
بسم الله الرحمن الرحیم

GROSS ANATOMY OF

ABDOMINAL WALL (INGUINAL CANAL)

By

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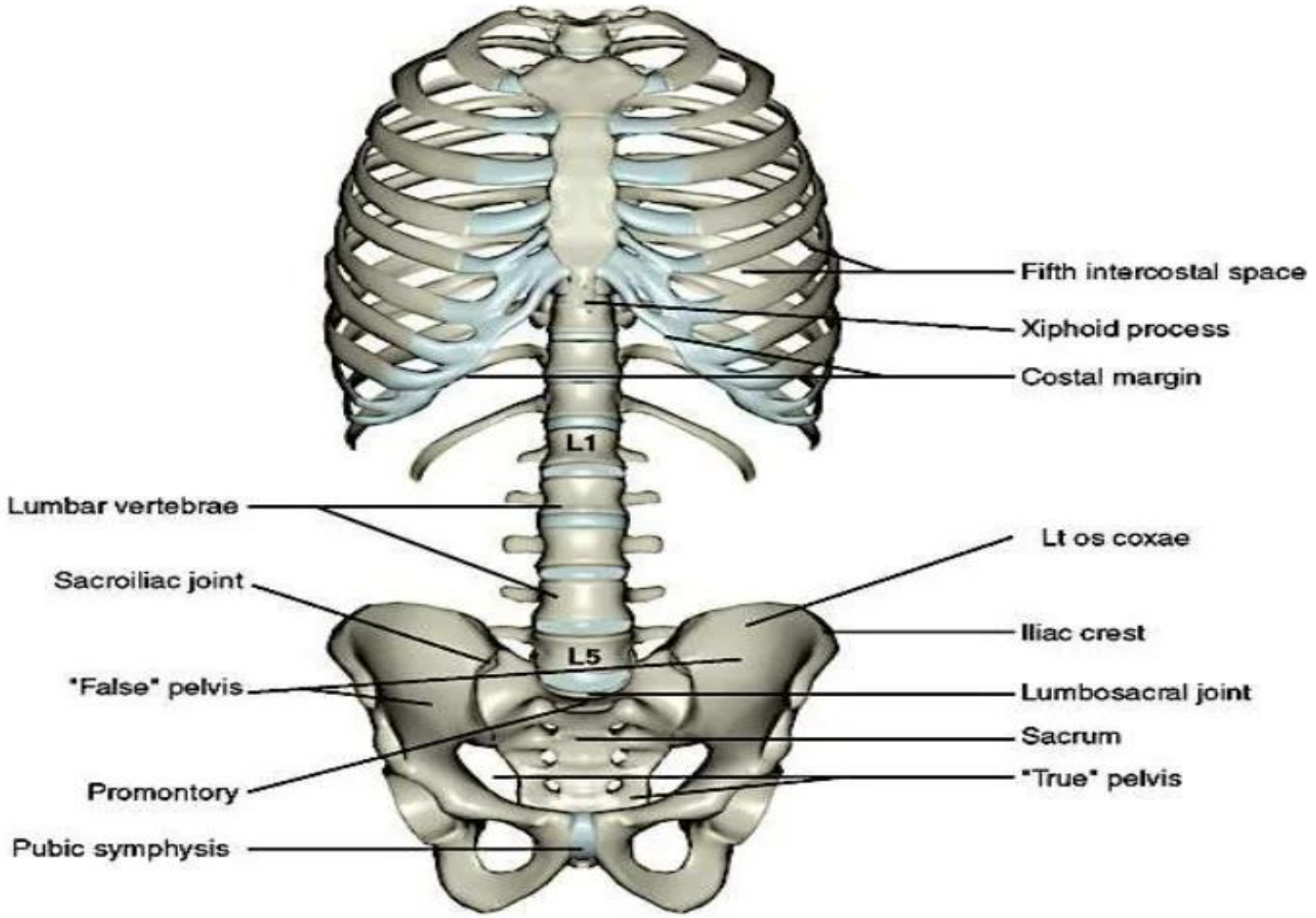
THE ANTEROLATERAL ABDOMINAL WALL

- The **abdominal wall** encloses the abdominal cavity and can be divided into anterolateral and posterior sections. The abdominal wall:
- Forms a firm, yet flexible boundary which keeps the abdominal viscera in the abdominal cavity and assists the viscera in maintaining their anatomical position against gravity.
- Protects the abdominal viscera from injury.
- Assists in forceful expiration by pushing the abdominal viscera upwards.
- Is involved in any action (coughing, vomiting, defecation) that increases intra-abdominal pressure.
- The anterolateral abdominal wall consists of four main layers (external to internal): skin, superficial fascia, muscles and associated fascia, and parietal peritoneum.

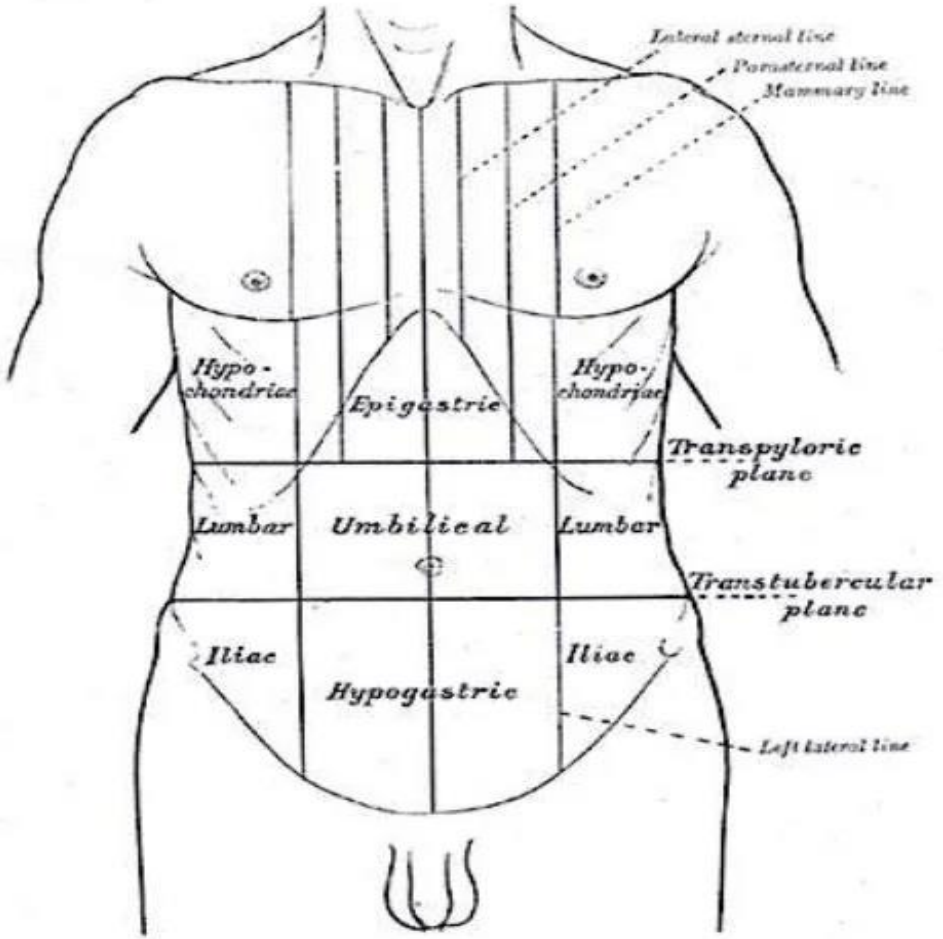
Bony framework

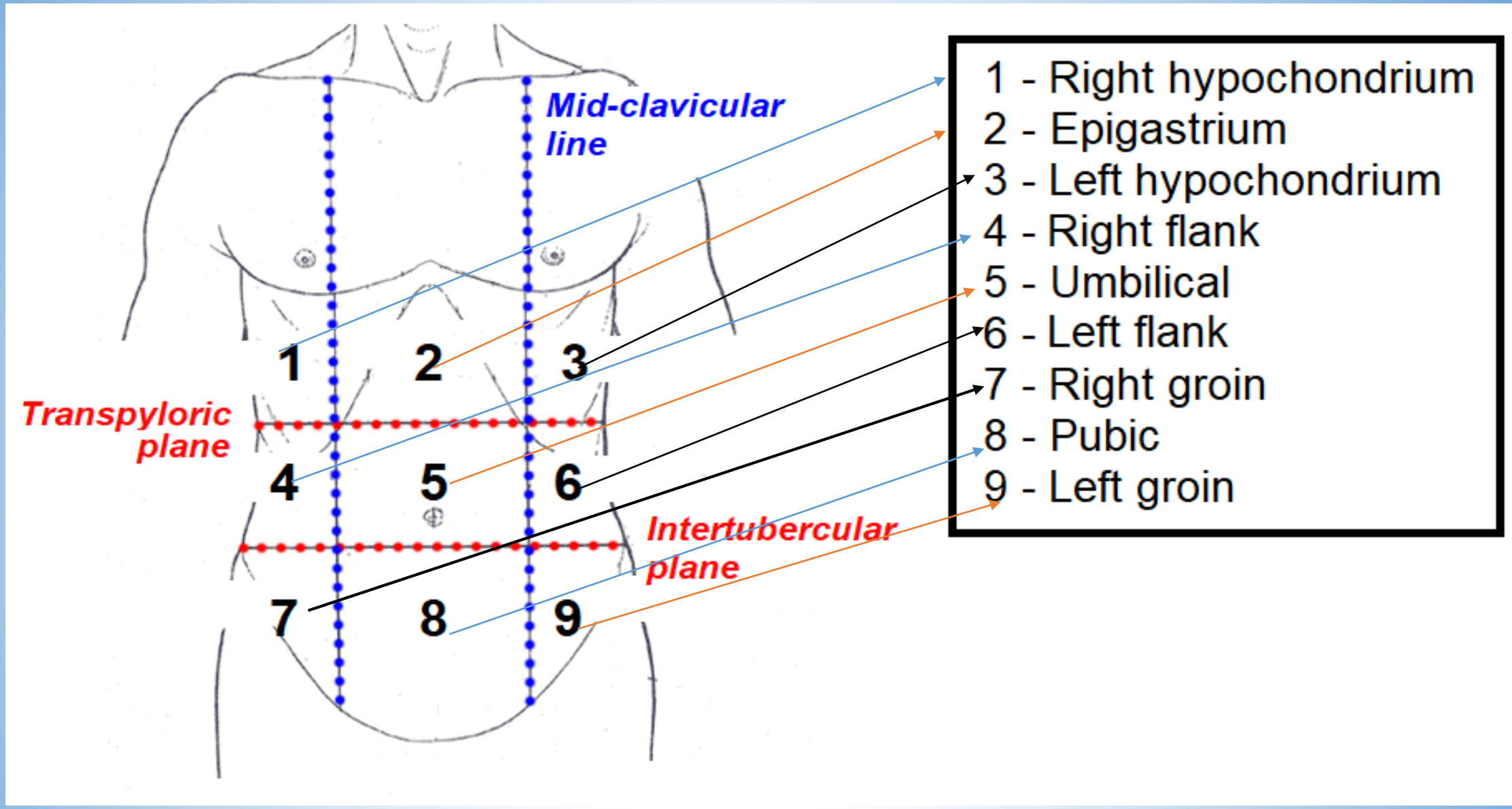


SURFACE ANATOMY CONTD

- The abdomen is a large area, and so it split into **nine regions** – these are useful clinically for describing the location of pain, location of viscera and describing surgical procedures. The nine regions are formed by two horizontal and two vertical planes:
- **Horizontal planes:**
  - Transpyloric plane – halfway between the jugular notch and the pubic symphysis, approximately the level of the L1 vertebrae.
  - Intertubercular plane – horizontal line that runs between the superior aspect of the right and left iliac crests.
- **Vertical planes** – run from the middle of the clavicle to the mid-inguinal point (halfway between the anterior superior iliac spine of the pelvis and the pubic symphysis). These planes are the mid-clavicular lines.

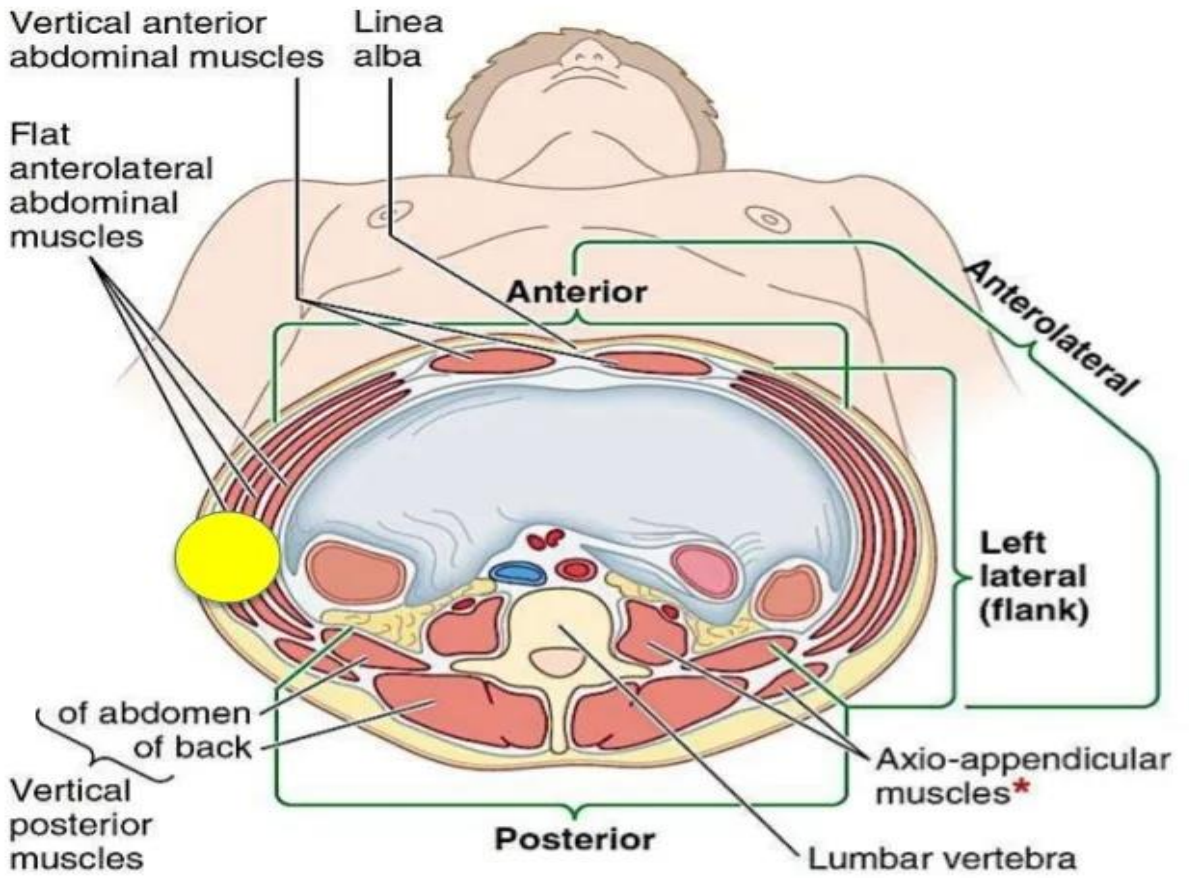
Boundaries & surface division

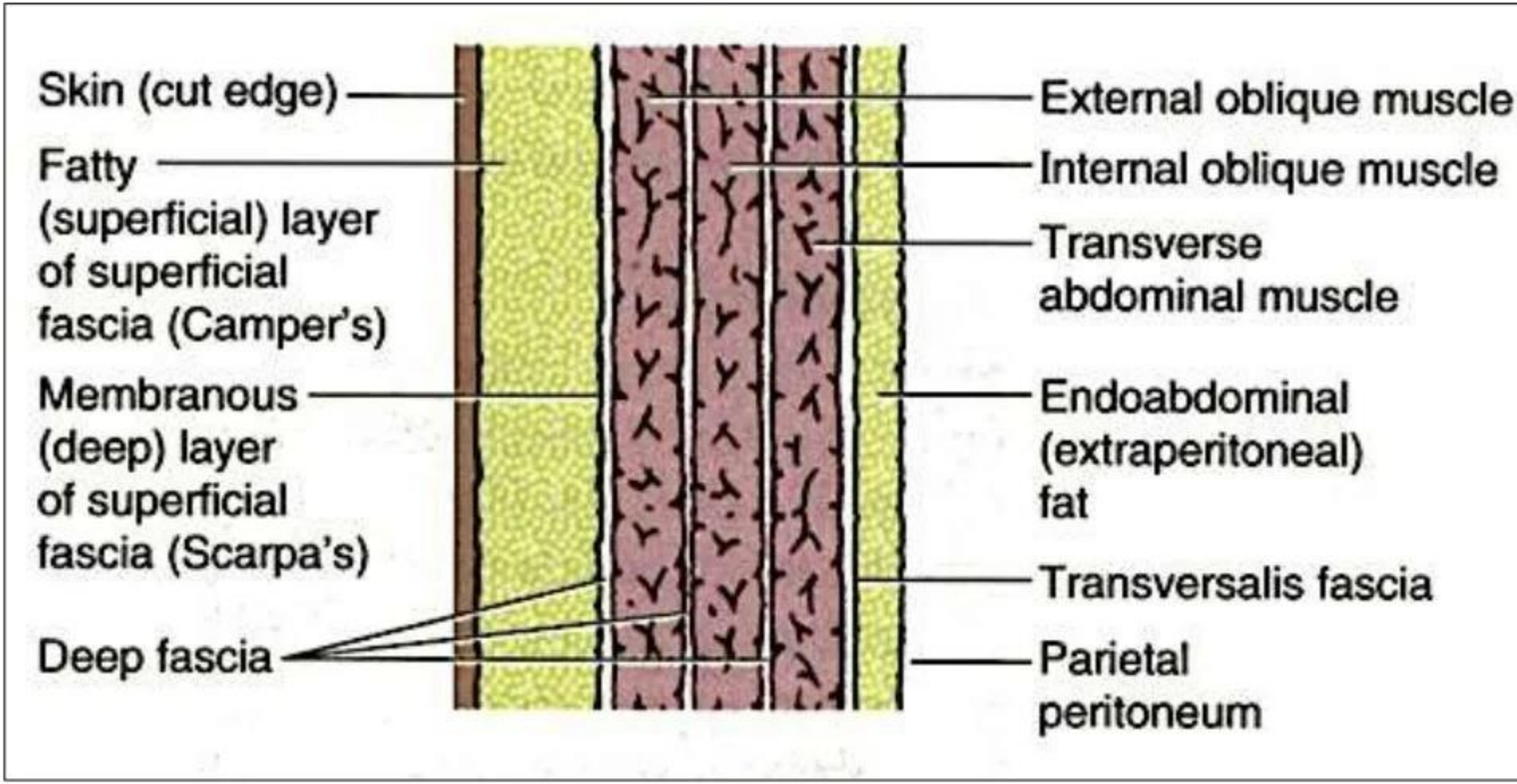




THE NINE REGIONS OF THE ABDOMEN

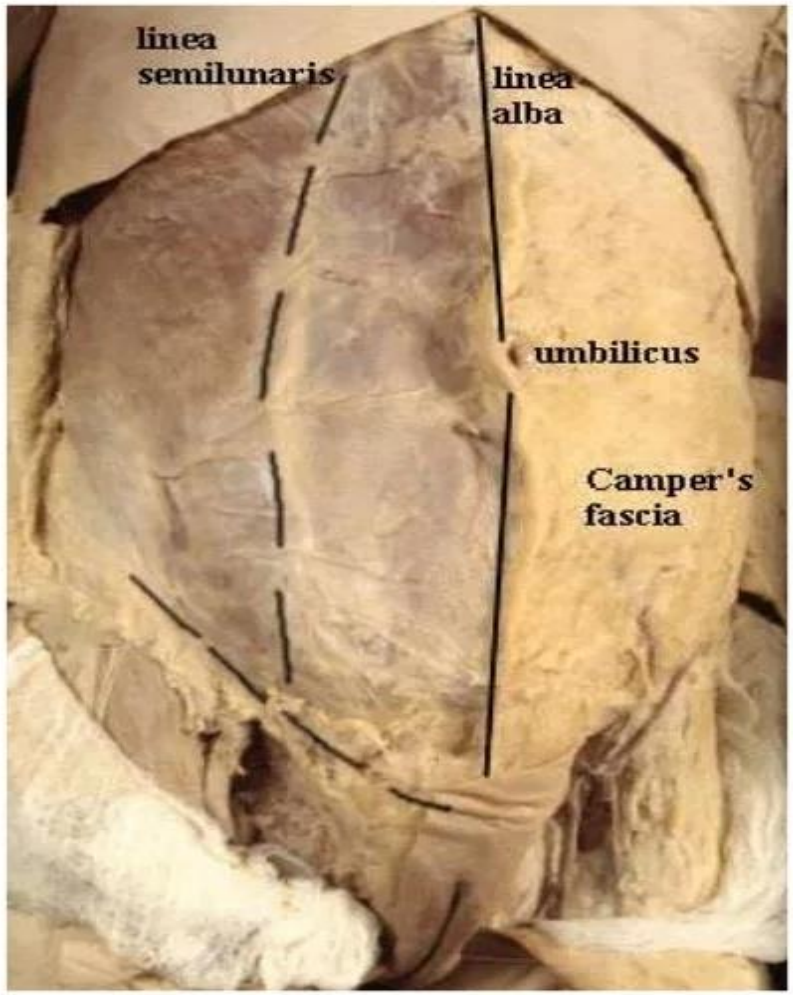
Layers


Vertical anterior abdominal muscles
Linea alba
Flat anterolateral abdominal muscles
Anterior
Anterolateral
Left lateral (flank)
of abdomen
of back
Vertical posterior muscles
Axio-appendicular muscles*
Posterior
Lumbar vertebra


Skin (cut edge)
Fatty (superficial) layer of superficial fascia (Camper's)
Membranous (deep) layer of superficial fascia (Scarpa's)
Deep fascia
External oblique muscle
Internal oblique muscle
Transverse abdominal muscle
Endoabdominal (extraperitoneal) fat
Transversalis fascia
Parietal peritoneum

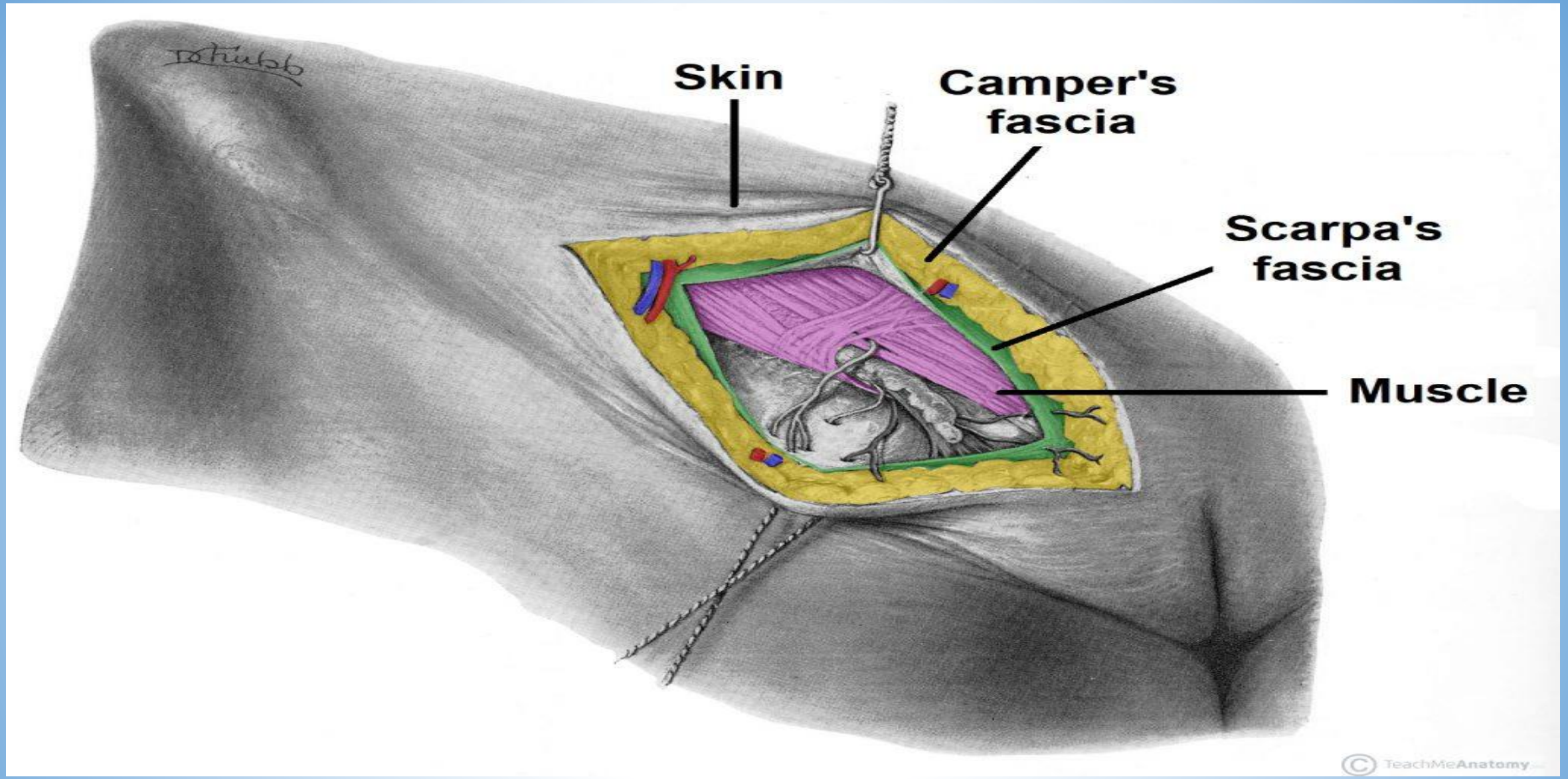
Superficial fascia

- In two layers
- Camper's - sup fatty layer
- Scarpa's - deep membranous layer
- CONTENTS
  - Cutaneous nerves
  - Arteries
  - Veins
  - Lymphatics



SUPERFICIAL FASCIA

- The superficial fascia is **connective tissue**. The composition of this layer depends on its location:
- **Above the umbilicus** – a single sheet of connective tissue. It is continuous with the superficial fascia in other regions of the body.
- **Below the umbilicus** – divided into two layers; the fatty superficial layer (Camper's fascia) and the membranous deep layer (Scarpa's fascia).
  - The superficial vessels and nerves run between these two layers of fascia.



