



✘ قَائِمَةٌ - شِفَاءٌ

The third practical lab of the 2nd week Sun 4/04

Anterior abdominal wall.

- 1. Inguinal canal**
- 2. Inguinal triangle**
- 3. Spermatic cord**
- 4. Scrotum and testis**

✦ Anterior abdominal wall.

A. Muscles of the anterior abdominal wall

- The students should know and identify the origin/ insertion/ nerve supply / and action of the following muscles :
 1. External oblique muscle
 2. Internal oblique muscle
 3. Transversus Abdominis muscle
 4. Rectus Abdominis muscle
 5. Pyramidalis muscle

External oblique muscle

- Broad
- Thin

✓ **Direction:**

Downward forward medially

✓ **Origin**

outer surface of lower 8 ribs.

✓ **Insertion**

Xiphoid process, Linea alba, pubic crest, pubic tubercle, iliac crest(ant. Half).

Note: "we talked about the origin & insertion" ~the doctor

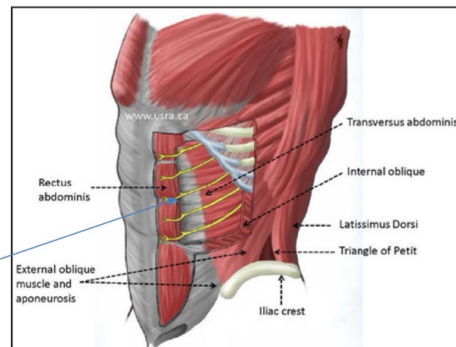
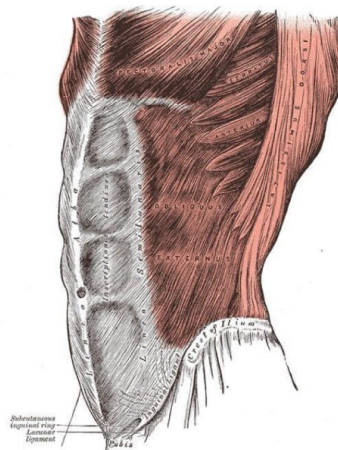
He didn't even read them but check them out just in case

✓ **Nerve Supply**

- 1- Lower 6th thoracic nerves (intercostal nerves)
- 2- L1 (iliohypogastric n., ilioinguinal n.)

How do the thoracic nerves reach the abdominal muscles?

- They descend between 2 muscles (transversus abdominis & internal oblique) then they enter the rectus sheath.



Internal Oblique

✓ **Direction:**

upward forward medially

✓ **Origin**

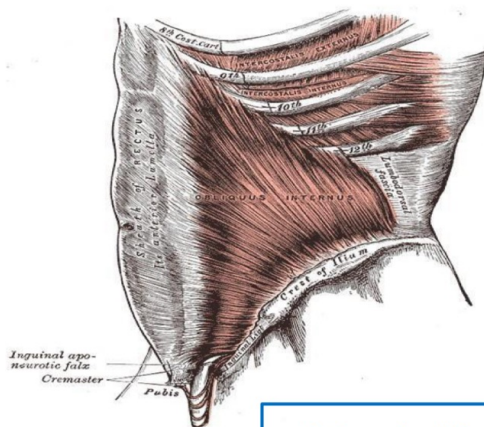
Lumbar Fascia, Ant 2/3 iliac crest, lateral two thirds of inguinal ligament.

✓ **Insertion**

- Lower three ribs & costal cartilage, Xiphoid process, Linea alba, symphysis pubis.

✓ **Nerve Supply** (same as external oblique)

Lower 6th thoracic (or intercostal) nerves, iliohypogastric n & ilioinguinal n → L1.



It also participates in the formation of rectus sheath

Internal oblique exactly opposite to external oblique, it's originates downward & inserts upward to linea alba So the direction of fibers upward, forward, medially.

❖ Transversus Abdominis

Direction doctor focused that this muscle assist in conjoint tendon formation and rectus sheath

- Its fibers run horizontally (transversely) forward under the internal oblique that's why it originates posteriorly from the back and goes forwards to the midline to be inserted in the linea alba.

