Hernia

Femoral Nerve

Adductor longus

Femoral Artery

Femoral sheath contains:

1. Femoral artery
2. Femoral vein
3. Femoral canal