THE LAYERS OF THE ANTEROLATERAL ABDOMINAL WALL. BELOW THE UMBILICUS, THERE ARE TWO LAYERS OF SUPERFICIAL FASCIA – CAMPER'S AND SCARPA'S.

MUSCLES OF THE ABDOMINAL WALL

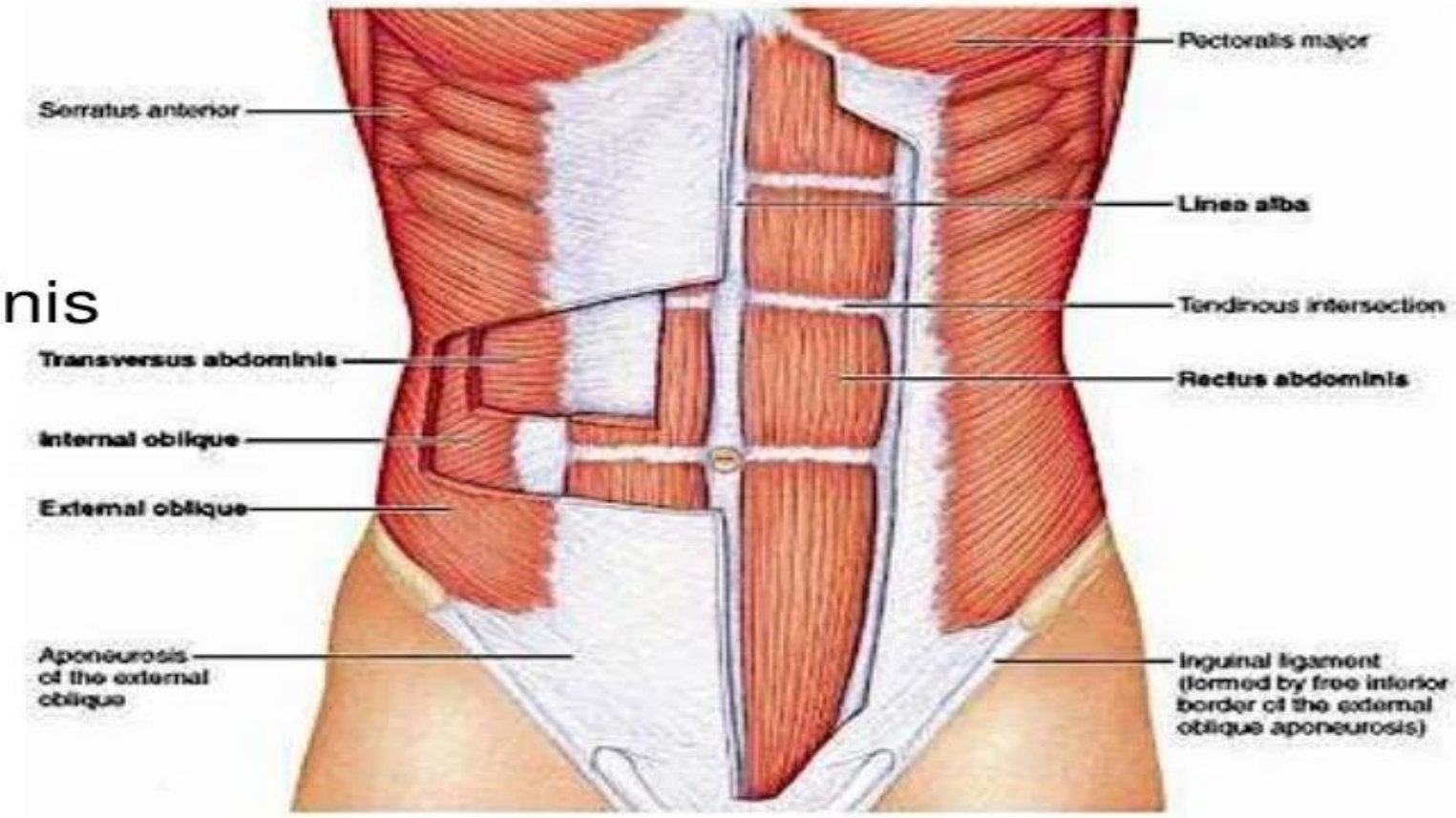
- The muscles of the anterolateral abdominal wall can be divided into two main groups:
- **Flat muscles** – three flat muscles, situated laterally on either side of the abdomen.
- **Vertical muscles** – two vertical muscles, situated near the mid-line of the body.

FLAT MUSCLES

- There are three flat muscles located laterally in the abdominal wall, stacked upon one another. Their fibers run in differing directions and **cross** each other – strengthening the wall and decreasing the risk of abdominal contents herniating through the wall.
- In the anteromedial aspect of the abdominal wall, each flat muscle forms an **aponeurosis** (a broad, flat tendon), which covers the vertical rectus abdominis muscle. The aponeuroses of all the flat muscles become entwined in the midline, forming the **linea alba** (a fibrous structure that extends from the xiphoid process of the sternum to the pubic symphysis).

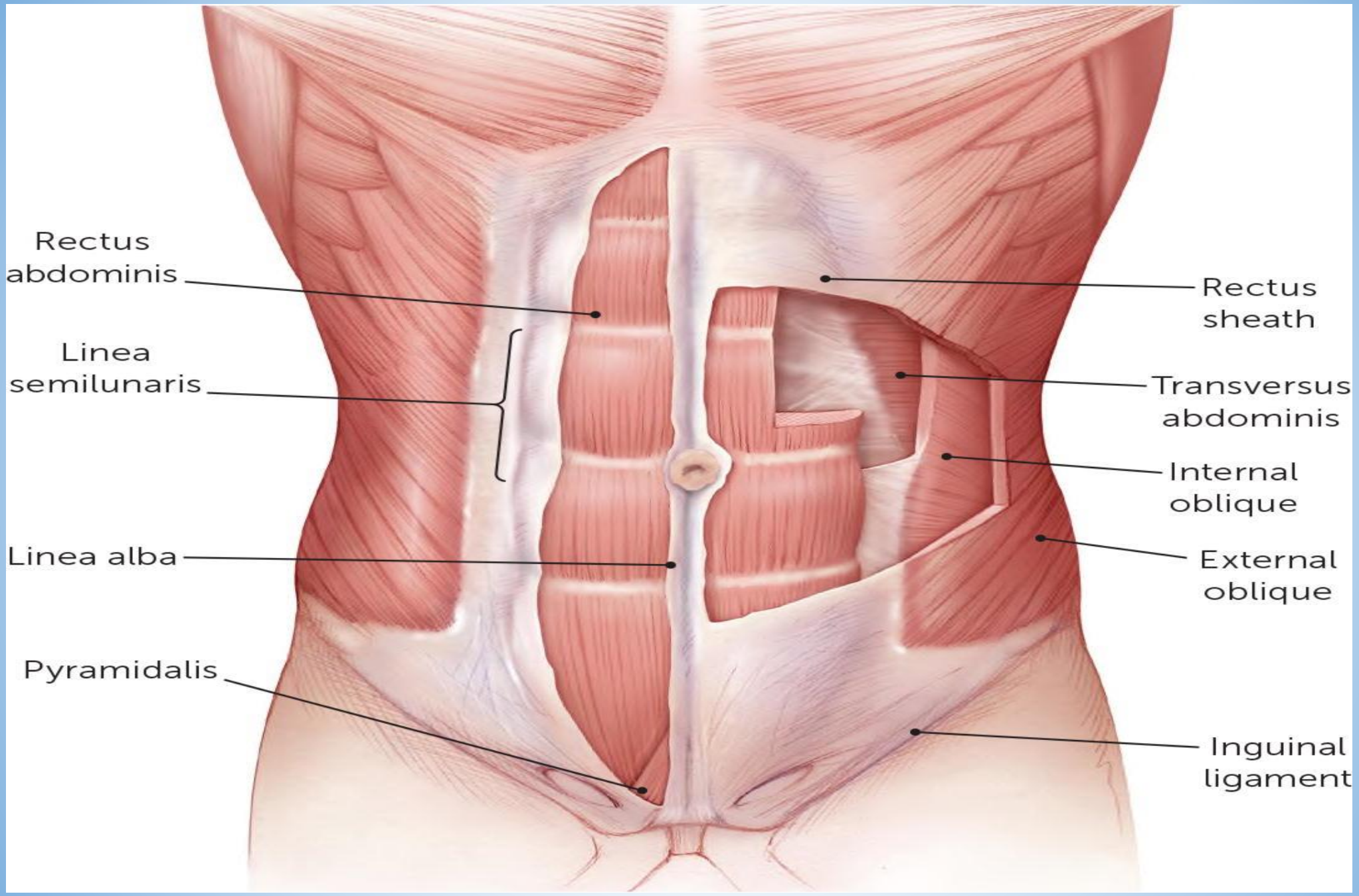
Muscles

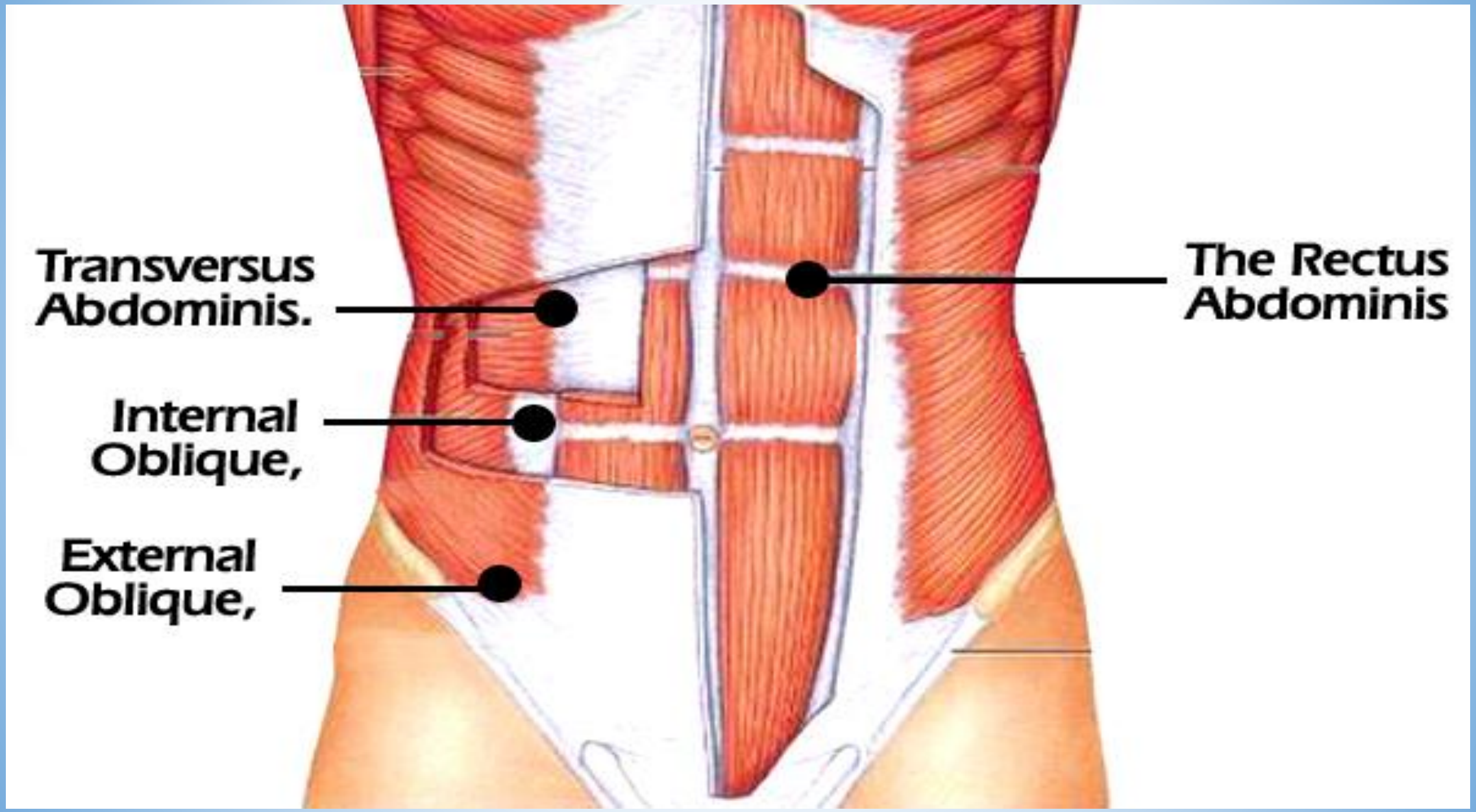
- External oblique
- Internal oblique
- Transversus abdominis
- Rectus abdominis
- Pyramidalis



EXTERNAL OBLIQUE

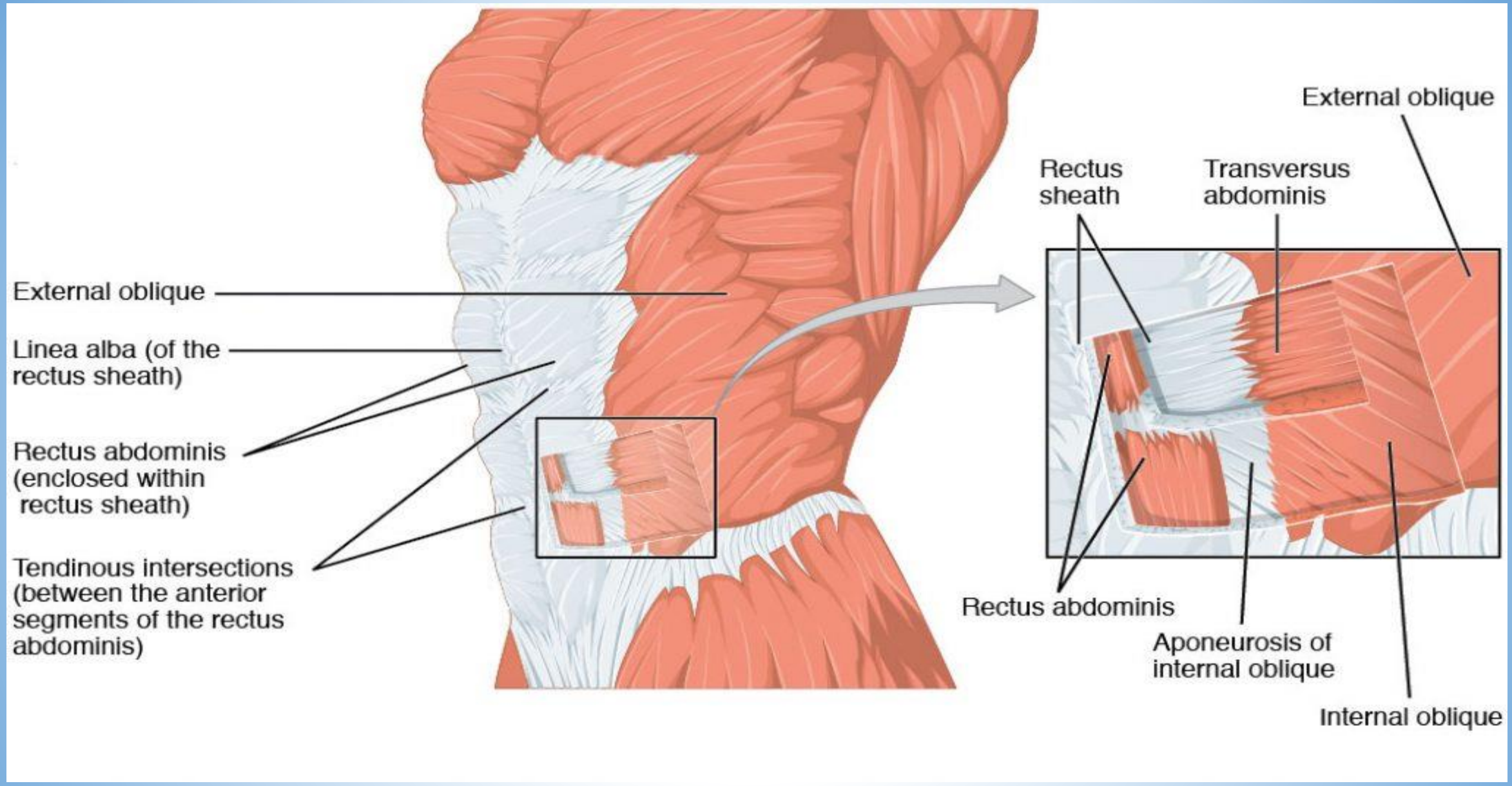
- The external oblique is the largest and most superficial flat muscle in the abdominal wall. Its fibres run inferomedially.
- **Attachments**: Originates from ribs 5-12, and inserts into the iliac crest and pubic tubercle.
- **Functions**: Contralateral rotation of the torso.
- **Innervation**: Thoracoabdominal nerves (T7-T11) and subcostal nerve (T12).


Rectus abdominis
Linea semilunaris
Linea alba
Pyramidalis
Rectus sheath
Transversus abdominis
Internal oblique
External oblique
Inguinal ligament


Transversus Abdominis.
Internal Oblique,
External Oblique,
The Rectus Abdominis

INTERNAL OBLIQUE

- The internal oblique lies deep to the external oblique. It is smaller and thinner in structure, with its fibers running **super medially** (perpendicular to the fibers of the external oblique).
- **Attachments**: Originates from the inguinal ligament, iliac crest and lumbodorsal fascia, and inserts into ribs 10-12.
- **Functions**: Bilateral contraction compresses the abdomen, while unilateral contraction ipsilaterally rotates the torso.
- **Innervation**: Thoracoabdominal nerves (T7-T11), subcostal nerve (T12) and branches of the lumbar plexus.



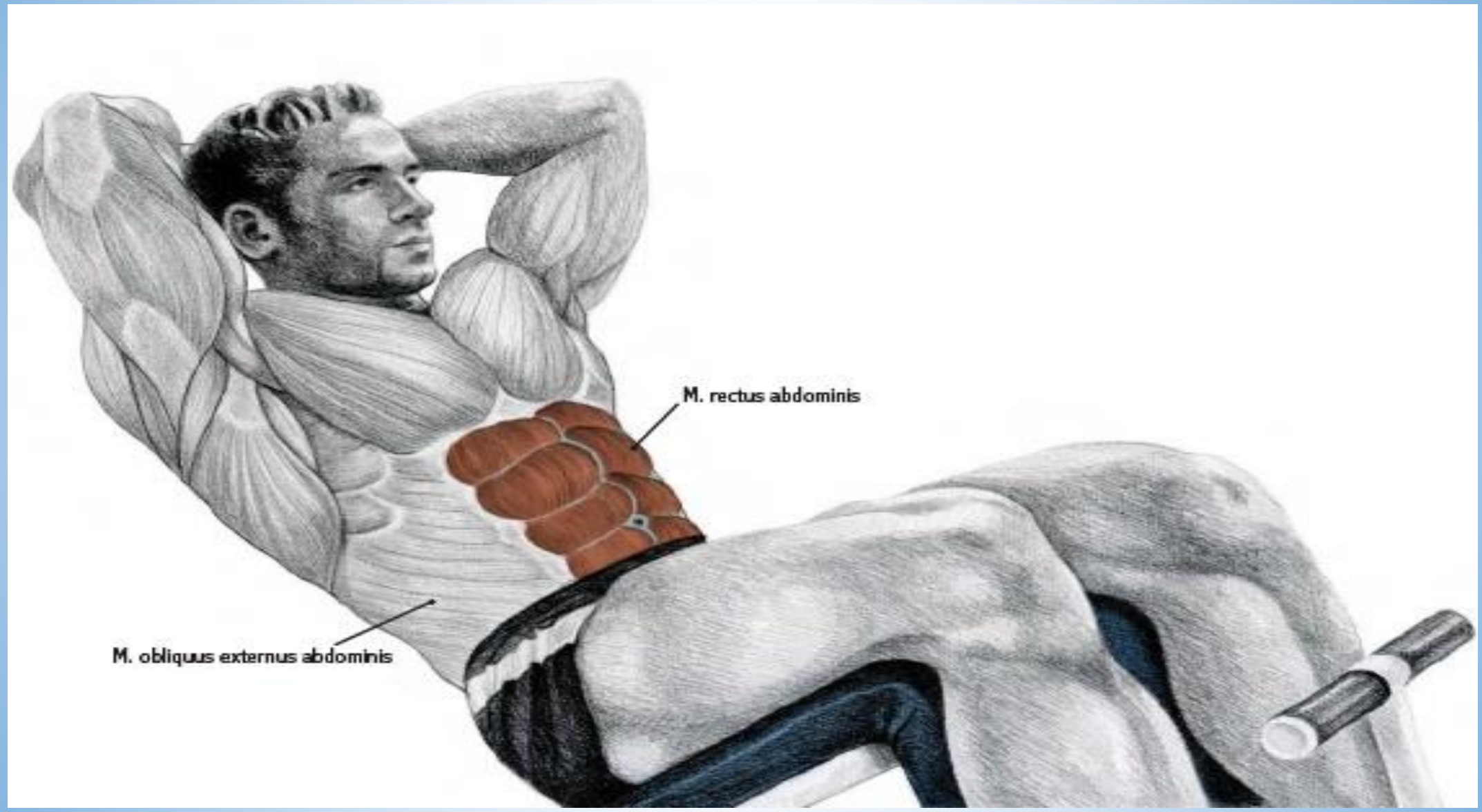
THE MUSCLES OF THE ANTEROLATERAL ABDOMINAL WALL.
NOTE HOW THE FLAT MUSCLES FORM APONEUROSES MEDIALLY

TRANSVERSUS ABDOMINIS

- The transversus abdominis is the deepest of the flat muscles, with transversely running fibres. Deep to this muscle is a well-formed layer of fascia, known as the transversalis fascia.
- **Attachments**: Originates from the inguinal ligament, costal cartilages 7-12, the iliac crest and thoracolumbar fascia. Inserts into the conjoint tendon, xiphoid process, linea alba and the pubic crest.
- **Functions**: Compression of abdominal contents.
- **Innervation**: Thoracoabdominal nerves (T7-T11), subcostal nerve (T12) and branches of the lumbar plexus.

VERTICAL MUSCLES

- There are two vertical muscles located in the midline of the anterolateral abdominal wall – the rectus abdominis and pyramidalis.
- **Rectus Abdominis**
- The rectus abdominis is long, paired muscle, found either side of the midline in the abdominal wall. It is split into two by the **linea alba**. The lateral borders of the muscles create a surface marking known as the **linea semilunaris**.
- At several places, the muscle is intersected by fibrous strips, known as **tendinous intersections.** The tendinous intersections and the linea alba give rise to the 'six pack' seen in individuals with a well-developed rectus abdominis.
- **Attachments**: Originates from the crest of the pubis, before inserting into the xiphoid process of the sternum and the costal cartilage of ribs 5-7.
- **Functions**: As well as assisting the flat muscles in compressing the abdominal viscera, the rectus abdominis also stabilises the pelvis during walking, and depresses the ribs.
- **Innervation**: Thoracoabdominal nerves (T7-T11).