✓ Origin

- Inner surface of lower six costal cartilage, lumbar fascia, anterior two thirds of iliac crest, lateral third of inguinal ligament.

✓ Insertion

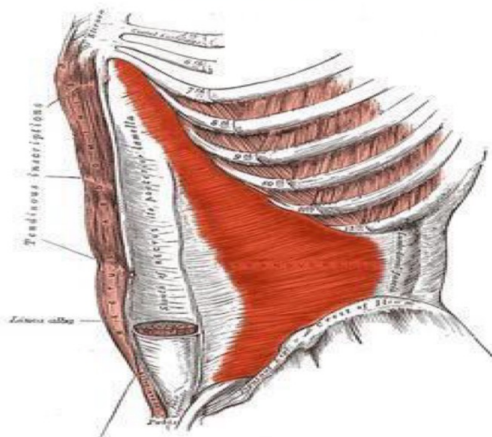
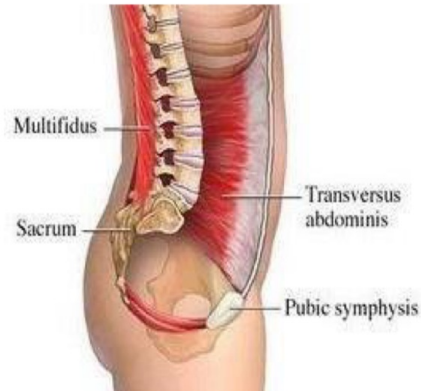
Xiphoid process, Linea alba, symphysis pubis.

-Linea alba extend from xiphoid process to symphysis pubis-

- ✓ The lower part fuses with internal oblique to form conjoint tendon which attach to pubic crest and pectineal line

✓ Nerve Supply

Lower six thoracic/intercostal nerves and L1(iliohypogastric n.& ilioinguinal n.)



RECTUS ABDOMINIS

- Long strap muscle, vertical
- Extends along the whole length of the anterior abdominal wall
- In the rectus sheath (which is formed by the aponeurosis of the transverse abdominal and the internal and external oblique muscles. It contains the rectus abdominis and pyramidalis muscles. It'll be discussed in detail in the next modified).

✓ Origin

Symphysis pubis, pubic crest

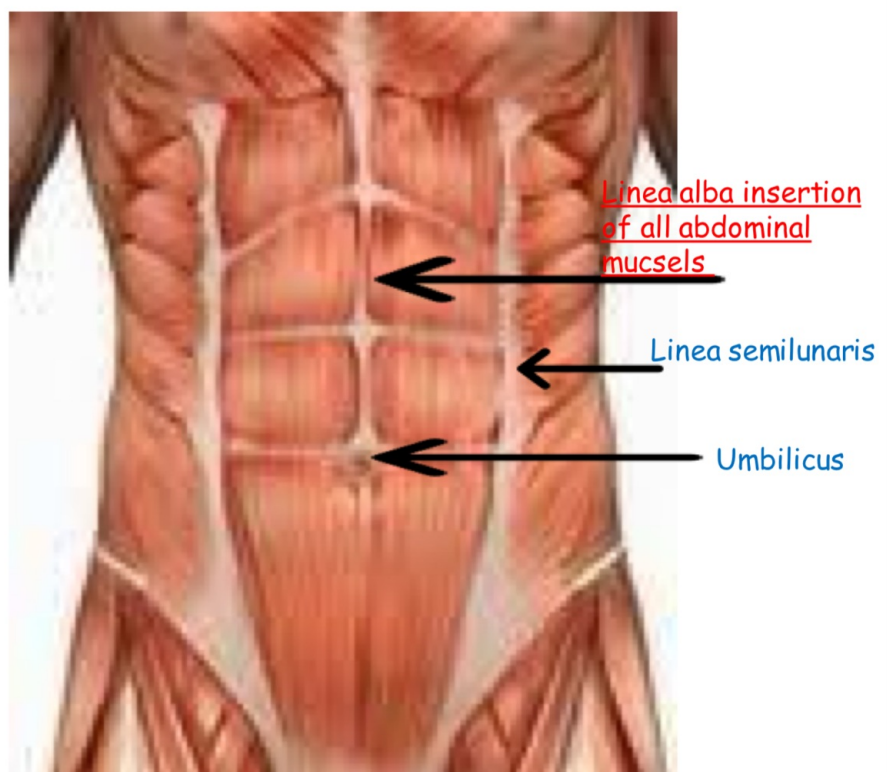
Its fibers run upwards to be inserted into:

✓ Insertion

5th, 6th and 7th costal cartilage & xiphoid process.

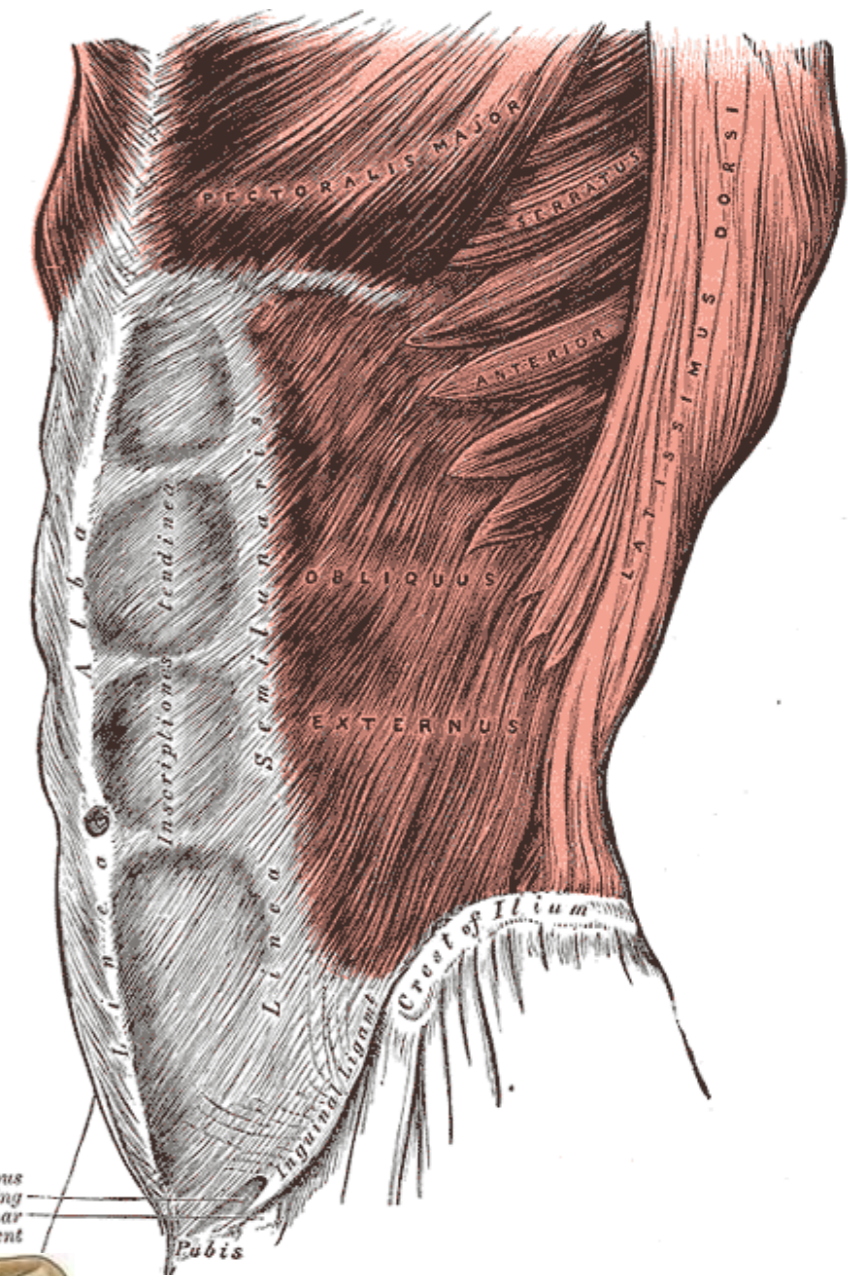