M. rectus abdominis
M. obliquus externus abdominis

PYRAMIDALIS

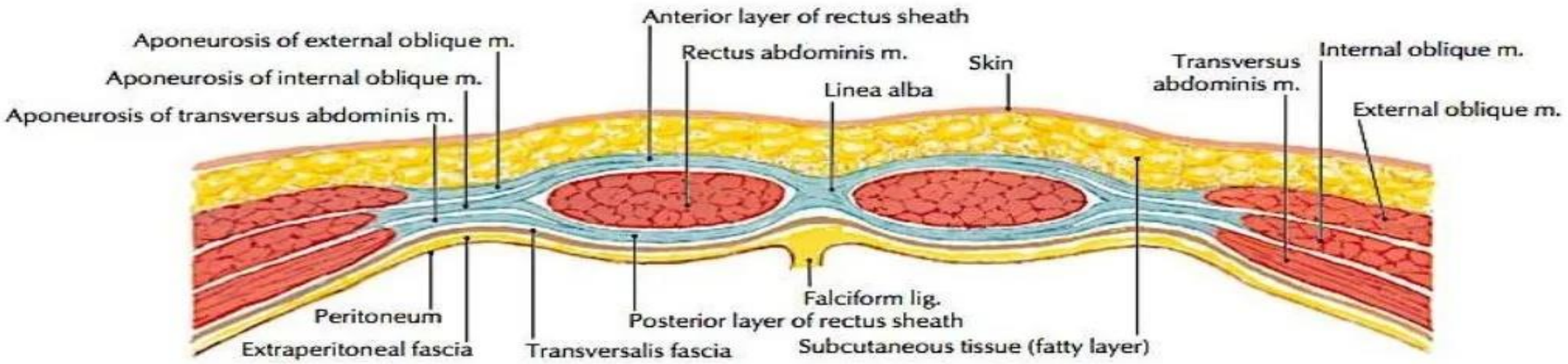
This is a small triangular muscle, found superficially to the rectus abdominis. It is located inferiorly, with its base on the **pubis bone**, and the apex of the triangle attached to the linea alba.

- **Attachments**: Originates from the pubic crest and pubic symphysis before inserting into the linea alba.
- **Functions**: It acts to tense the linea alba.
- **Innervation**: Subcostal nerve (T12).

RECTUS SHEATH

- The rectus sheath is formed by the **aponeuroses** of the three flat muscles and encloses the rectus abdominis and pyramidalis muscles. It has an anterior and posterior wall for most of its length:
- The **anterior wall** is formed by the aponeuroses of the external oblique, and of half of the internal oblique.
- The **posterior wall** is formed by the aponeuroses of half the internal oblique and of the transversus abdominis.
- Approximately midway between the umbilicus and the pubic symphysis, all the aponeuroses move to the anterior wall of the **rectus sheath**. At this point, there is no posterior wall to the sheath; the rectus abdominis is in direct contact with the **transversalis fascia**.
- The demarcation point where the posterior layer of the rectus sheath ends is the **arcuate line.**

Linea alba and rectus sheath

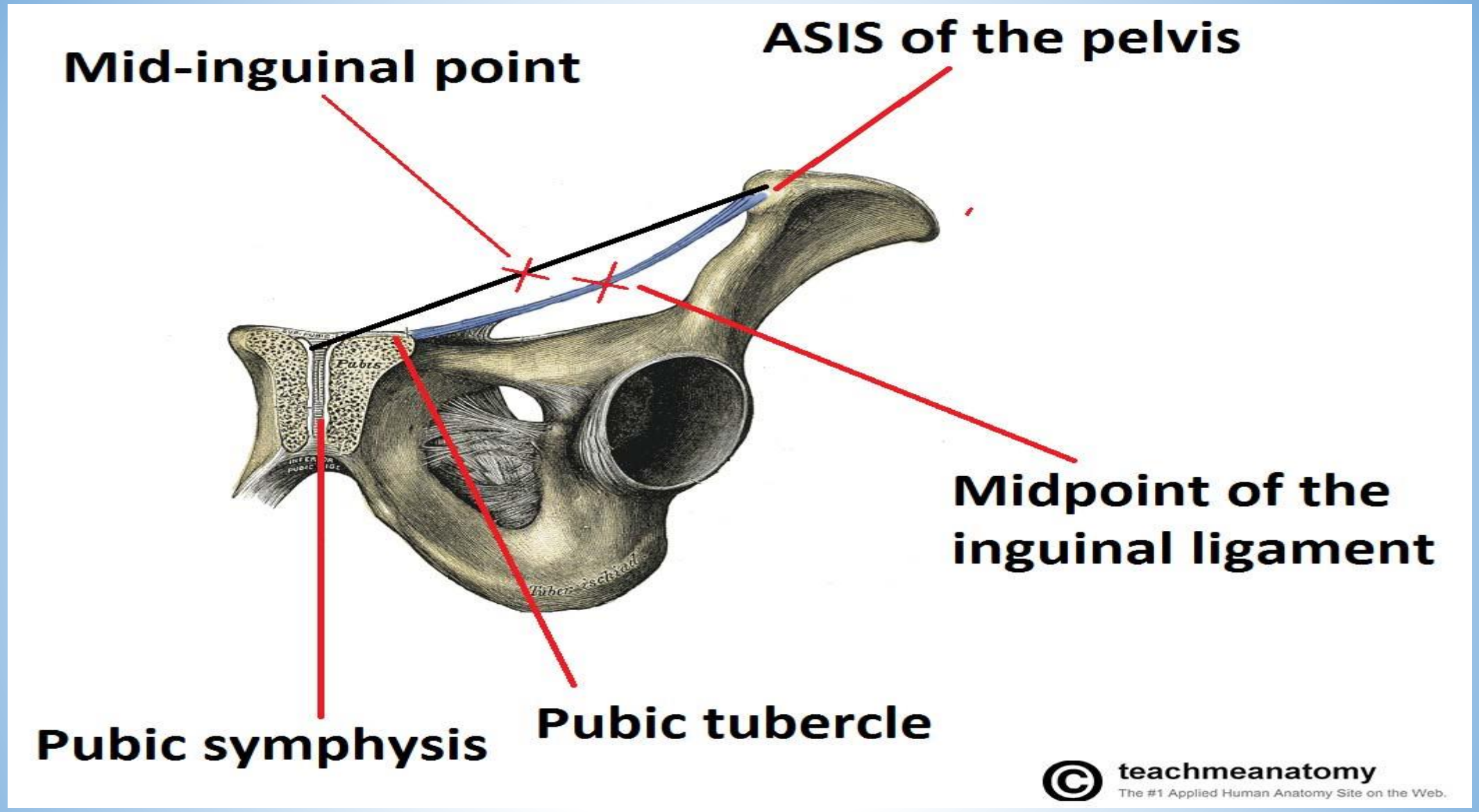


SURFACE ANATOMY

- Many of the organs in the abdominal cavity can be **palpated** through the abdominal wall, or their position can be visualised by surface markings.
- The **umbilicus** is the most visible structure of the abdominal wall and is the scar of the site of attachment of the umbilical cord. It is usually located midway between the xiphoid process and the pubis symphysis.
- The rectus abdominis muscle gives rise to abdominal markings. The lateral border of this muscle is indicated by the **linea semilunaris**, a curved line running from the 9th rib to the pubic tubercle. The **linea alba** is a fibrous line that splits the rectus abdominis into two. It is visible as a vertical groove extending inferiorly from the xiphoid process.

MID-INGUINAL POINT AND MIDPOINT OF THE INGUINAL LIGAMENT

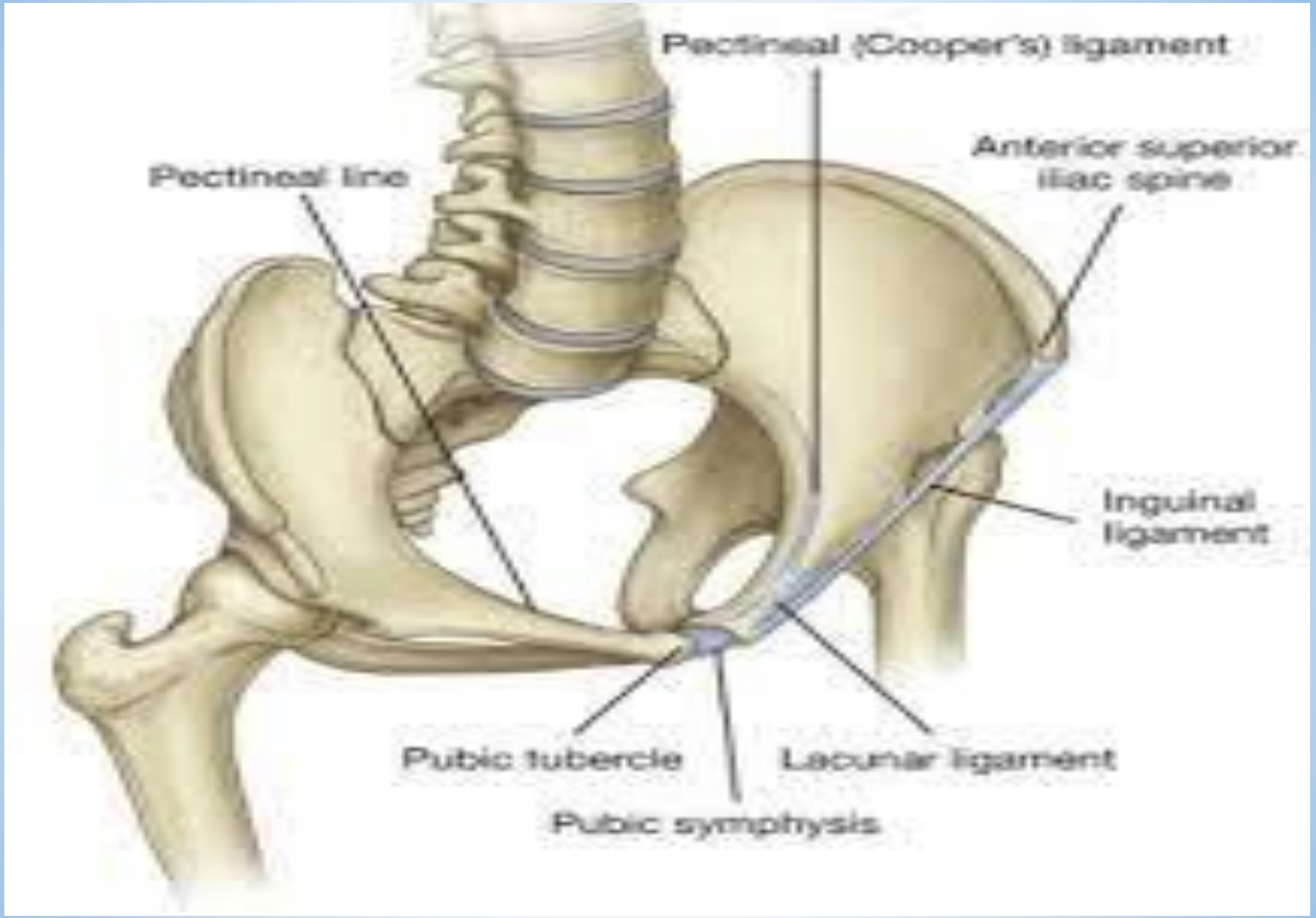
- These two terms are mentioned frequently in this article, and are often (mistakenly) used interchangeably:
- **Mid-inguinal point** – halfway between the pubic symphysis and the anterior superior iliac spine. The femoral pulse can be palpated here.
- **Midpoint of the inguinal ligament** – halfway between the pubic tubercle and the anterior superior iliac spine (the two attachments of the inguinal ligament). The opening to the inguinal canal is located just above this point.



Coronal view of the pelvis, demonstrating the mid-inguinal point and the midpoint of the inguinal ligament

Inguinal ligament

- **The inguinal ligament is the thickened, underturned, inferior margin of the aponeurosis of the external oblique**
- ***It forms a retinaculum that bridges the subinguinal space. A slit-like gap between the medial and the lateral crura of the external oblique aponeurosis, bridged by intercrural fibers, forms the superficial inguinal ring***

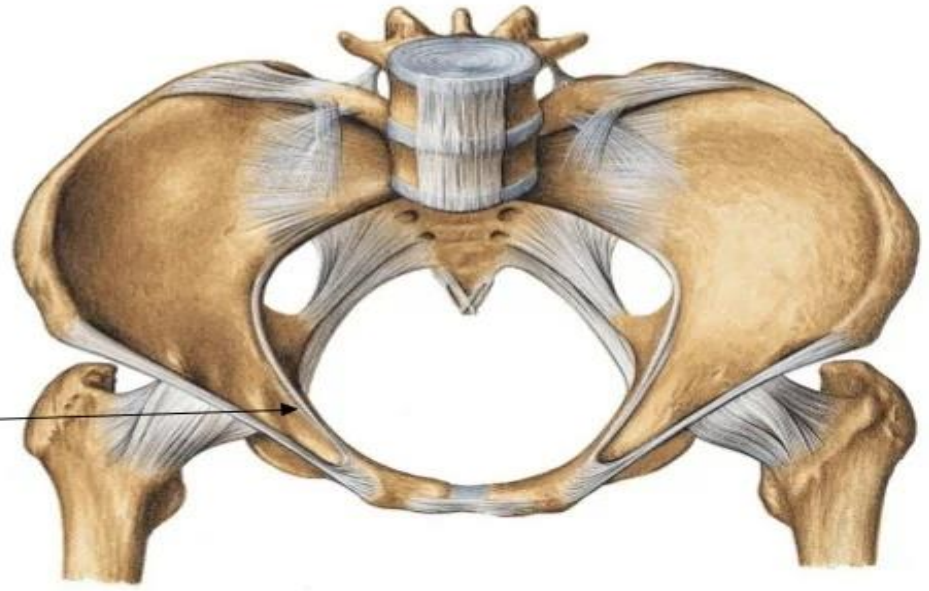

Pectineal (Cooper's) ligament
Pectineal line
Anterior superior iliac spine
Inguinal ligament
Pubic tubercle
Lacunar ligament
Pubic symphysis

The lacunar ligament

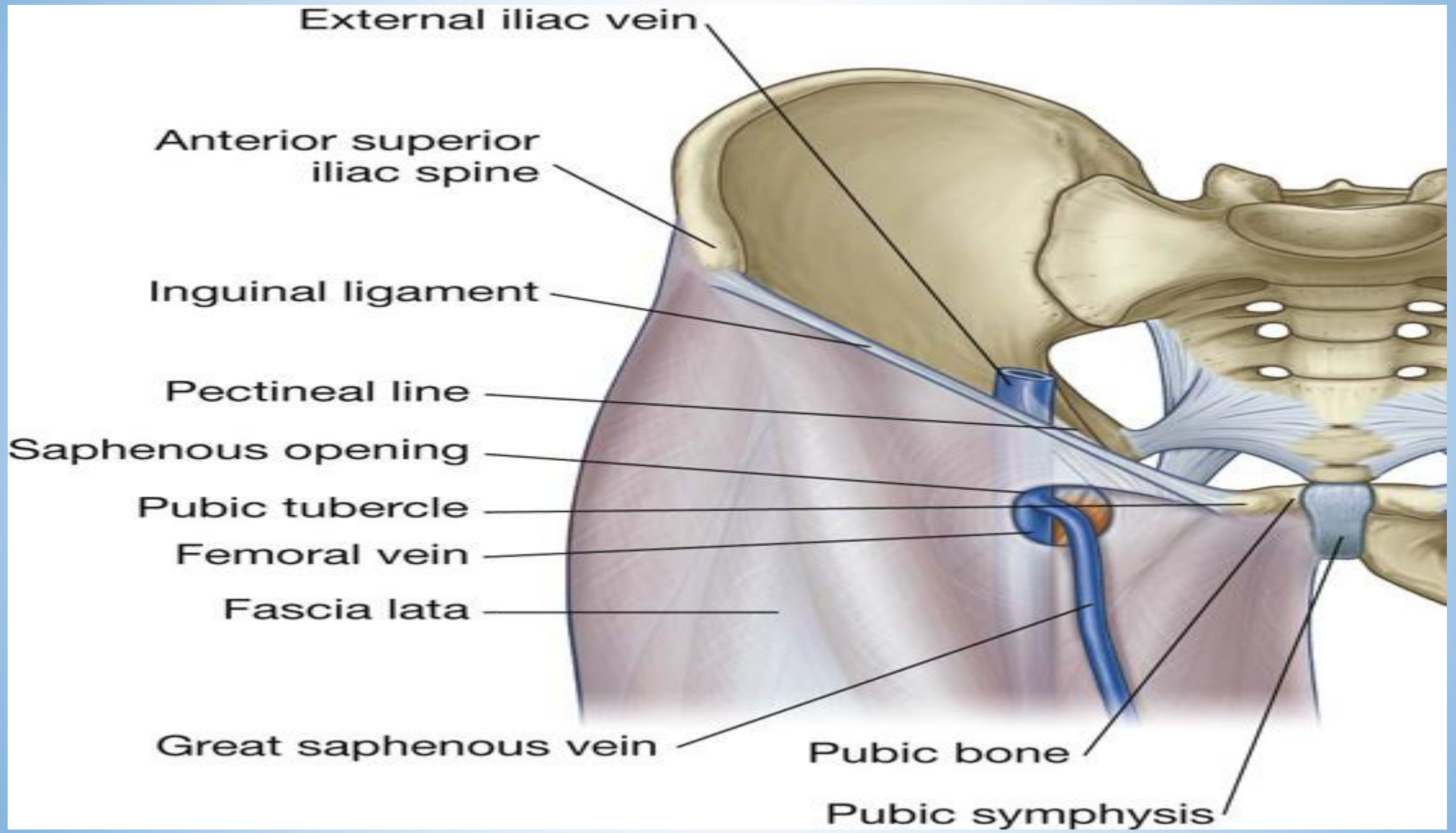
- The lacunar ligament is a thick triangular band of tissue lying mainly posterior to the medial end of the inguinal ligament.
- It measures 2 cm from base to apex and is a little larger in the male.
- It is formed from fibres of the medial end of the inguinal ligament and fibres from the fascia lata of the thigh, which join the medial end of the inguinal ligament from below.
- The inguinal fibres run posteriorly and laterally to the medial end of the pectineal line and are continuous with the pectineal fascia.
  - They form a near horizontal, triangular sheet with a curved medial border. This edge forms the lateral border of the femoral canal. The apex of the triangle is attached to the pubic tubercle.

Pectineal ligament

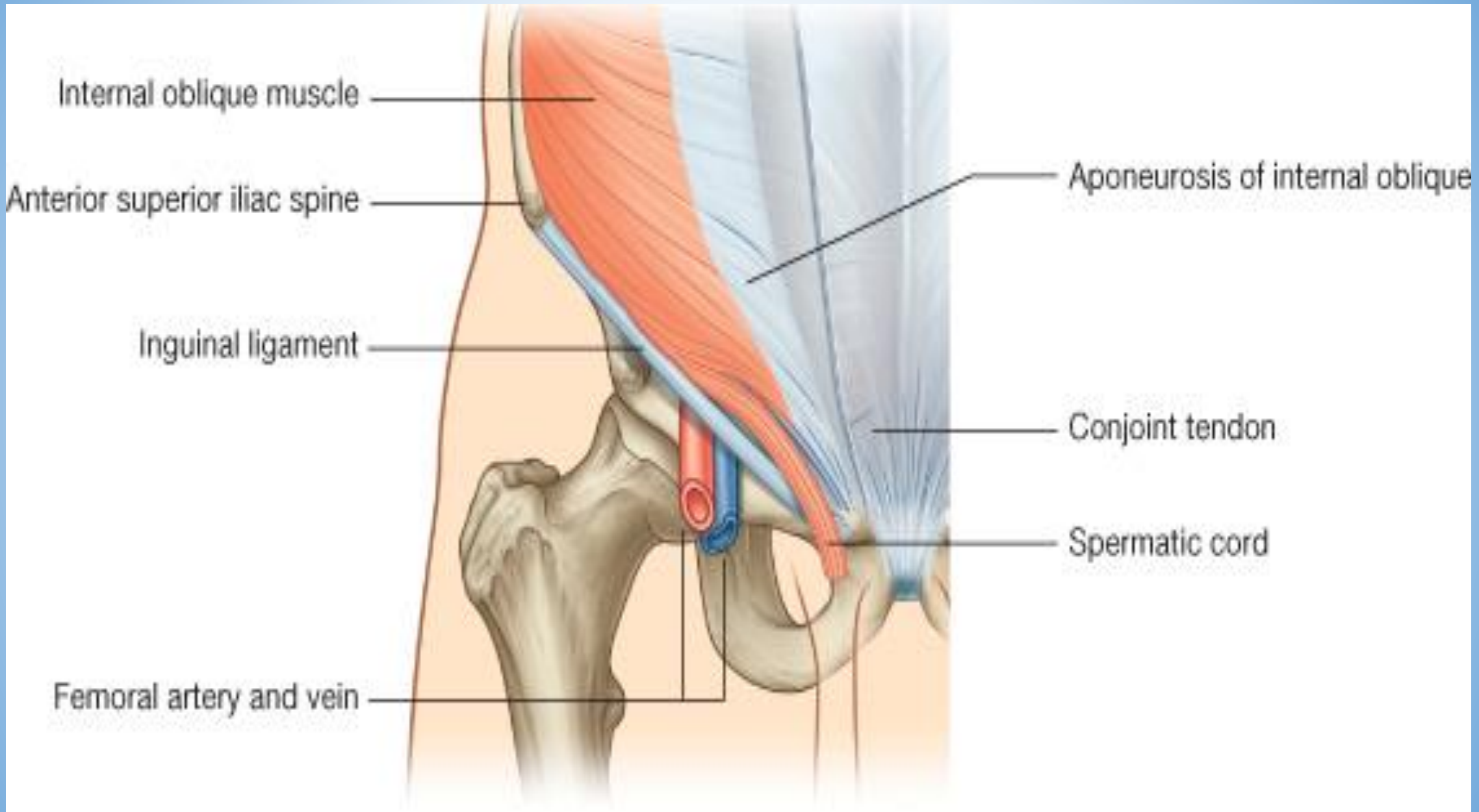
- Pectineal (backward)extension of inguinal ligament to pectineal line (pectin pubis)
- Pectineal ligament is lateral extension of inguinal ligament along pectineal line.

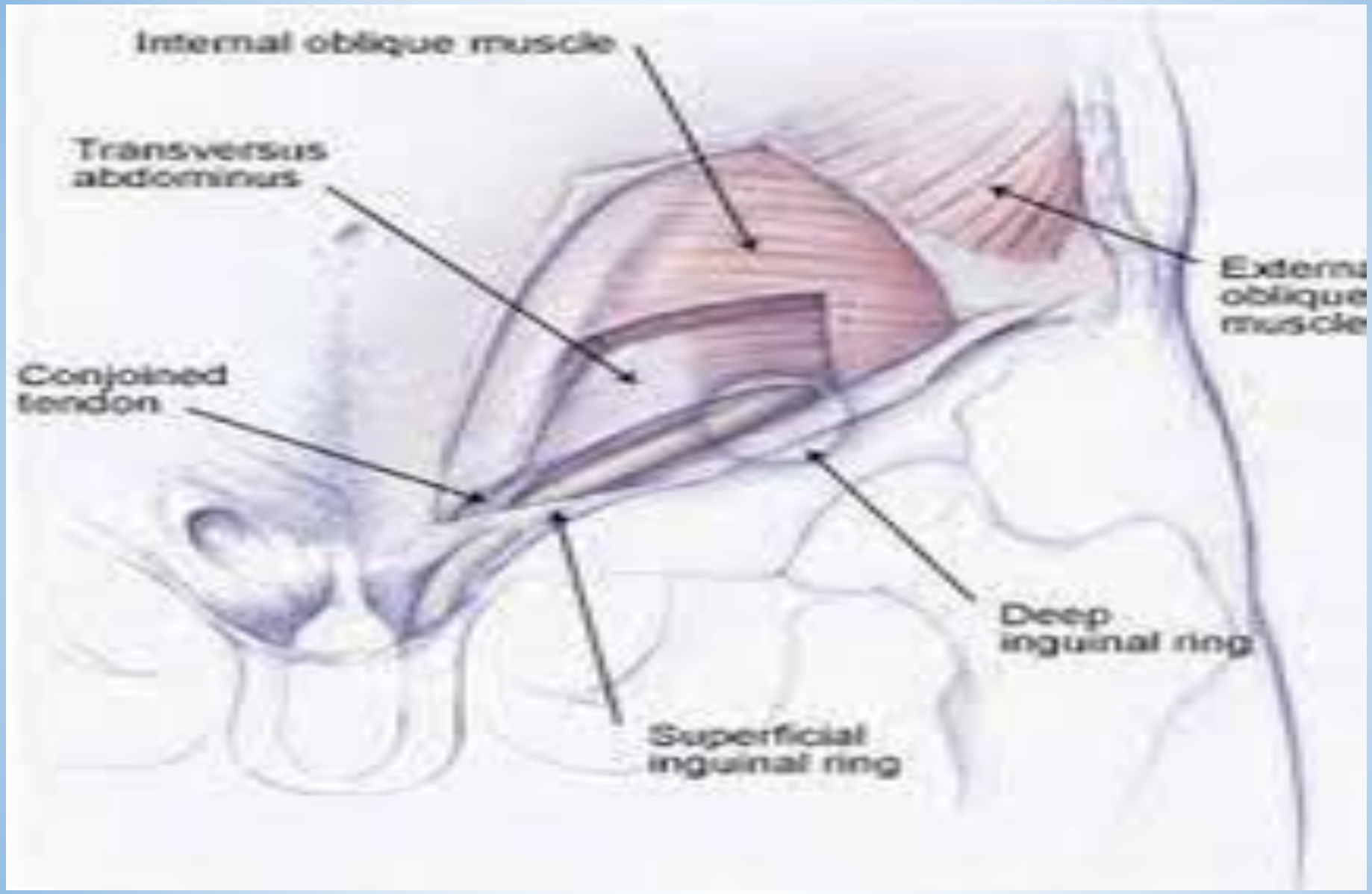


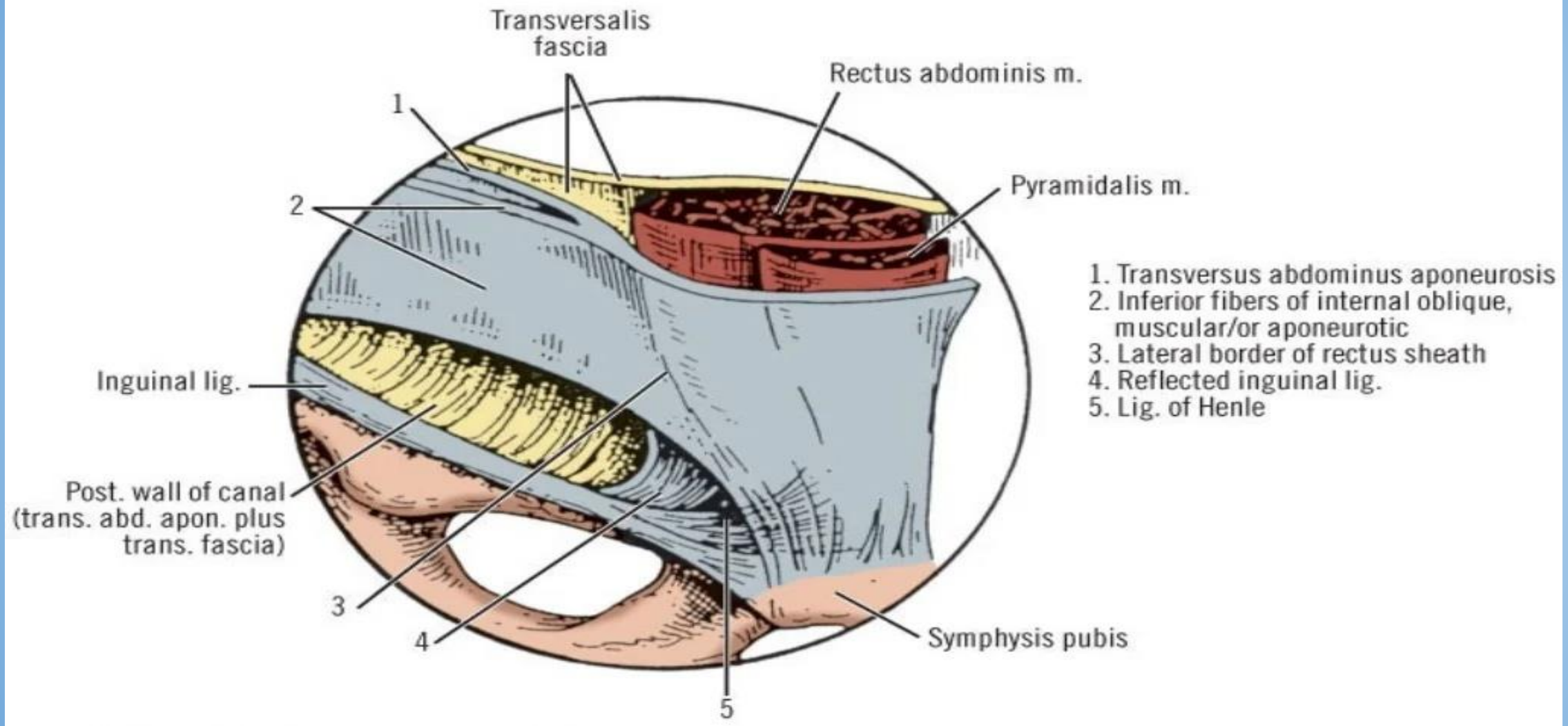
- Represents the medial triangular expansion of the inguinal ligament to the pectineal line of the pubis.
- Forms the medial border of the femoral ring and the floor of the inguinal canal.


External iliac vein
Anterior superior iliac spine
Inguinal ligament
Pectineal line
Saphenous opening
Pubic tubercle
Femoral vein
Fascia lata
Great saphenous vein
Pubic bone
Pubic symphysis

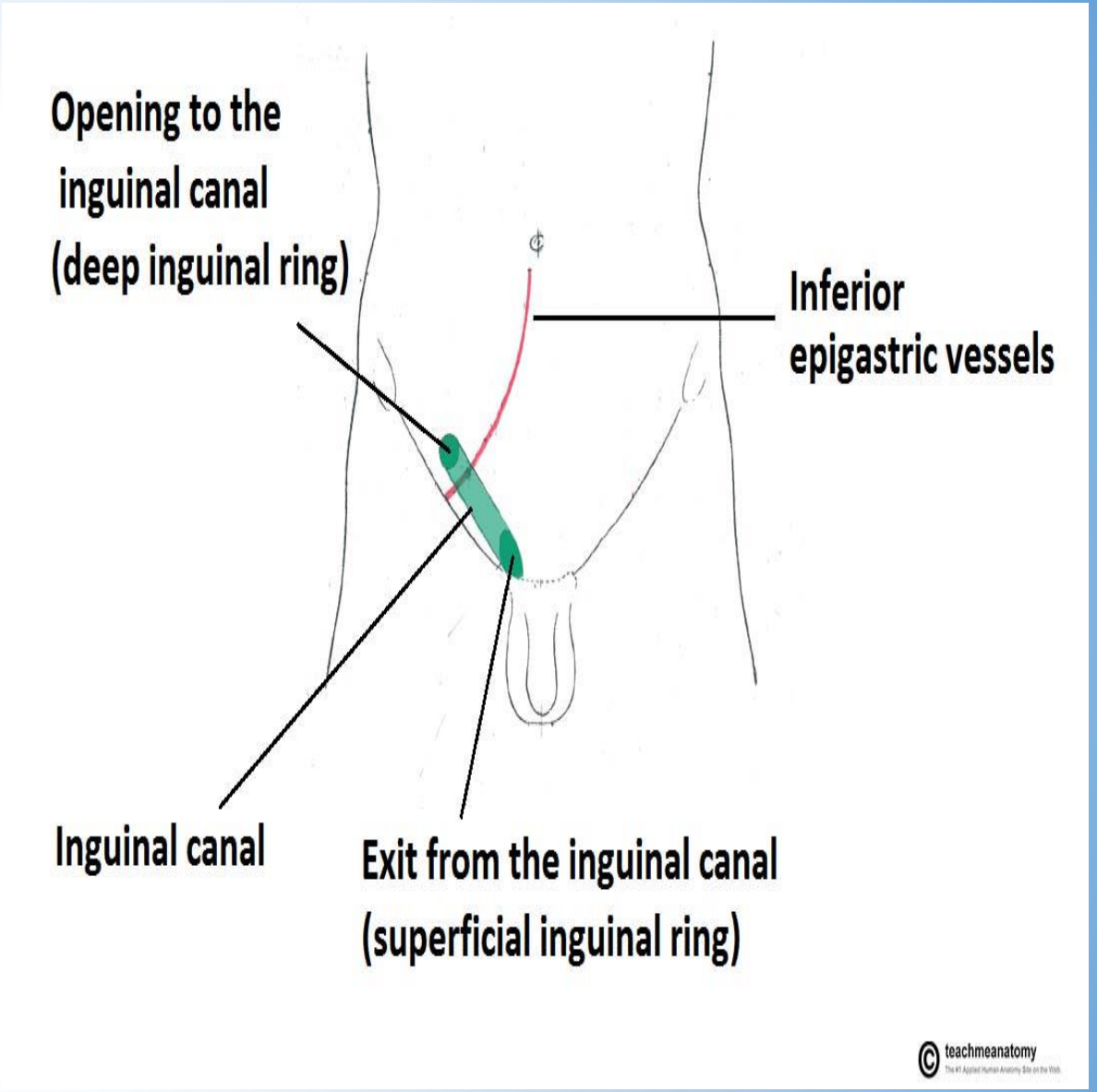
- The **conjoint tendon** (previously known as the **inguinal aponeurotic falx**) is a sheath of connective tissue formed from the lower part of the common aponeurosis of the abdominal internal oblique muscle and the transversus abdominis muscle, joining the muscle to the pelvis. It forms the medial part of the posterior wall of the inguinal canal.



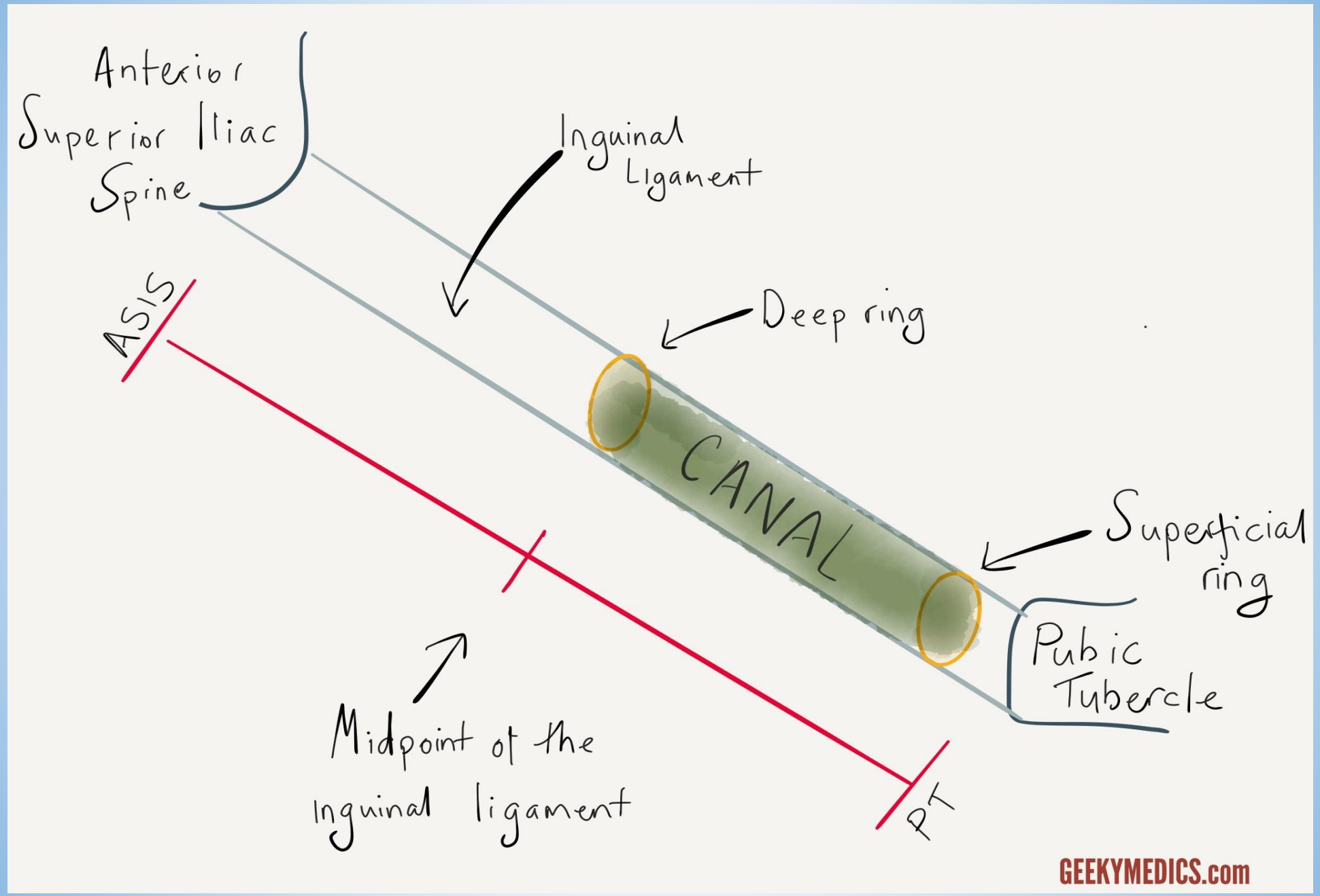

Internal oblique muscle
Transversus abdominus
Conjoined tendon
Deep inguinal ring
Superficial inguinal ring



- The **inguinal canal** is a short oblique passage that extends inferiorly and medially through the inferior part of the abdominal wall. It is superior and parallel to the inguinal ligament.
- The canal serves as a pathway by which structures can pass from the abdominal wall to the external genitalia. It is of clinical importance as a potential **weakness** in the abdominal wall, and thus a common site of herniation.



Overview of the inguinal canal. Clinically it is important to note that the opening to the inguinal canal is located laterally to the inferior epigastric artery.


Anterior Superior Iliac Spine
Inguinal Ligament
ASIS
Deep ring
CANAL
Superficial ring
Pubic Tubercle
Midpoint of the inguinal ligament
PT
GEEKYMEDICS.com

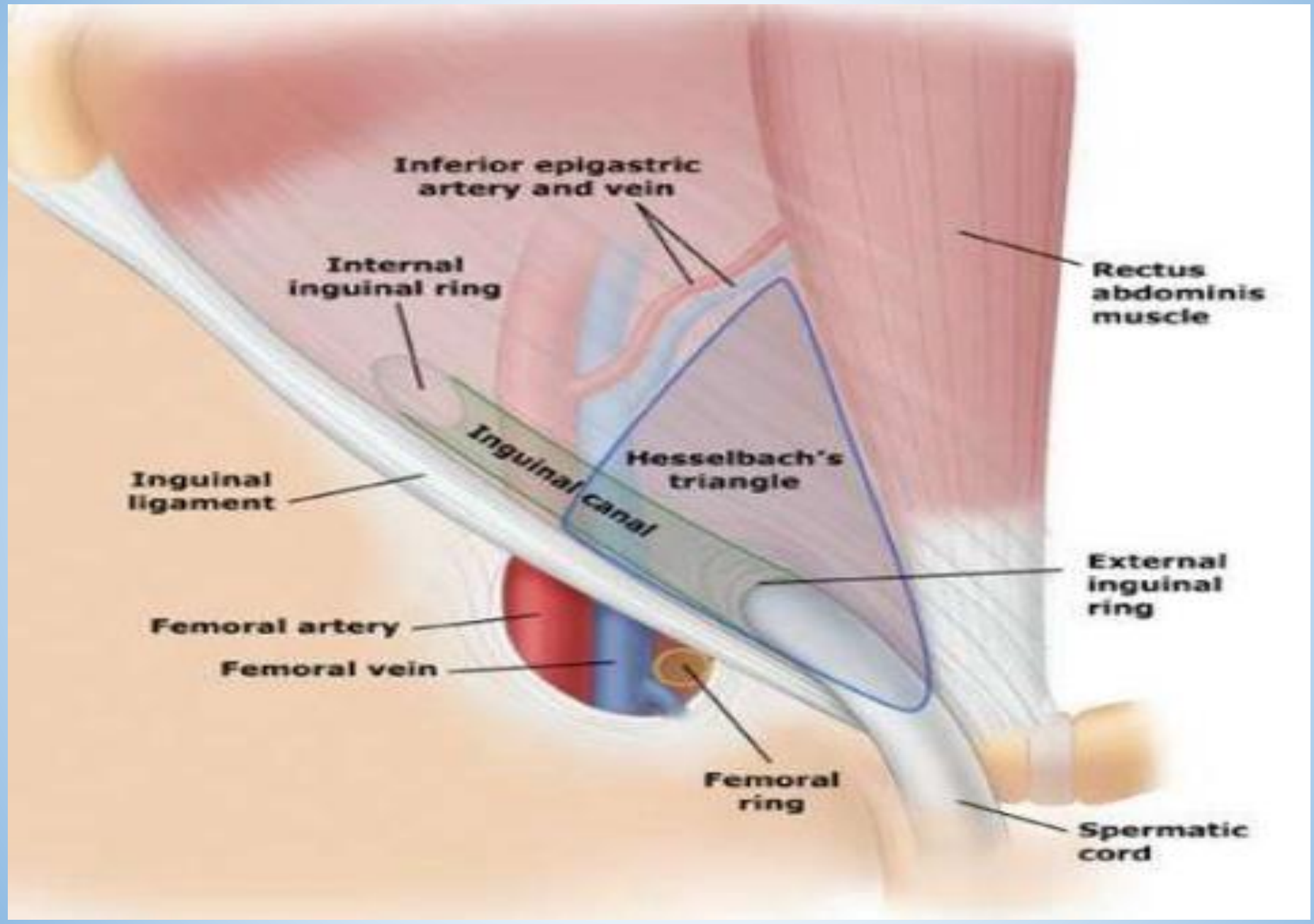
Function of the Inguinal Canal

- The inguinal canal allows structures of the spermatic cord to pass to and from the testis to the abdomen in the male.
- (Normal spermatogenesis takes place only if the testis leaves the abdominal cavity to enter a cooler environment in the scrotum.)
- In the female, the smaller canal permits the passage of the round ligament of the uterus from the uterus to the labium majus.

RINGS

The two openings to the inguinal canal are known as rings.

- The **deep (internal) ring** is found above the midpoint of the inguinal ligament. which is lateral to the inferior epigastric artery(vessels). There is oval opening (ring is) created by the transversalis fascia, which invaginates to form a covering of the contents of the inguinal canal.(margins are attached with internal spermatic fascia)
- The **superficial (external) ring** marks the end of the inguinal canal, and lies just superior to the pubic tubercle. It is a triangle shaped opening, in the aponeurosis of external oblique, which forms another covering of the inguinal canal contents.(external spermatic fascia)
- This opening contains intercrural fibres, which run perpendicular to the aponeurosis of the external oblique and prevent the ring from widening.

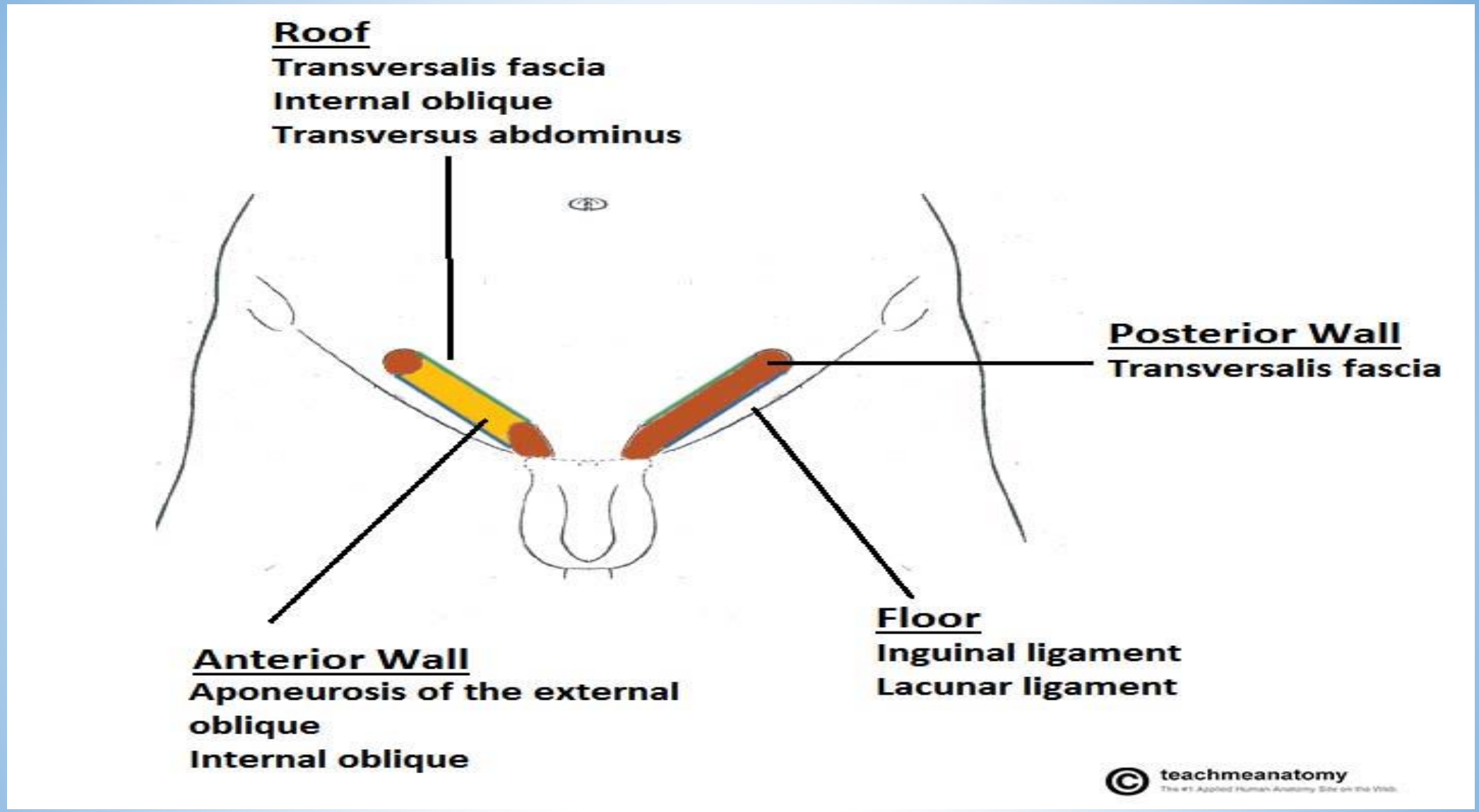

Inferior epigastric artery and vein
Internal inguinal ring
Rectus abdominis muscle
Inguinal canal
Hesselbach's triangle
Inguinal ligament
External inguinal ring
Femoral artery
Femoral vein
Femoral ring
Spermatic cord

BOUNDARIES

The inguinal canal is bordered by anterior, posterior, superior (roof) and inferior (floor) walls. It has two **openings** – the superficial and deep rings.

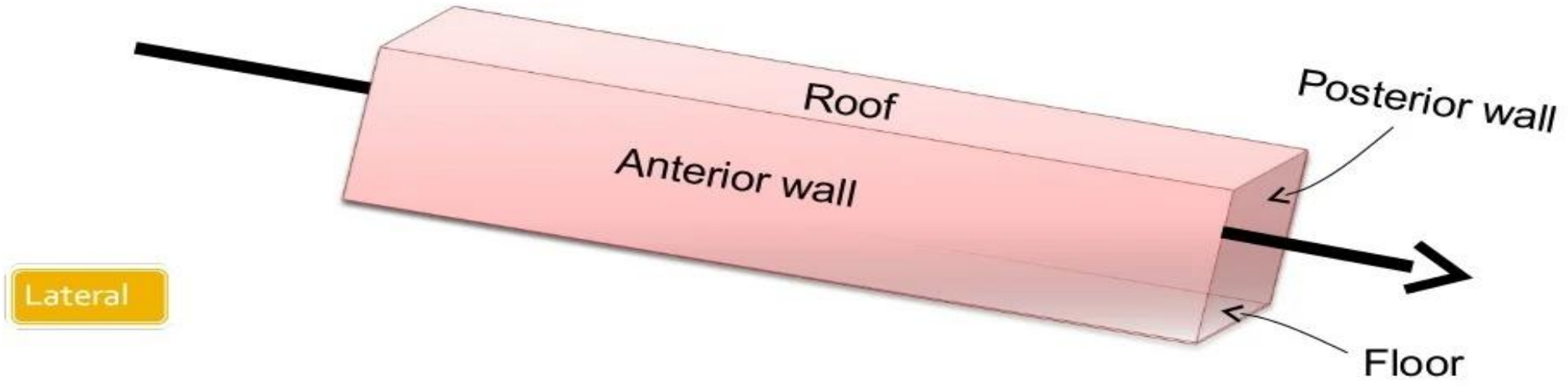
W A L L S

- **Anterior wall** – aponeurosis of the external oblique, reinforced by the internal oblique muscle laterally. weak point is sup inguinal ring STRENGHTHENED POST BY CONJOIND TENDON
- **Posterior wall** – transversalis fascia lat, conjoind tendon medially. Weak point is deep inguinal ring STRENGTHEND ANTERIORLY BY I.O MUSCLE
- **Roof** – transversalis fascia, internal oblique, and transversus abdominis.
- **Floor** – inguinal ligament (a 'rolled up' portion of the external oblique aponeurosis), thickened medially by the lacunar ligament.