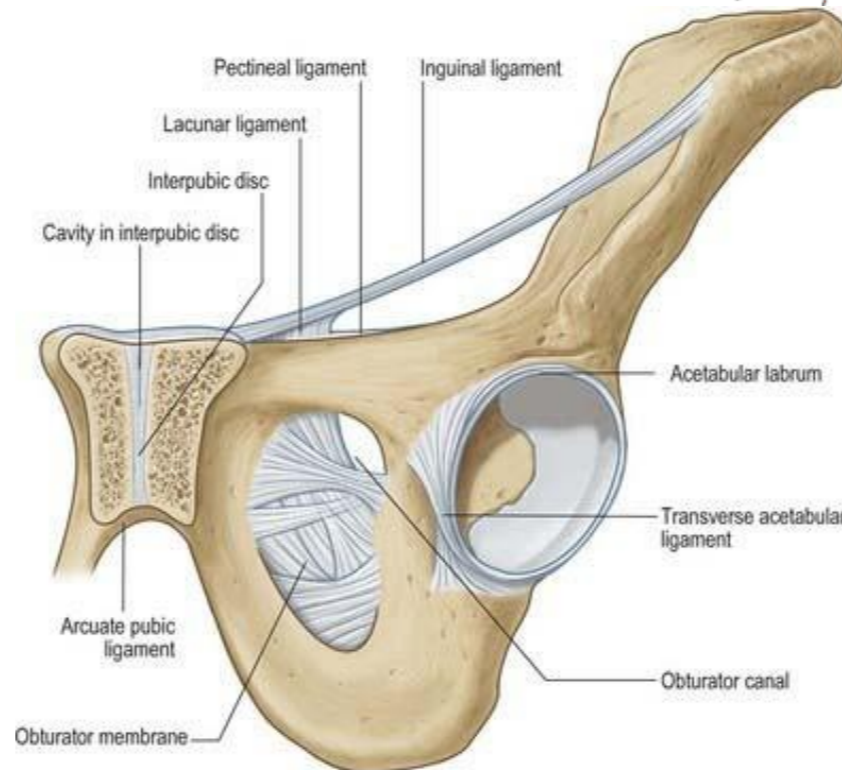
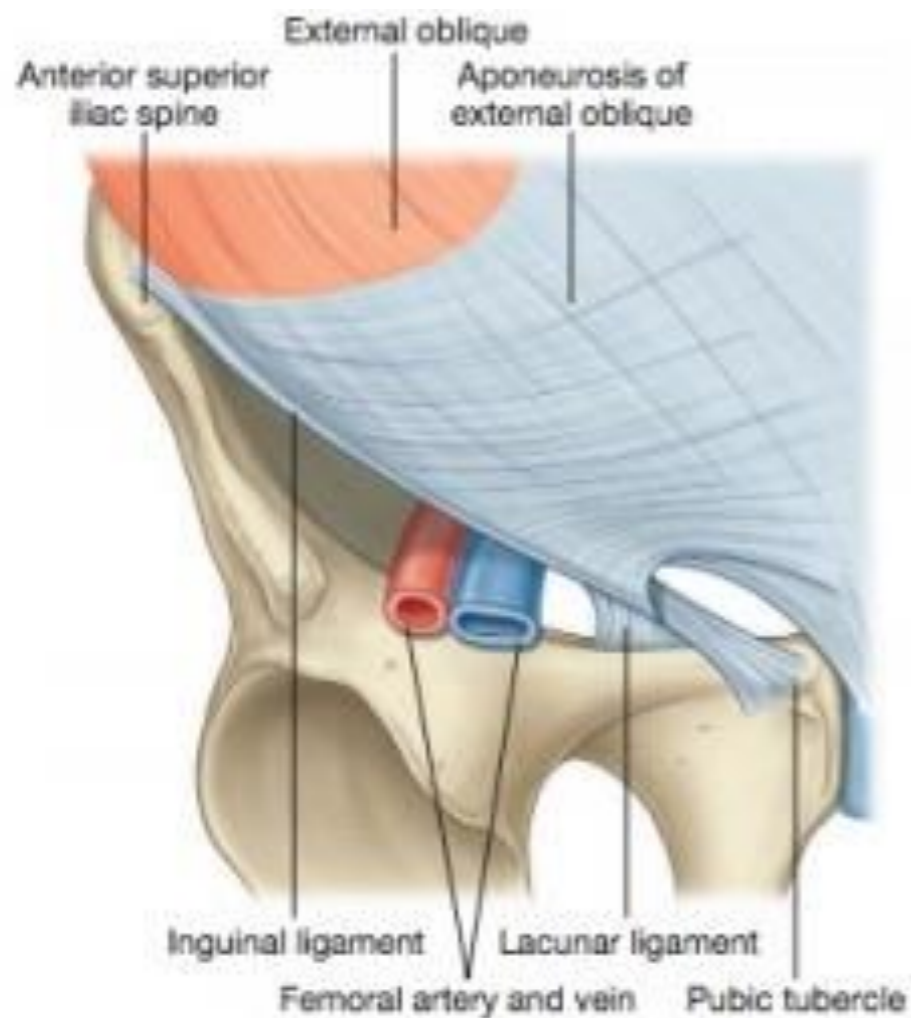
✓ Nerve Supply