THE BORDERS OF THE INGUINAL CANAL. THE ANTERIOR WALL OF THE LEFT INGUINAL CANAL HAS BEEN REMOVED.

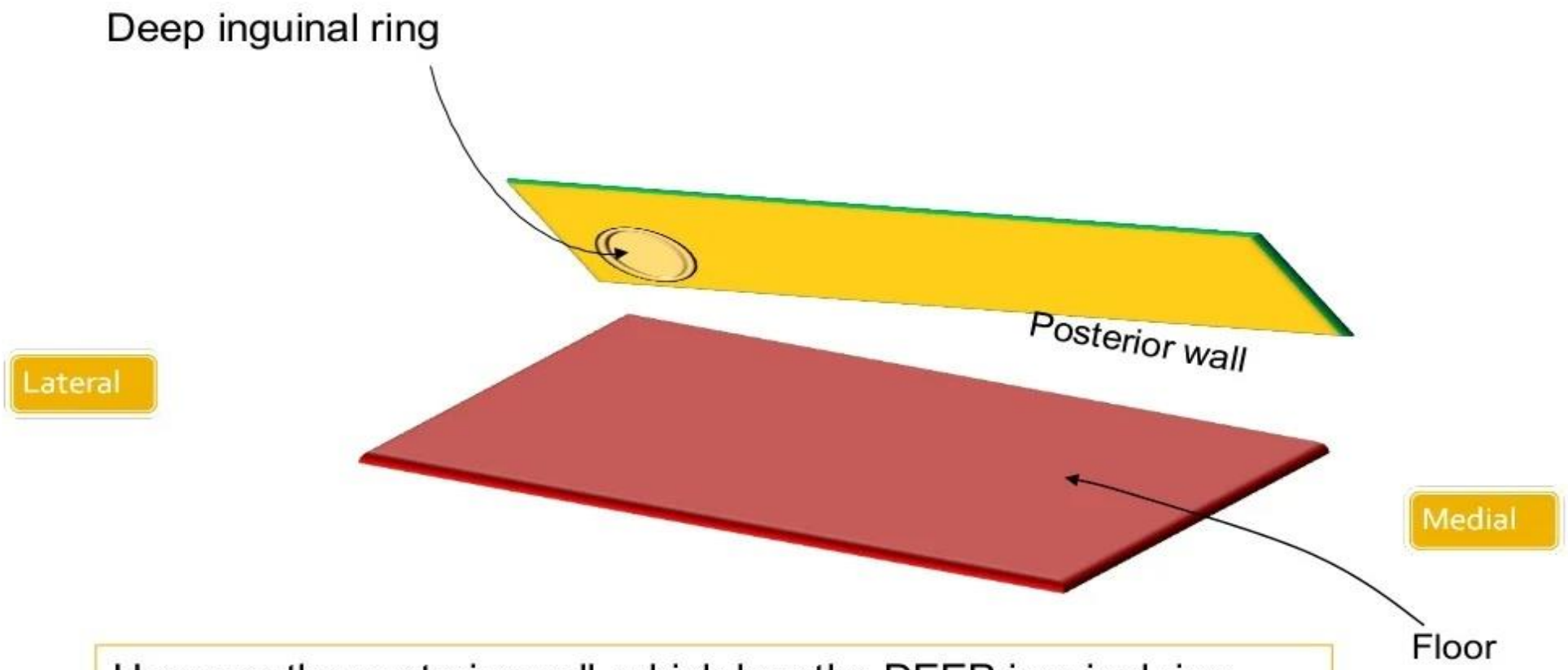
A Box?



Imagine the right side inguinal canal viewed from the front as a box with anterior & posterior walls, a roof & floor. The arrow indicates that structures can run through it from lateral to medial – e.g. in males it transmits the spermatic cord, and in females, the round ligament of the uterus.

r C Slater, Department of Human Biology, University of Cape Town

Inguinal canal



Here are the posterior wall, which has the DEEP inguinal ring situated laterally, and the floor. (Roof and anterior wall removed).

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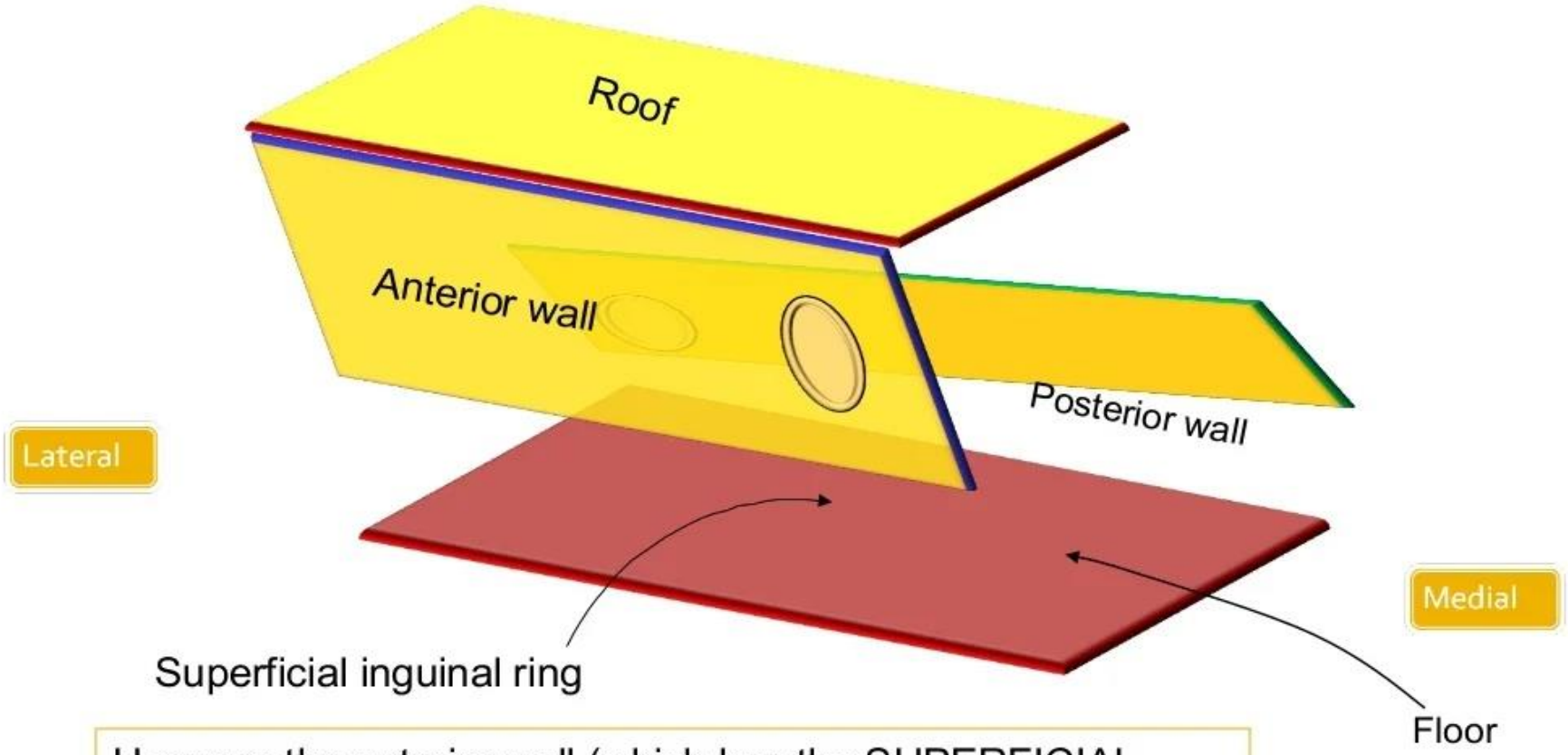
Inguinal canal



Here are the anterior wall (which has the SUPERFICIAL inguinal ring situated medially), and the roof.

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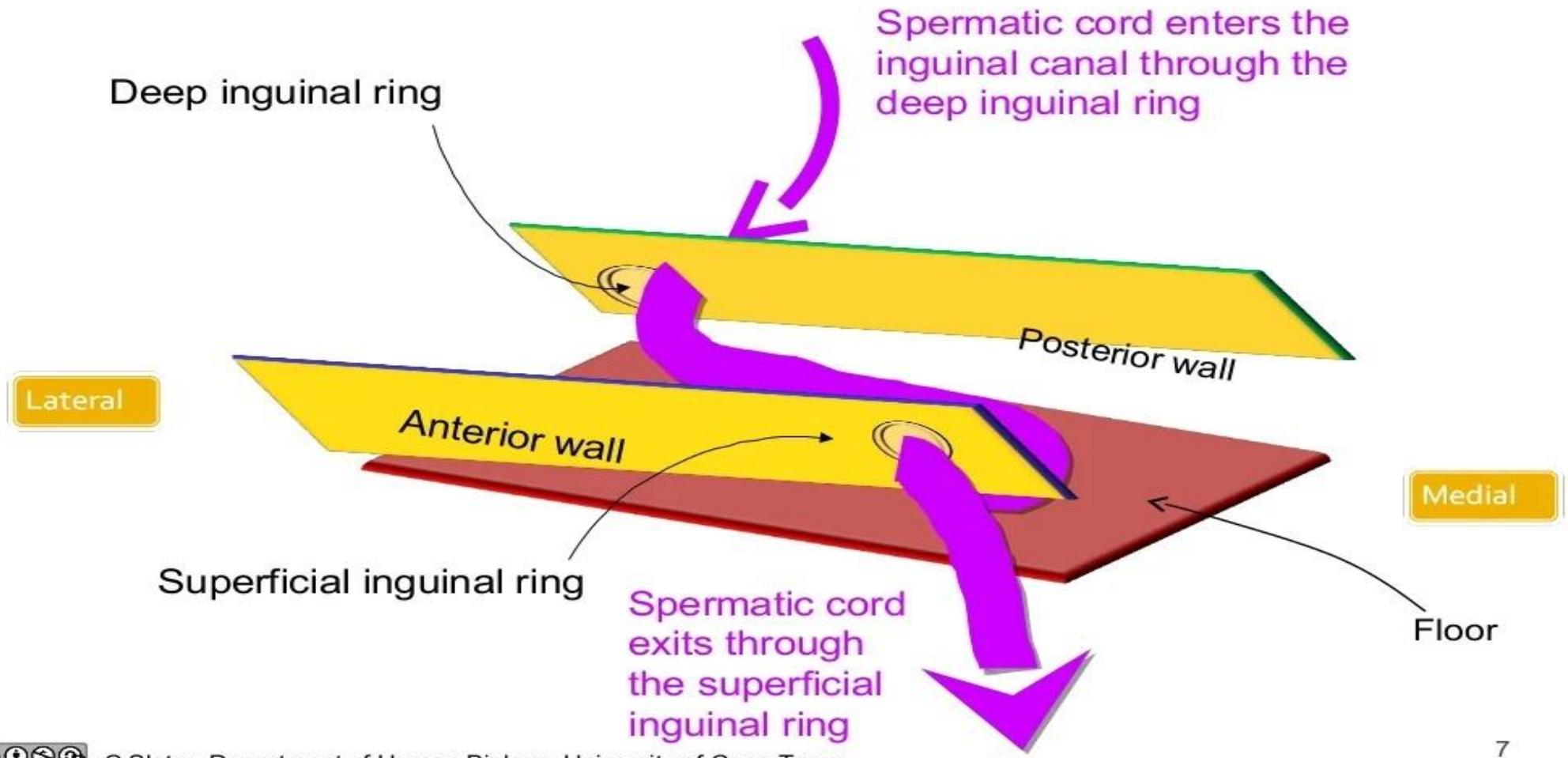
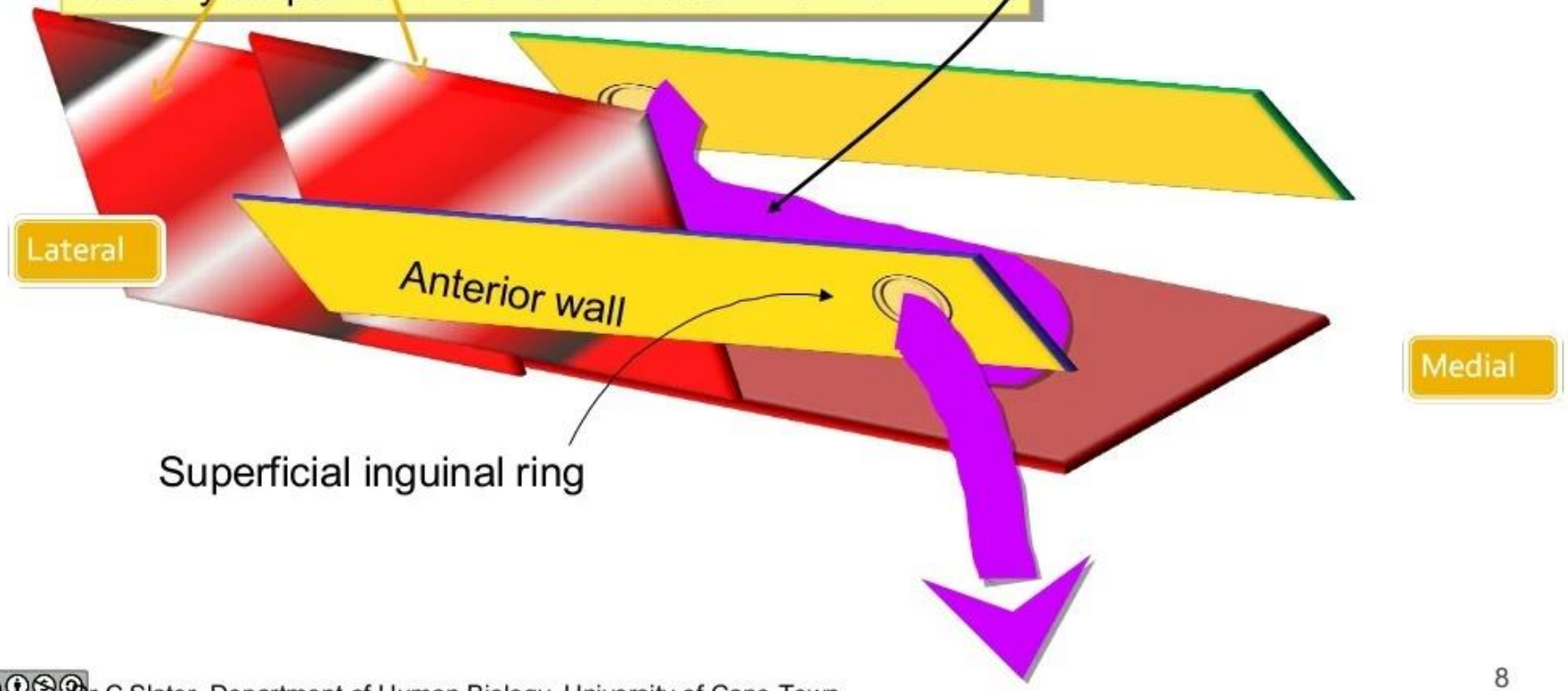
Inguinal canal



Inguinal canal

The anterior wall is made up of the **external oblique** muscle throughout, and is reinforced by the **internal oblique m.** laterally.
The **transversus abdominus m.** lies even more laterally as part of the anterior abdominal wall.



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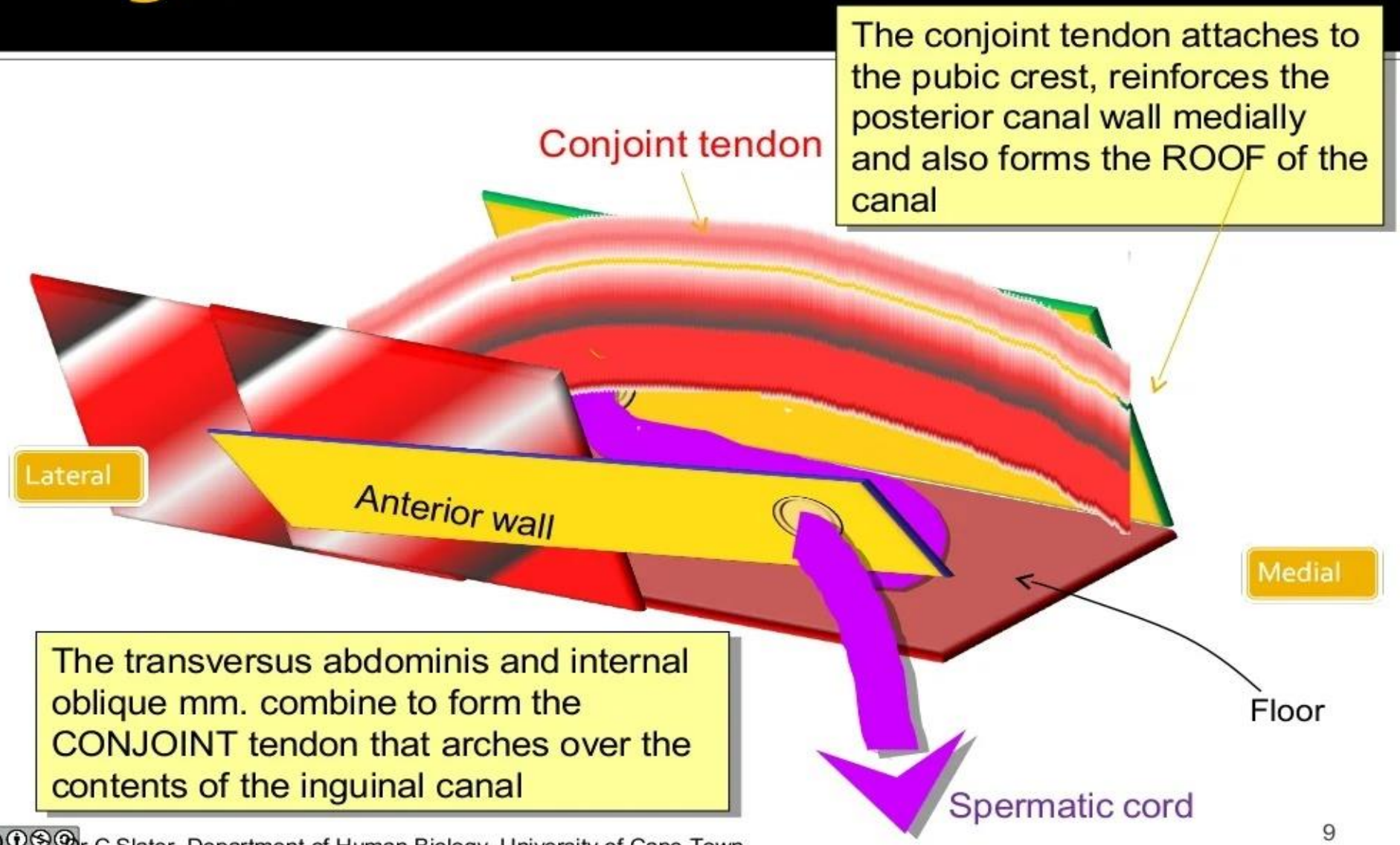
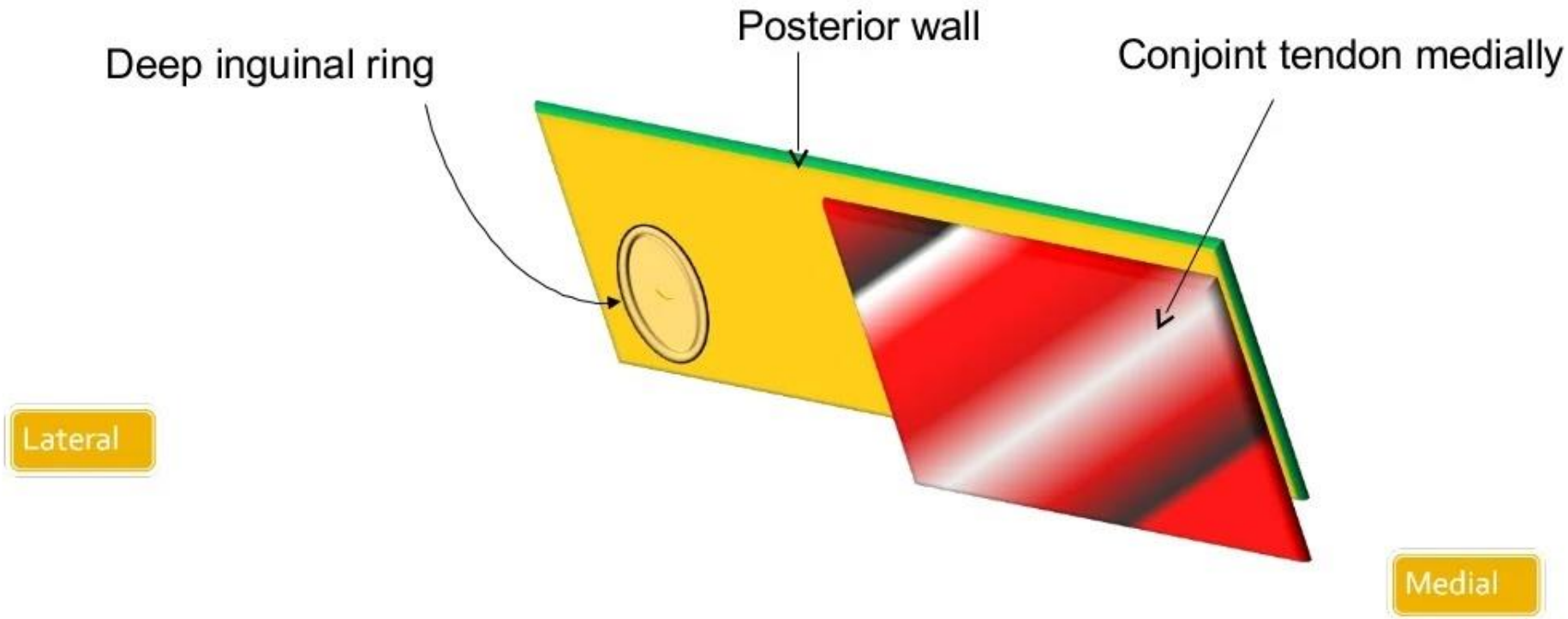
Inguinal canal



The transversus abdominis and internal oblique mm. combine to form the CONJOINT tendon that arches over the contents of the inguinal canal

Posterior wall of the inguinal canal



The posterior wall is formed by transversalis fascia (orange) throughout and the conjoint tendon (red) medially. The wall is particularly weak over the deep inguinal ring

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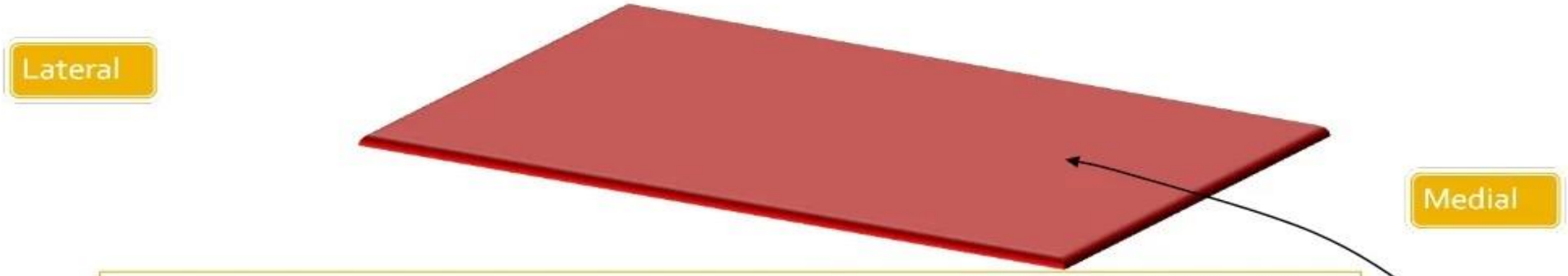
Floor of the inguinal canal



The floor is formed by an incurving of the inguinal ligament, which is part of the external oblique muscle, forming a gutter. (Medially it forms the lacunar ligament which is not illustrated).

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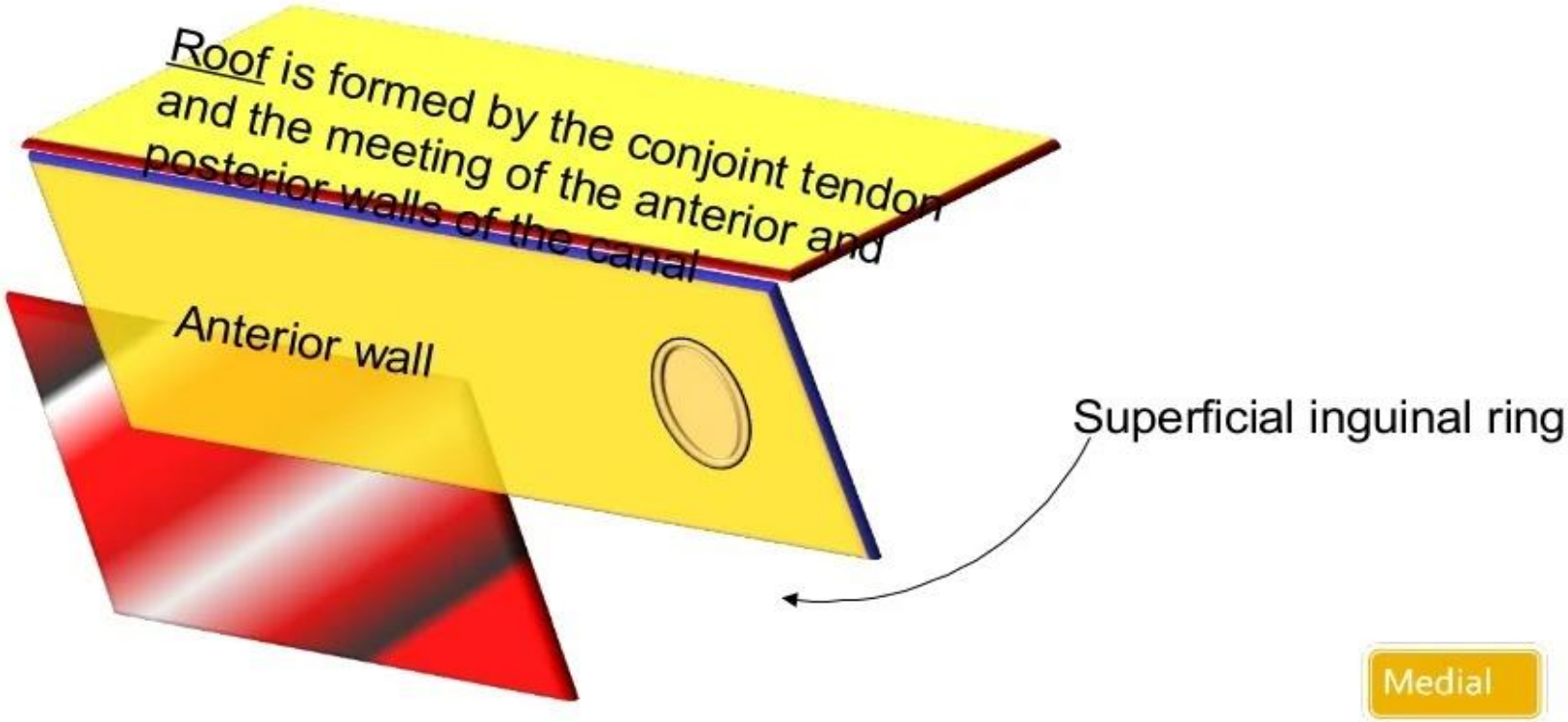
Roof and anterior wall of the inguinal canal



The anterior wall of the canal is formed by external oblique muscle (orange) throughout and by internal oblique muscles (red/black/white) laterally. This wall is weak medially because of the "hole" in the external oblique muscle (= superficial inguinal ring).

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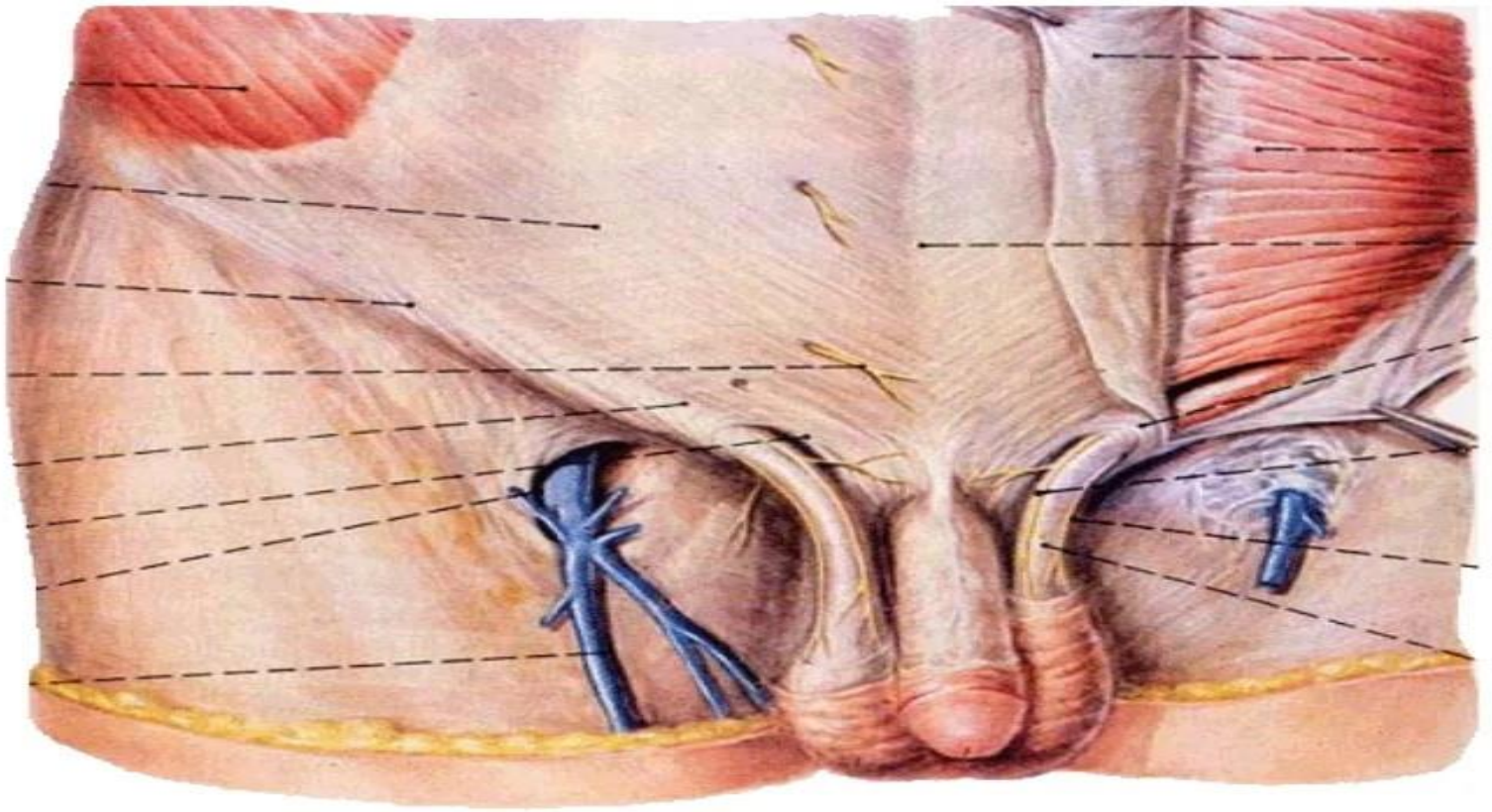
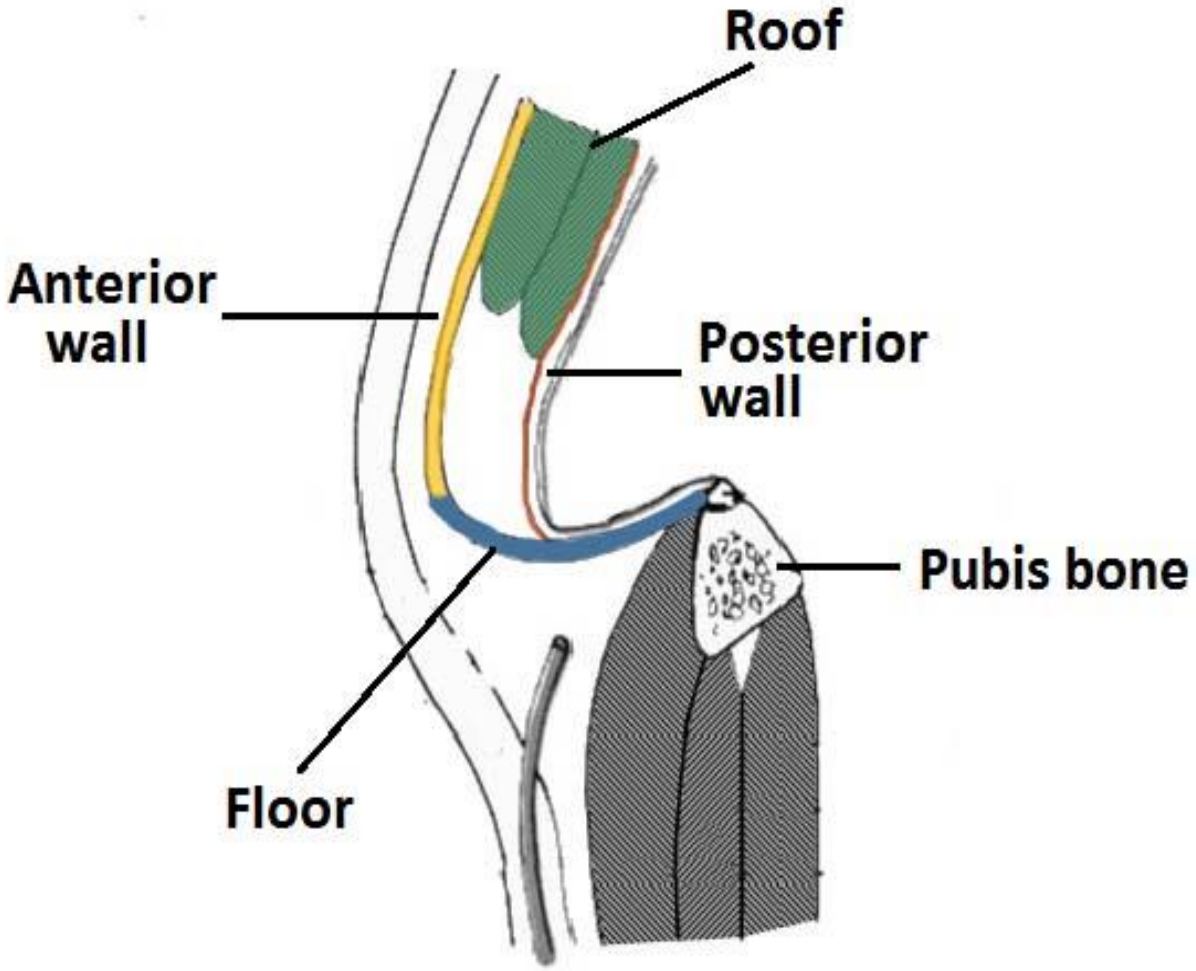
Surface marking of inguinal canal

- A horizontal line stretching from anterior iliac spine to lateral margin of rectus abdominis.
- The inguinal canal is larger and more prominent in men.





Aponeurosis of the external oblique

Internal oblique and transversus abdominis.

Tranversalis fascia

Inguinal ligament

SAGITTAL VIEW OF THE INGUINAL CANAL, SHOWING THE BORDERS

Contents

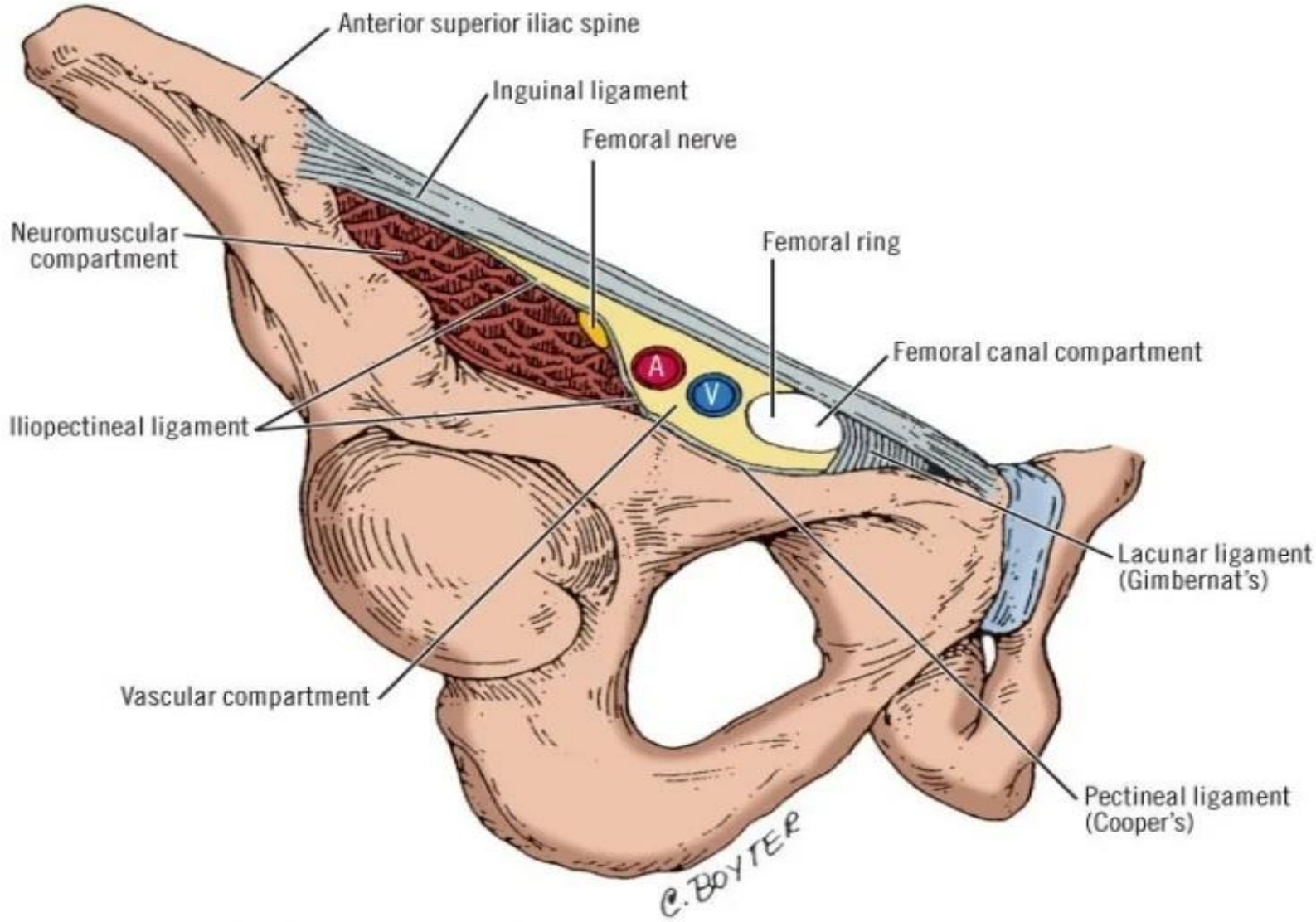
- In the males, it allows structures to pass to and from the testis to the abdomen.
- In females it allows the round ligament of the uterus to pass from the uterus to the labium majus.
- The inguinal canal also contains blood and lymphatic vessels and the ilioinguinal nerve in both sexes.

Structures passing through the deep inguinal ring

1- Spermatic cord in male or round ligament of uterus in female.
2- Genital branch of genitofemoral nerve (to cremasteric muscle)
3- Cremasteric artery which is branch of inferior epigastric artery to cremasteric muscle.

Structures passing through the superficial inguinal ring

1- Spermatic cord or round ligament of uterus.
2- Internal spermatic fascia.
3- Cremasteric muscle & its fascia.
4- Genital branch of genitofemoral nerve.
5- Cremasteric artery.
6- Ilio-inguinal nerve.



Length

- The canal is about 1.5 in. (4 cm) long in the adult.
- It is directed inferomedially through the inferior part of the anterolateral abdominal wall.
- It lies parallel and superior to the medial half of the inguinal ligament.
- Its size and form vary with age, and although it is present in both sexes it is most well developed in the male.

1.OBLIQUITY OF CANAL

During periods of increased **intra-abdominal** pressure, the abdominal viscera are pushed into the posterior wall of the inguinal canal.

the muscles of the anterior and posterior wall contract, and ‘clamp down’ on the canal.

In order to prevent herniation of viscera into the canal

2.Contraction of cremaster muscle

3.Contraction of external oblique muscle

4. harmones

CONTENTS

The contents of the inguinal canal include:

- **Spermatic cord** (biological males only) – contains neurovascular and reproductive structures that supply and drain the testes.
- **Round ligament** (biological females only) – originates from the uterine horn and travels through the inguinal canal to attach at the labia majora.
- **Ilioinguinal nerve** – contributes towards the sensory innervation of the genitalia
  - Note: only travels through *part* of the inguinal canal, exiting via the superficial inguinal ring (it does not pass through the deep inguinal ring)
  - This is the nerve most at risk of damage during an inguinal hernia repair.

CONTENTS CONTD…..

- **Genital branch of the genitofemoral nerve** – supplies the cremaster muscle and anterior scrotal skin in males, and the skin of the mons pubis and labia majora in females.
- The walls of the inguinal canal are usually **collapsed** around their contents, preventing other structures from potentially entering the canal and becoming stuck.

KEY FACTS ABOUT THE INGUINAL CANAL	
WALLS	Roof - formed by Muscles: internal oblique, transversus abdominis Anterior - formed by Aponeuroses: internal oblique, external oblique Floor - formed by Ligaments: inguinal ligament, lacunar ligament Posterior - formed by Tendon and transversalis fascia *Mnemonic:* MALT
OPENINGS	Deep inguinal ring - at the midpoint of the inguinal ligament Superficial inguinal ring - 'V' shaped defect in the external oblique aponeurosis within the Hasselbach's triangle
CONTENT	Male: spermatic cord and ilioinguinal nerve Female: round ligament of the uterus and ilioinguinal nerve (*ilioinguinal nerve enters the scrotum through superficial ring, but does not travel through the inguinal canal)
SPERMATIC CORD CONTENT	3 arteries: testicular, cremasteric, ductus deferens artery 3 fascial layers: external spermatic, cremasteric, internal spermatic 3 nerves: genital branch of genitofemoral nerve, sympathetic fibers, ilioinguinal nerve
CLINICAL IMPORTANCE	Herniations

CLINICAL RELEVANCE
INGUINAL HERNIA

A hernia is defined as the protrusion of an organ or fascia through the wall of a cavity that normally contains it. Hernias involving the inguinal canal can be divided into two main categories:

- **Indirect** – where the peritoneal sac enters the inguinal canal through the deep inguinal ring. Lat to inferior epigastric vessels
- **Direct** – where the peritoneal sac enters the inguinal canal though the posterior wall of the inguinal canal. medial to inferior epigastric artery
- Both types of inguinal hernia can present as lumps in the scrotum or labia majora.

Inguinal hernias

- The posterior wall of the canal is particularly weak laterally because of the deep inguinal ring
- The anterior wall opposite the deep ring is reinforced laterally by the internal oblique m.
- A hernia (e.g. of small bowel) that comes through the deep inguinal ring will have to travel along the inguinal canal as it cannot push into the reinforced layers of muscle in the anterior wall of the canal directly opposite the deep inguinal ring

Inguinal hernias

- The anterior wall of the canal is weak medially where the superficial inguinal ring is situated
- The posterior wall, opposite the superficial ring, is reinforced medially by the conjoint tendon that is formed by fibres of the internal oblique and transversus abdominis muscles
- Abdominal contents cannot normally force themselves through the superficial ring directly because of the reinforced posterior wall medially

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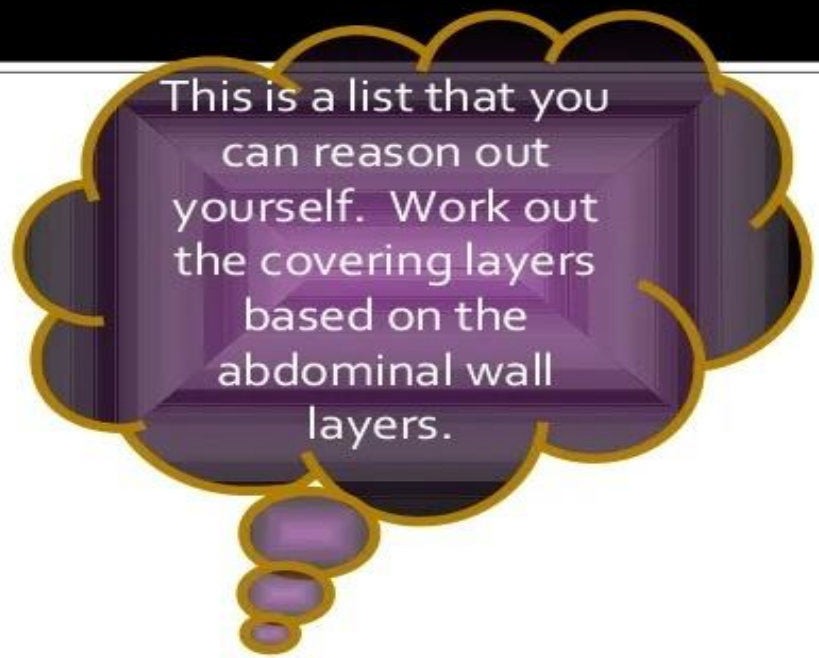
Indirect inguinal hernias

- Pass through the deep ring
- Travel along the canal
- Exit the superficial ring above and medial to the pubic tubercle (remember the inguinal ligament attaches to the tubercle). Since the incurved inguinal ligament forms the floor of the canal, the contents of the canal could not emerge below or lateral to the public tubercle (useful in surgical diagnosis). An example is congenital inguinal hernia.
- Coverings of indirect hernias

Coverings of indirect hernias

- Peritoneum
- Internal spermatic fascia (from transversalis fascia)
- Cremaster muscle & fascia (from transversus abdominis and internal oblique mm.)
- External spermatic fascia (from external oblique m.)
- Superficial fascia
- Skin



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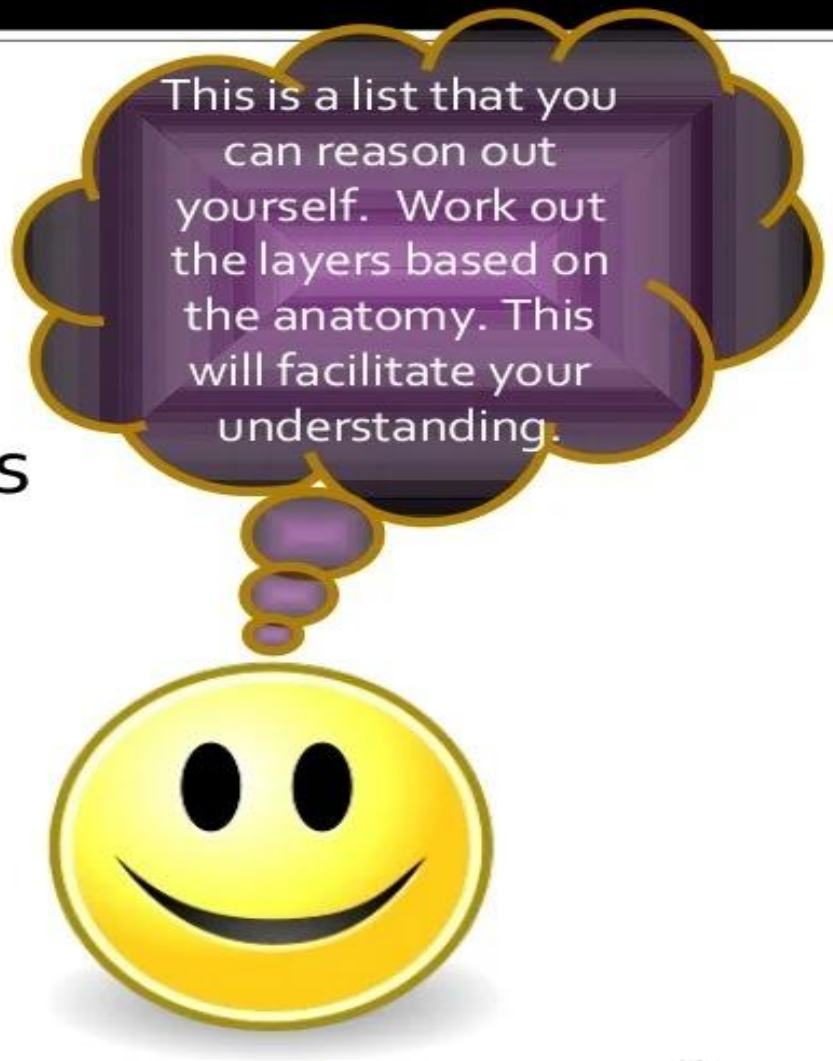
Direct inguinal hernias

- If the posterior wall of the canal is weakened medially (e.g. by chronically increased intra-abdominal pressure), it can stretch and bulge out through the superficial ring
- The contents of the hernia do not travel along the length of the canal but push directly on the stretched posterior inguinal canal wall and through the superficial ring.
- Coverings of direct hernias

Coverings of direct hernias

- Peritoneum
- Transversalis fascia
- Conjoint tendon
- External oblique aponeurosis
- Superficial fascia
- Skin



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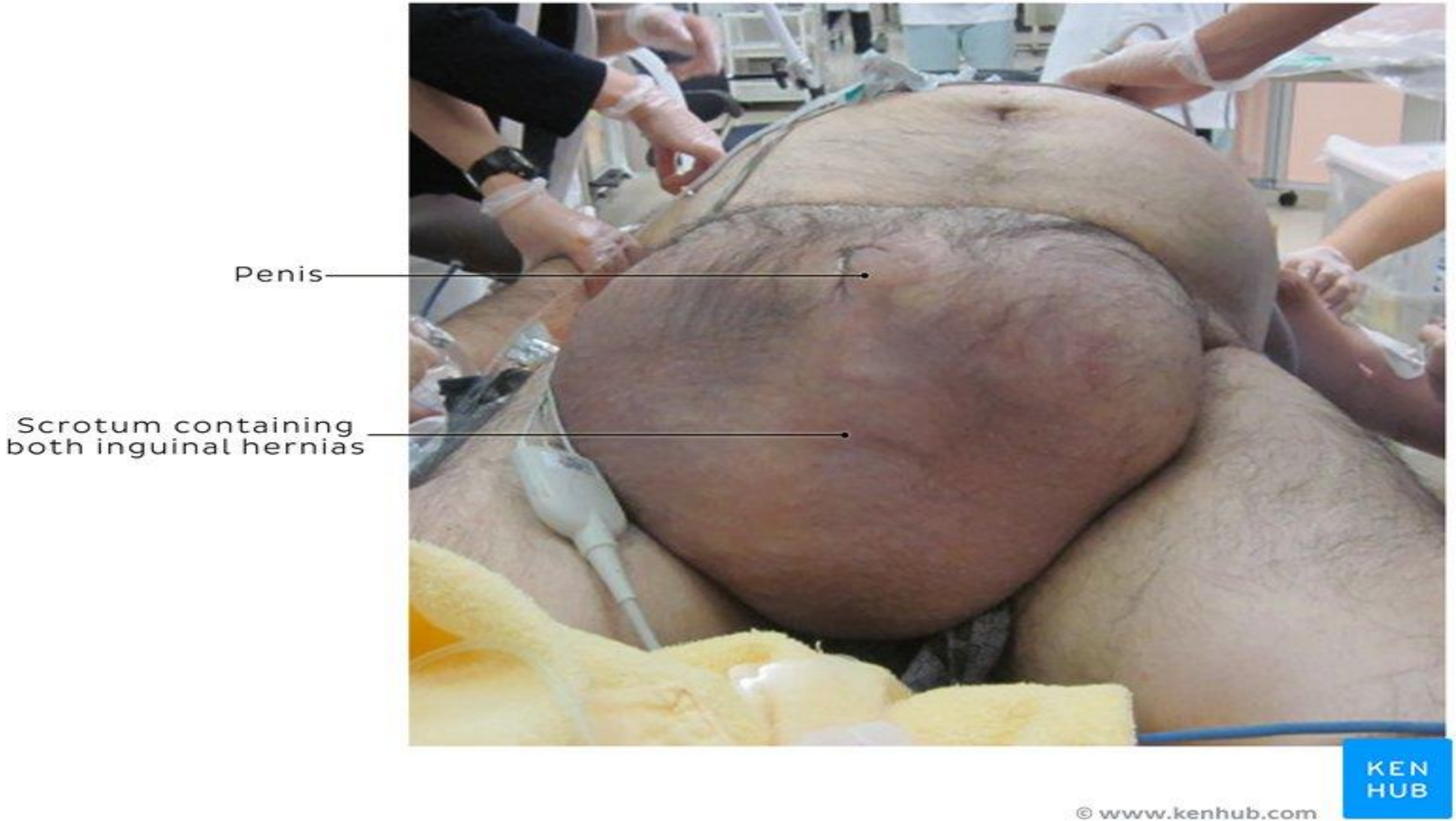
CLINICAL RELEVANCE
INGUINAL HERNIA

Indirect Inguinal Hernia

- Indirect inguinal hernias are the more common of the two types. They are caused by the failure of the processus vaginalis to **regress**.
- The peritoneal sac (and potentially loops of bowel) enters the inguinal canal via the deep inguinal ring. The degree to which the sac herniates depends on the amount of **processus vaginalis** still present.
- Large herniations are possible in which the peritoneal sac and its contents may traverse the entire inguinal canal, emerge through the superficial inguinal ring, and reach the scrotum.

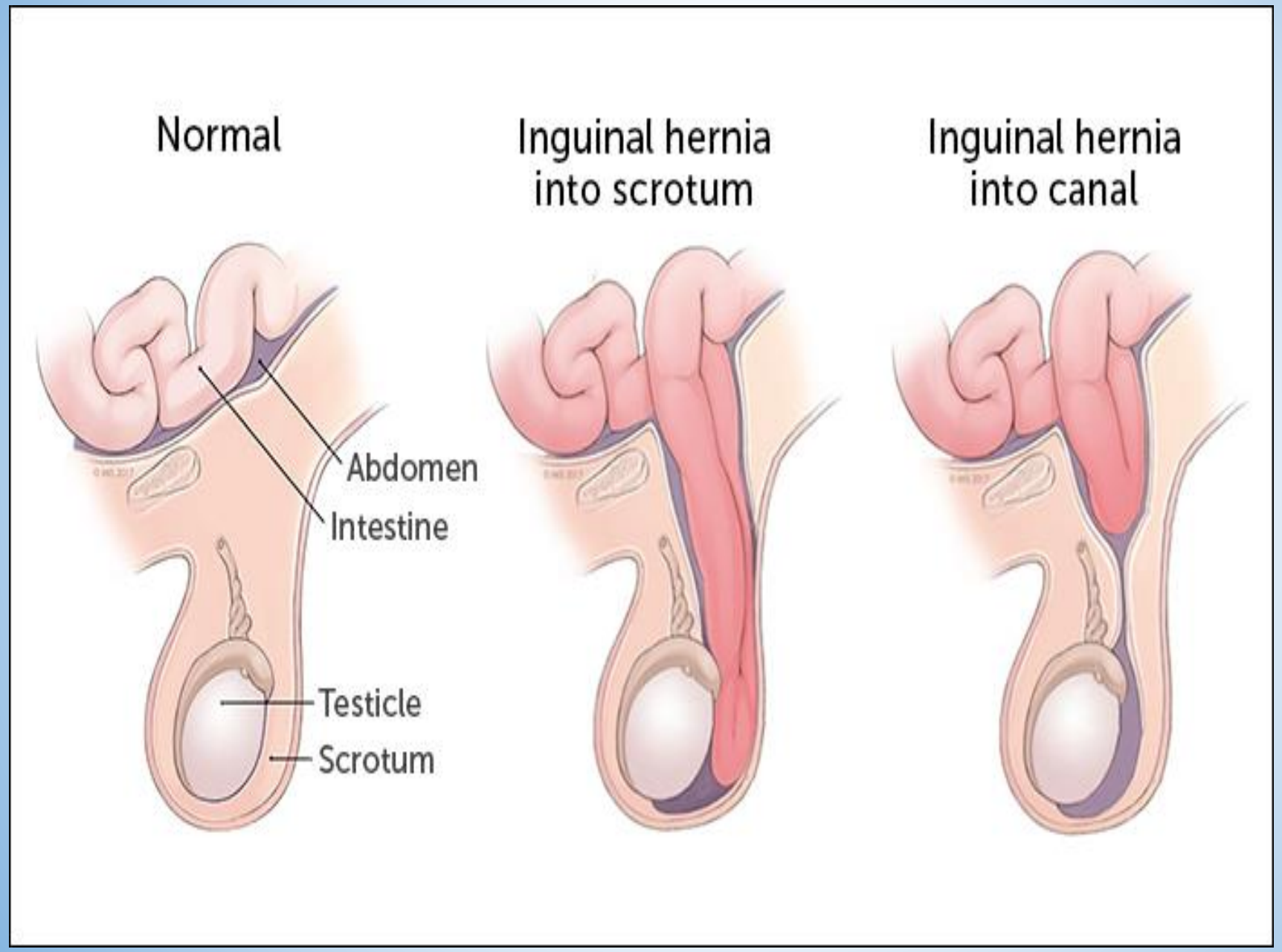


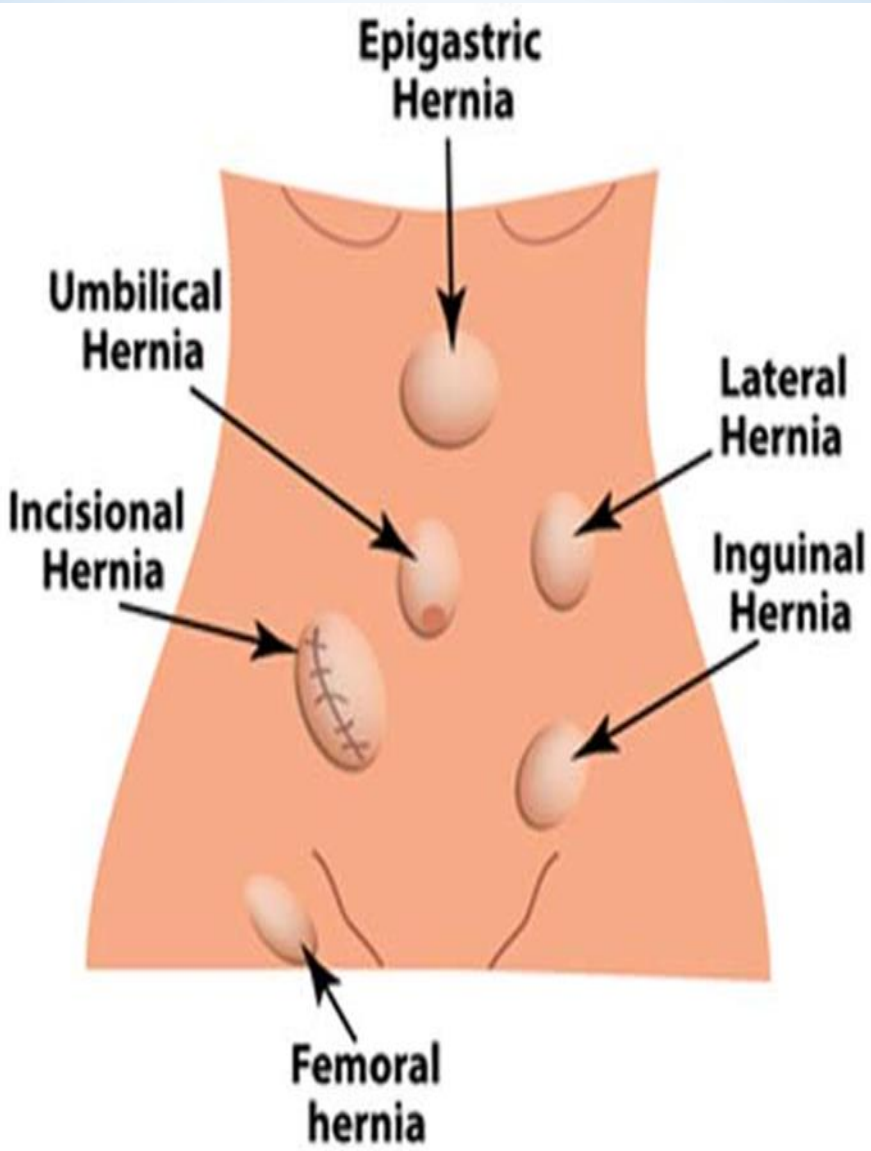
INGUINAL HERNIA

CLINICAL RELEVANCE
INGUINAL HERNIA

DIRECT INGUINAL HERNIA

- In contrast to the indirect hernia, direct inguinal hernias are acquired, usually in adulthood, due to **weakening** in the abdominal musculature.
- The peritoneal sac bulges into the inguinal canal via the posterior wall medial to the epigastric vessels and can enter the superficial inguinal ring. The sac is **not** covered with the coverings of the contents of the canal.

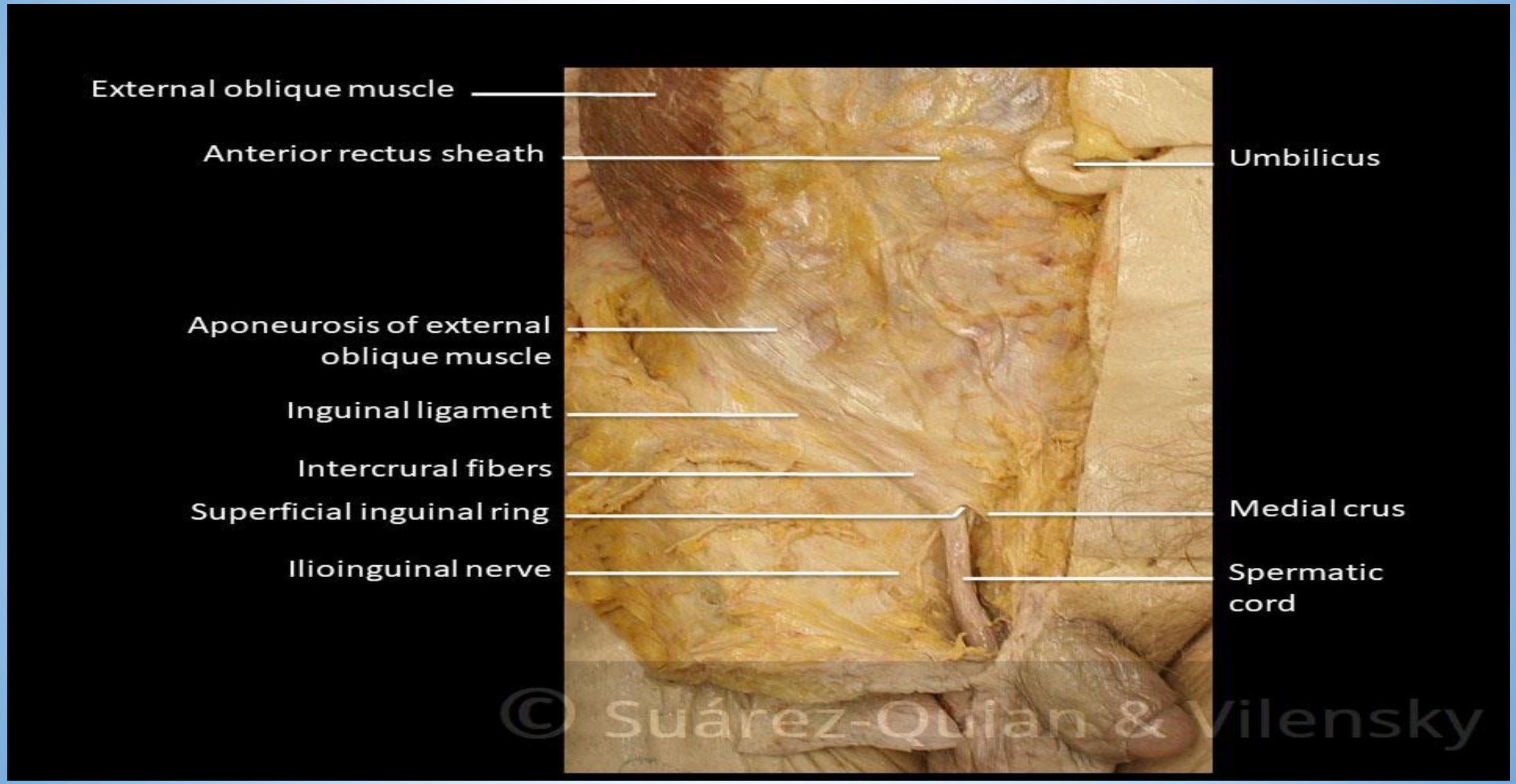

Normal
Inguinal hernia into scrotum
Inguinal hernia into canal
Abdomen
Intestine
Testicle
Scrotum


Epigastric Hernia
Umbilical Hernia
Lateral Hernia
Incisional Hernia
Inguinal Hernia
Femoral hernia

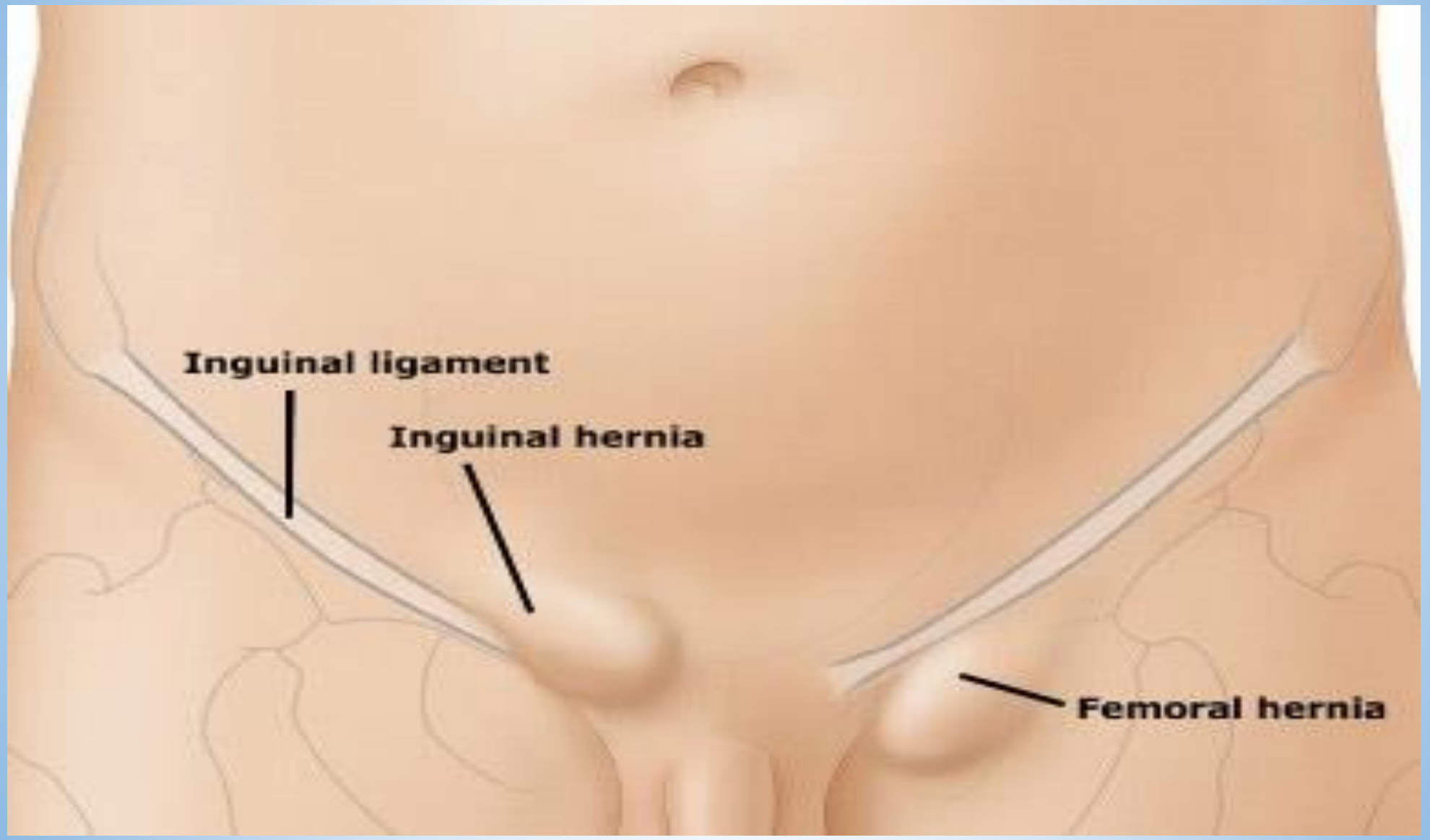
Femoral hernia

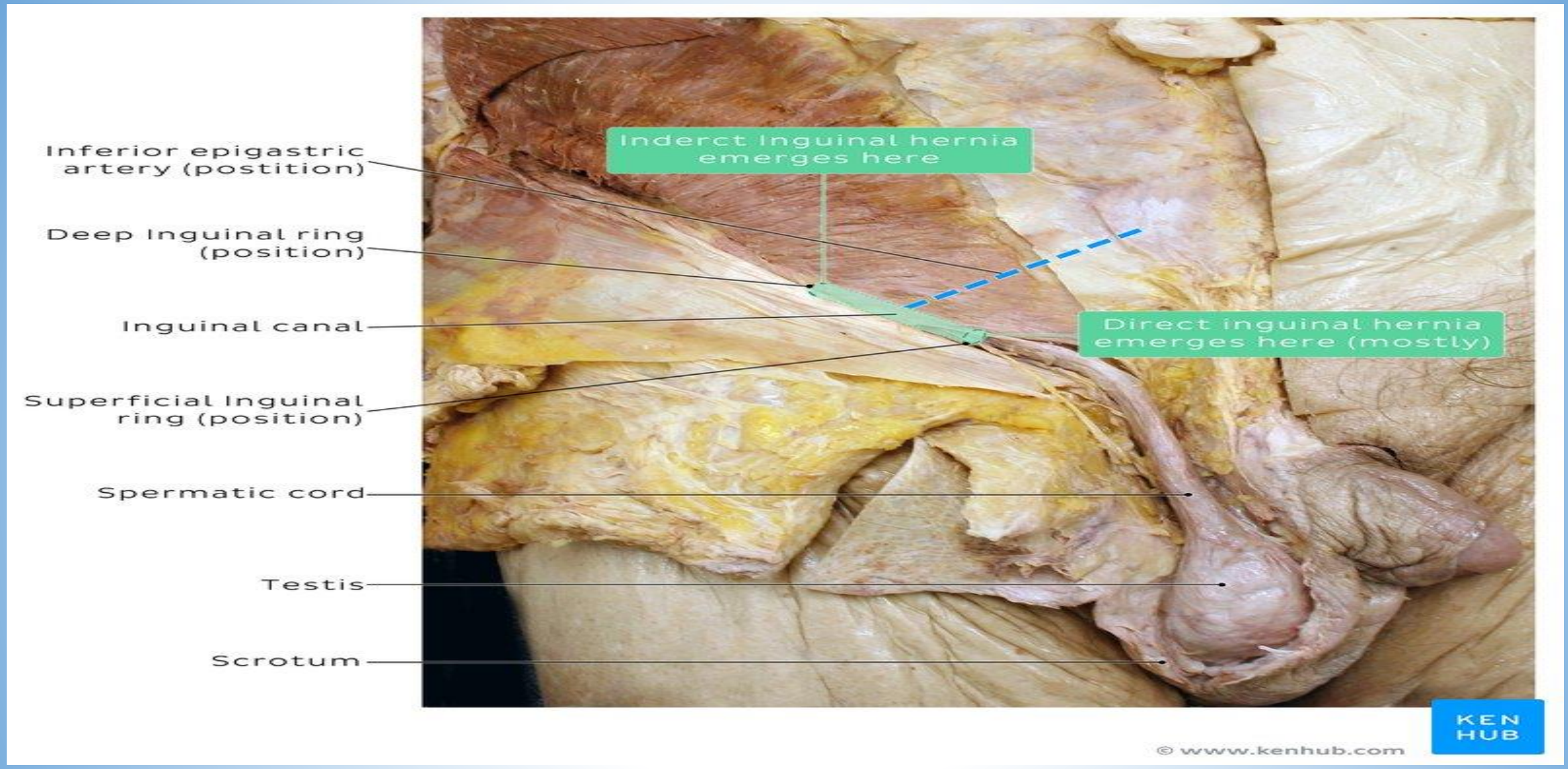
- Femoral hernia:A femoral hernia protrudes through the femoral ring. The femoral ring is normally closed by a femoral septum of modified extraperitoneal tissue, and is therefore a weak spot. In females, the ring is relatively large and subject to profound changes during pregnancy, explaining why femoral hernias are more common in women.
- The pubic tubercle is an important landmark in distinguishing inguinal from femoral hernias; the neck of the hernia is superomedial to it in inguinal hernia, but inferolateral in the femoral form.

PROSECTION IMAGES



THE SPERMATIC CORD AND INGUINAL CANAL.


Inguinal ligament
Inguinal hernia
Femoral hernia



Inguinal canal in a cadaver: While dissecting the inguinal canal, you will find the vas deferens coursing laterally to the inferior epigastric vessels. In addition, the hard, cord-like and firm thread felt on palpation is the vas deferens.

PROSECTION IMAGES

THE SUPERFICIAL INGUINAL RING AND CONTENTS OF THE INGUINAL CANAL.

COMPARISON OF INDIRECT AND DIRECT INGUINAL HERNIAS

Indirect	*Direct*
Traverses the whole length of inguinal canal	Passes through Hesselbach's triangle
It occurs due to congenital defects of processus vaginalis	It is acquired
At any age but common in young	Common after the age of 40 years
Inferior epigastric artery is medial to neck of hernial sac	The artery is lateral to neck of sac

INTERNAL RING OCCLUSION TEST

The test is used to differentiate between direct and indirect inguinal hernia. Pressure applied on the deep inguinal ring prevents hernia to appear if it is indirect. In case of direct inguinal hernia pressure on the deep inguinal ring does not prevent hernia to appear.

DIFFERENCE BETWEEN INGUINAL HERNIA AN FEMORAL HERNIA

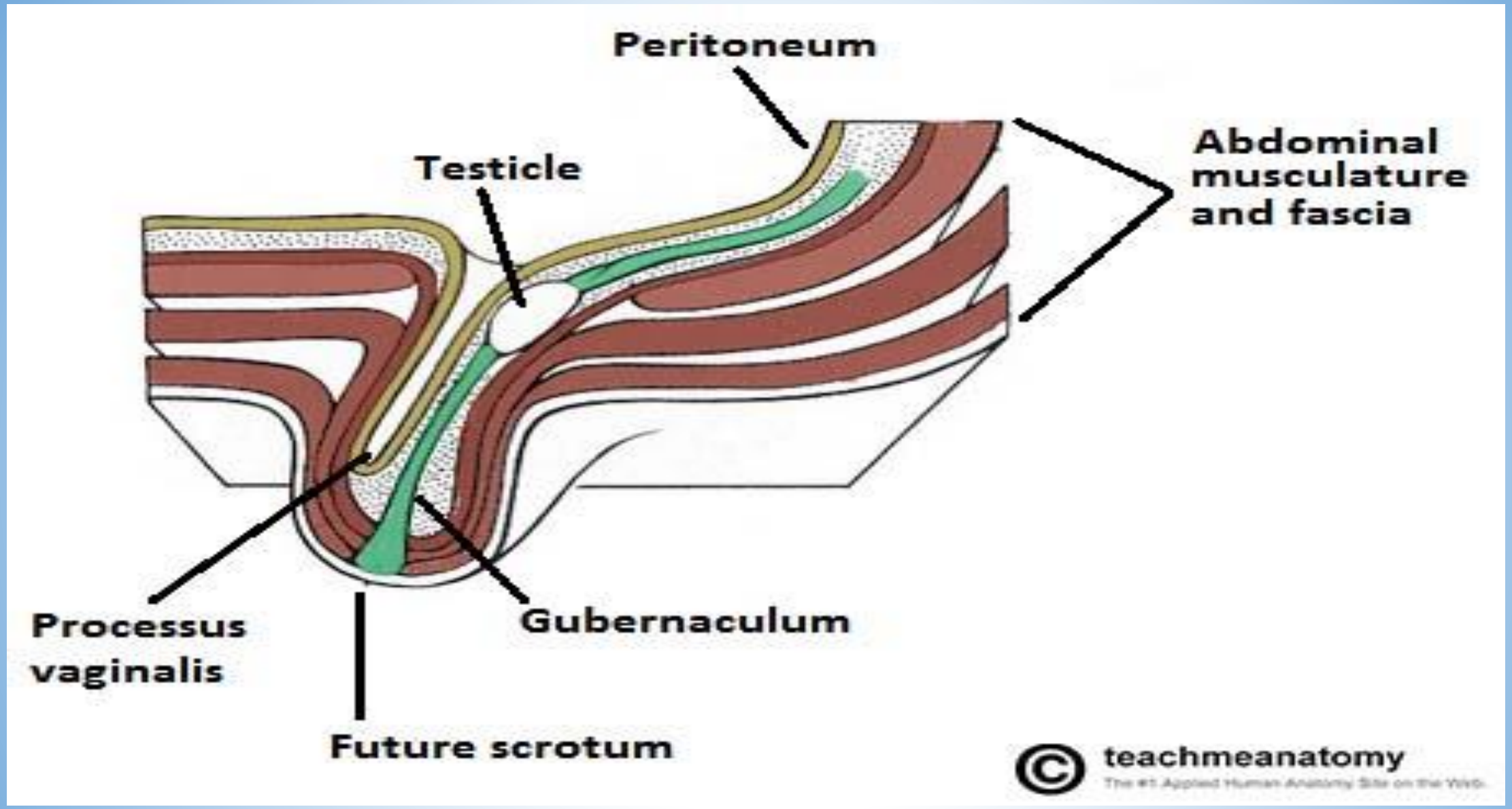
Inguinal hernia	*Femoral hernia*
More common in males	More common in fem
Above inguinal ligament	Below inguinal ligam
Neck of protrusion is supero-medial to pubic tubercle	Neck of protrusion is infero-lateral to pubic tubercle

DEVELOPMENT OF THE INGUINAL CANAL

- During development, the tissue that will become gonads (either testes or ovaries) establish in the posterior abdominal wall, and descend through the abdominal cavity. A fibrous cord of tissue called the **gubernaculum** attaches the inferior portion of the gonad to the future scrotum or labia, and guides them during their descent.
- The inguinal canal is the pathway by which the **testes** (in an individual with an XY karyotype) leave the abdominal cavity and enter the scrotum. In the embryological stage, the canal is flanked by an out-pocketing of the peritoneum (processus vaginalis) and the abdominal musculature.

DEVELOPMENT OF THE INGUINAL CANAL CONTD

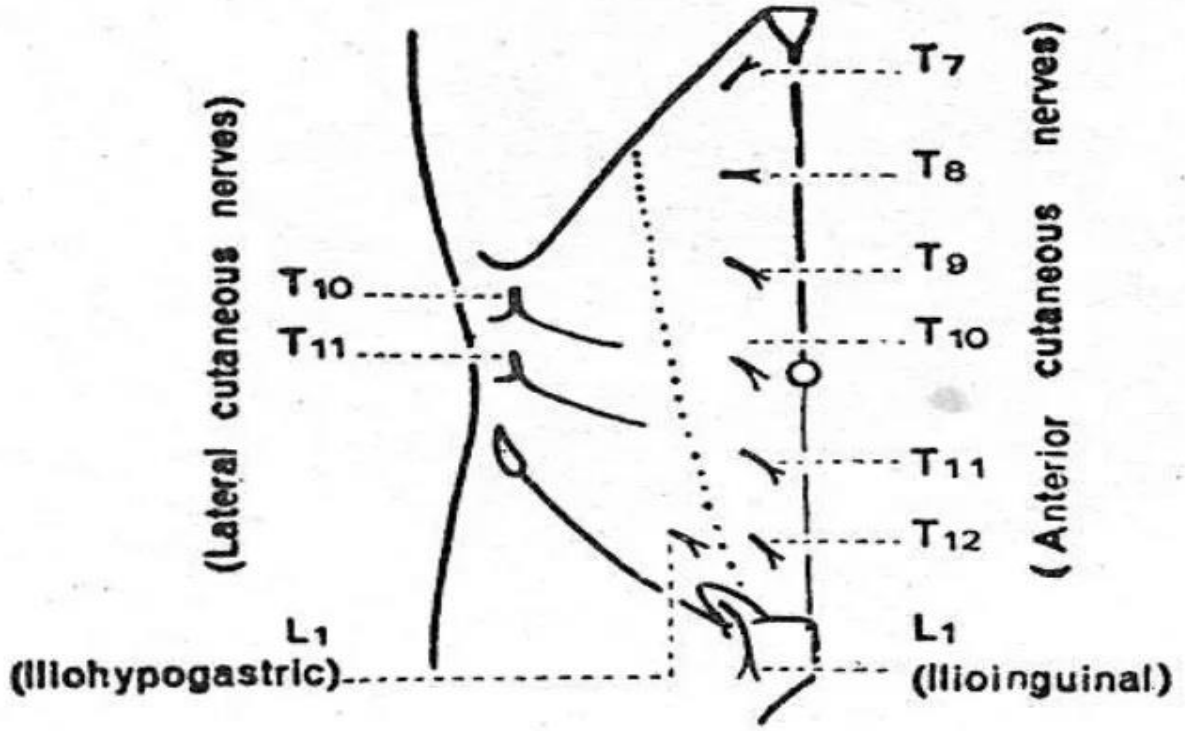
- The processus vaginalis normally **degenerates**, but a failure to do so can cause an indirect inguinal hernia, a hydrocele, or interfere with the descent of the testes. The gubernaculum (once it has shortened in the process of the descent of the testes) becomes a small scrotal ligament, tethering the testes to the scrotum and limiting their movement.
- Individuals with an XX karyotype also have a gubernaculum, which attaches the **ovaries** to the uterus and future labia majora. Because the ovaries are attached to the uterus by the gubernaculum, they are prevented from descending as far as the testes, instead moving into the **pelvic cavity**. The gubernaculum then becomes two structures in the adult: the ovarian ligament and round ligament of uterus



The descent and embryological development of the testes. Note that the processus vaginalis normally regresses after the descent of the testes


THANK
YOU

Skin



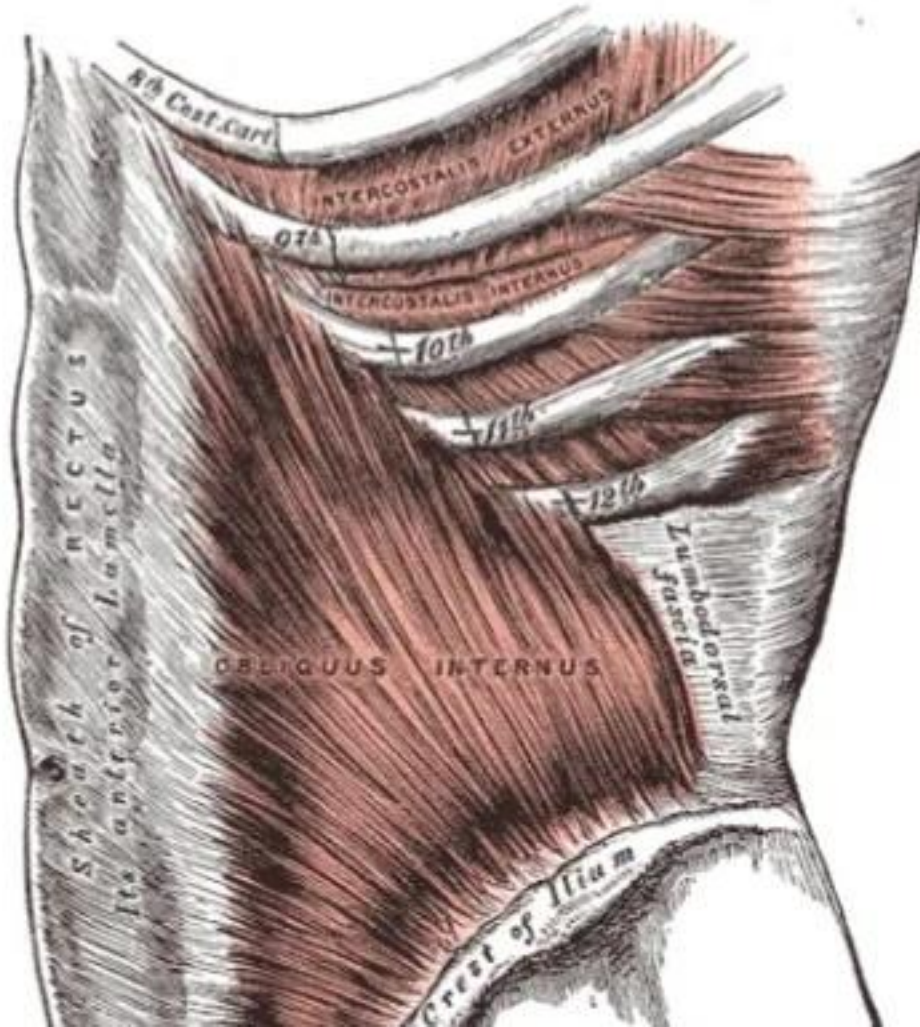
The cutaneous nerves of the anterior abdominal wall.

External oblique

- Origin: external surfaces and inferior borders of 5-12 ribs with serr ant and lat dorsi
- Insertion: iliac crest, linea alba, forms inguinal ligament
- Direction: inferiorly and anteriorly

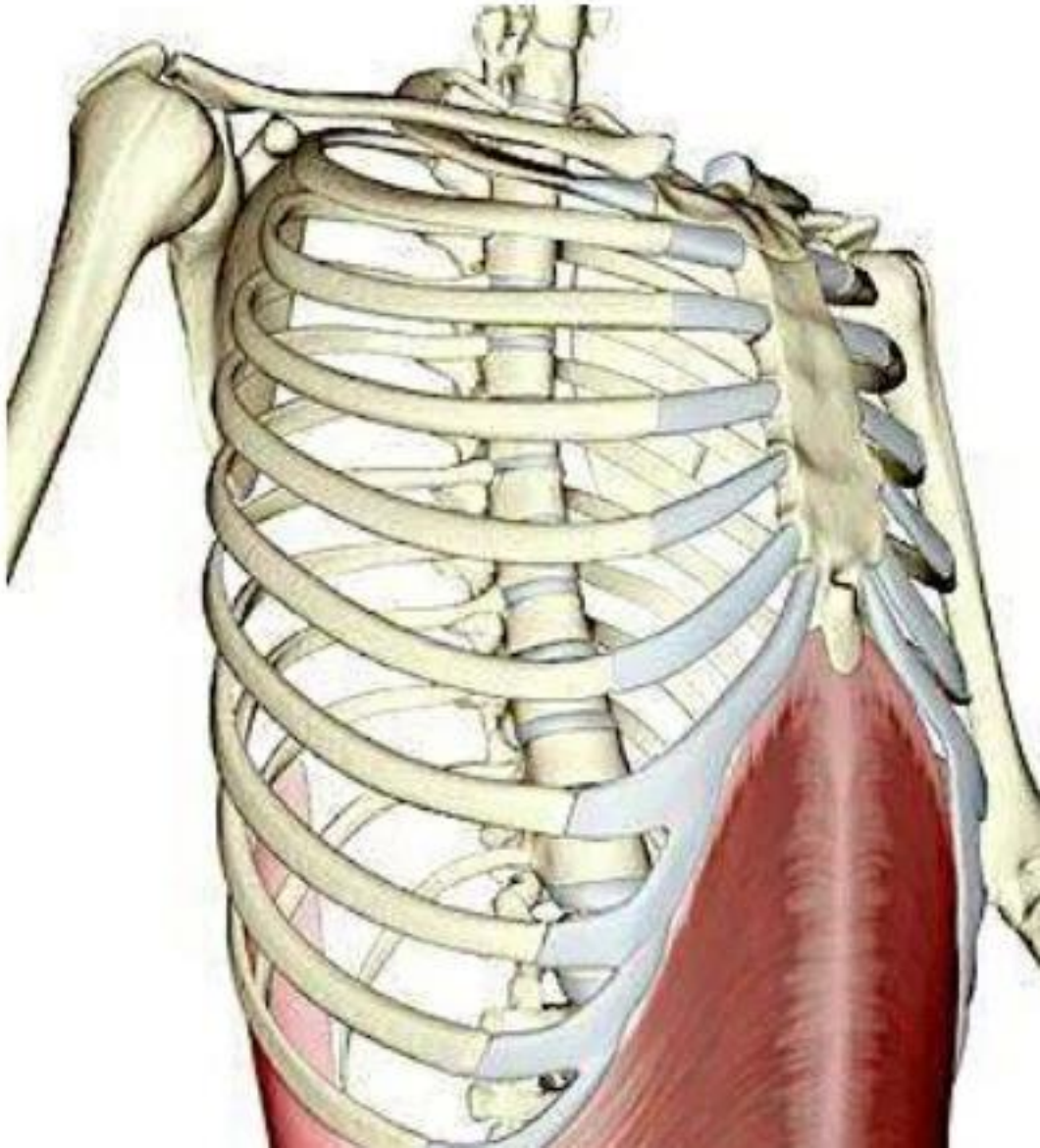
Internal oblique

- Origin: thoracolumbar fascia, iliac crest, lat 2/3 of inguinal ligament
- Insertion: pectan pubis (conjoint tendon), linea alba, 10-12 ribs
- Direction: superiorly and

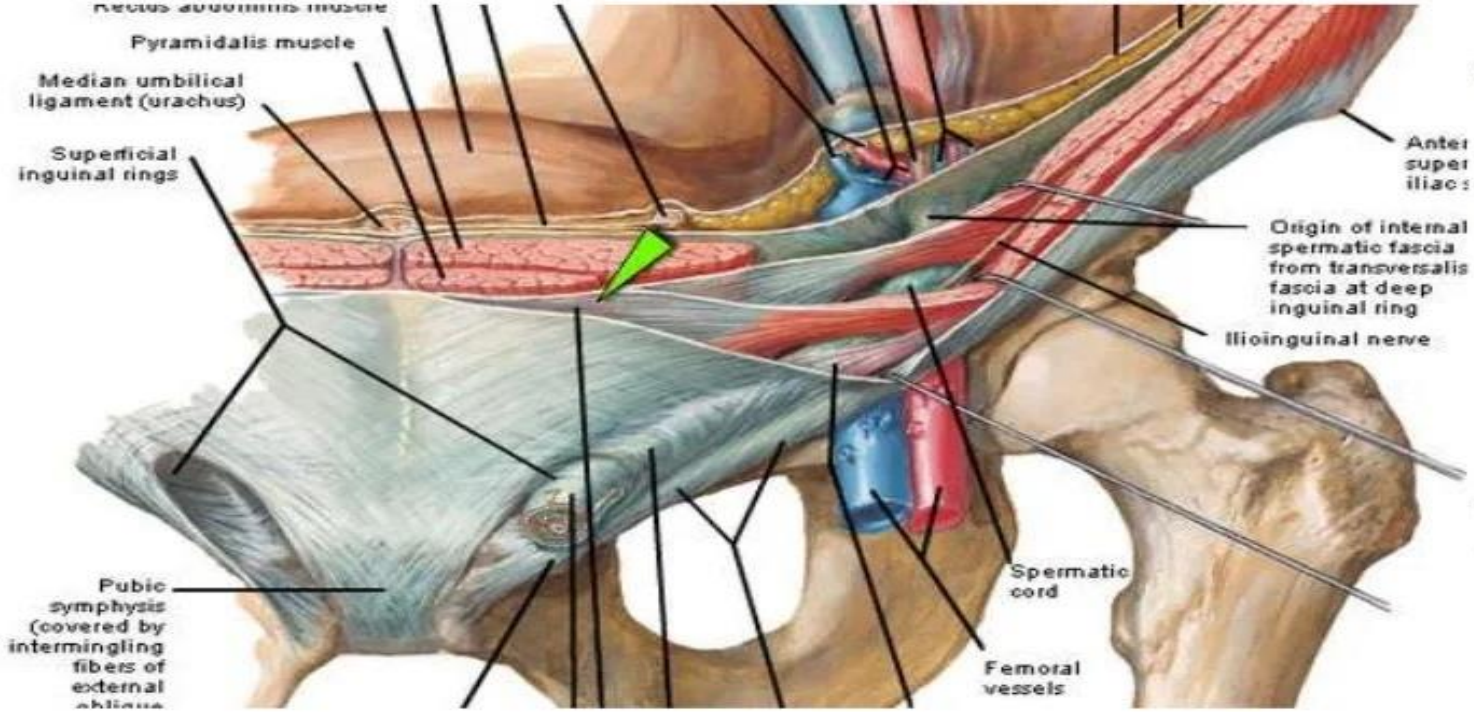


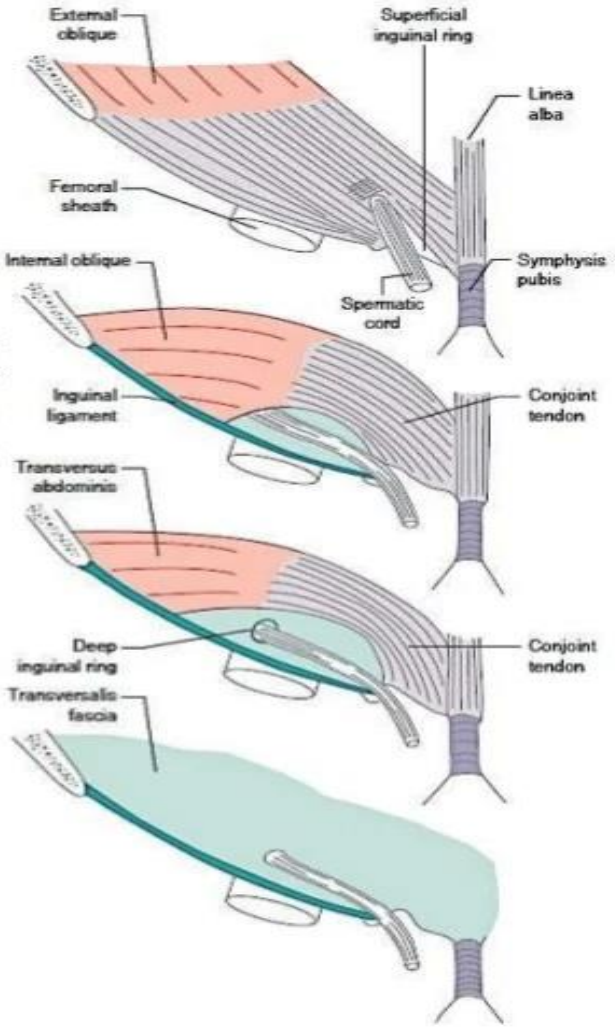
Transversus abdominis

- Origin: thoracolumbar fascia, Iliac crest, lat ½ of inguinal ligament, and costal cartilages 7-12
- Insertion: Xiphoid process, linea alba, pubic crest and pecten pubis via conjoint



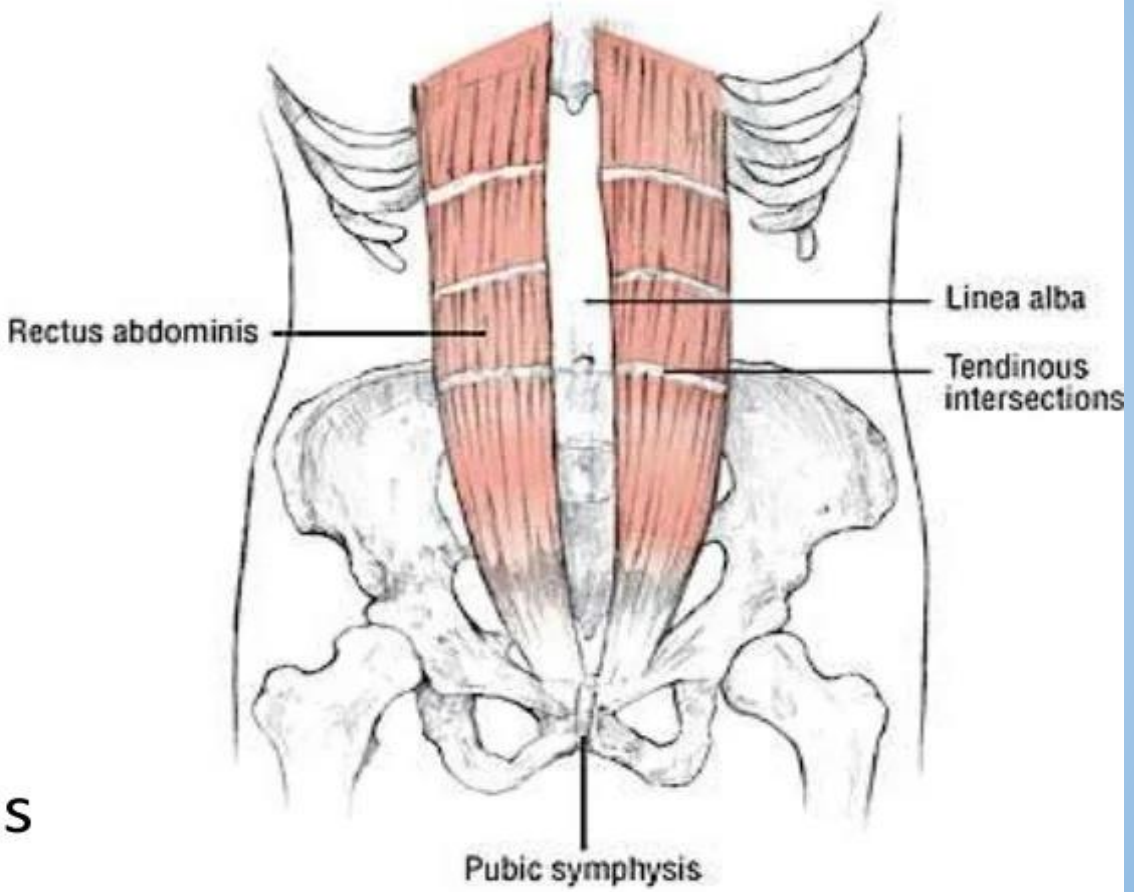
Conjoint tendon





Rectus abdominis

- Origin: Pubic crest
- Insertion: costal cartilage 5-7, xiphoid process
- Direction: vertical
- Nerve supply: T7-T11
- Tendinous intersections



Pyramidalis

- Inconsistent muscle, within rectus sheath
- Origin: pubic symphysis and pubic crest
- Insertion: linea alba
- Nerve supply: T12