Lower 6th thoracic nerves



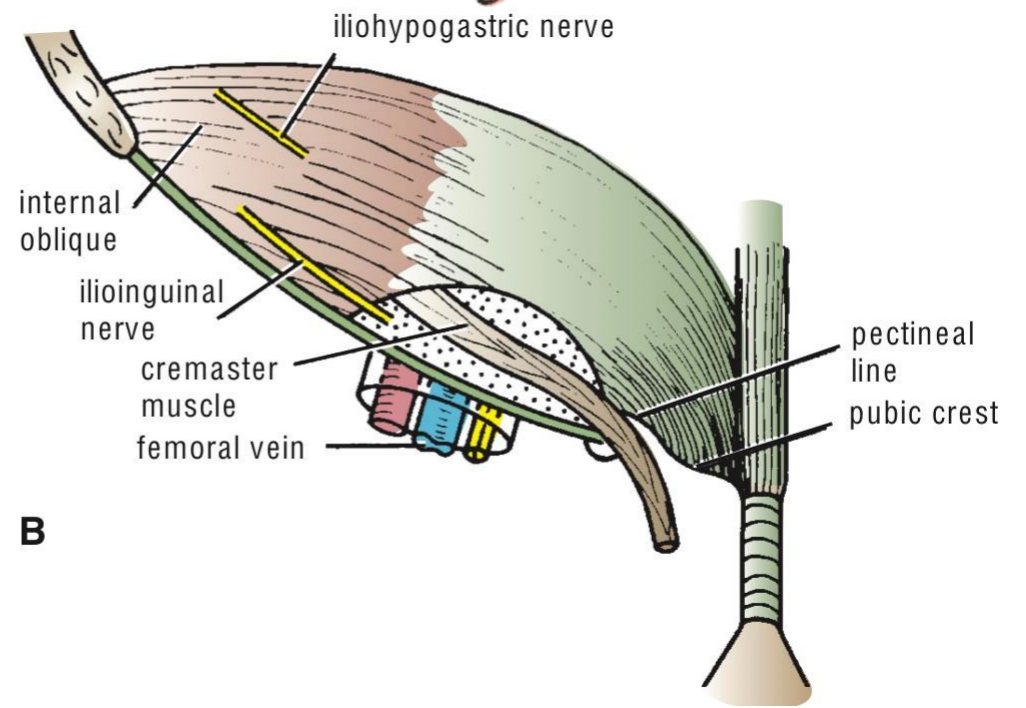
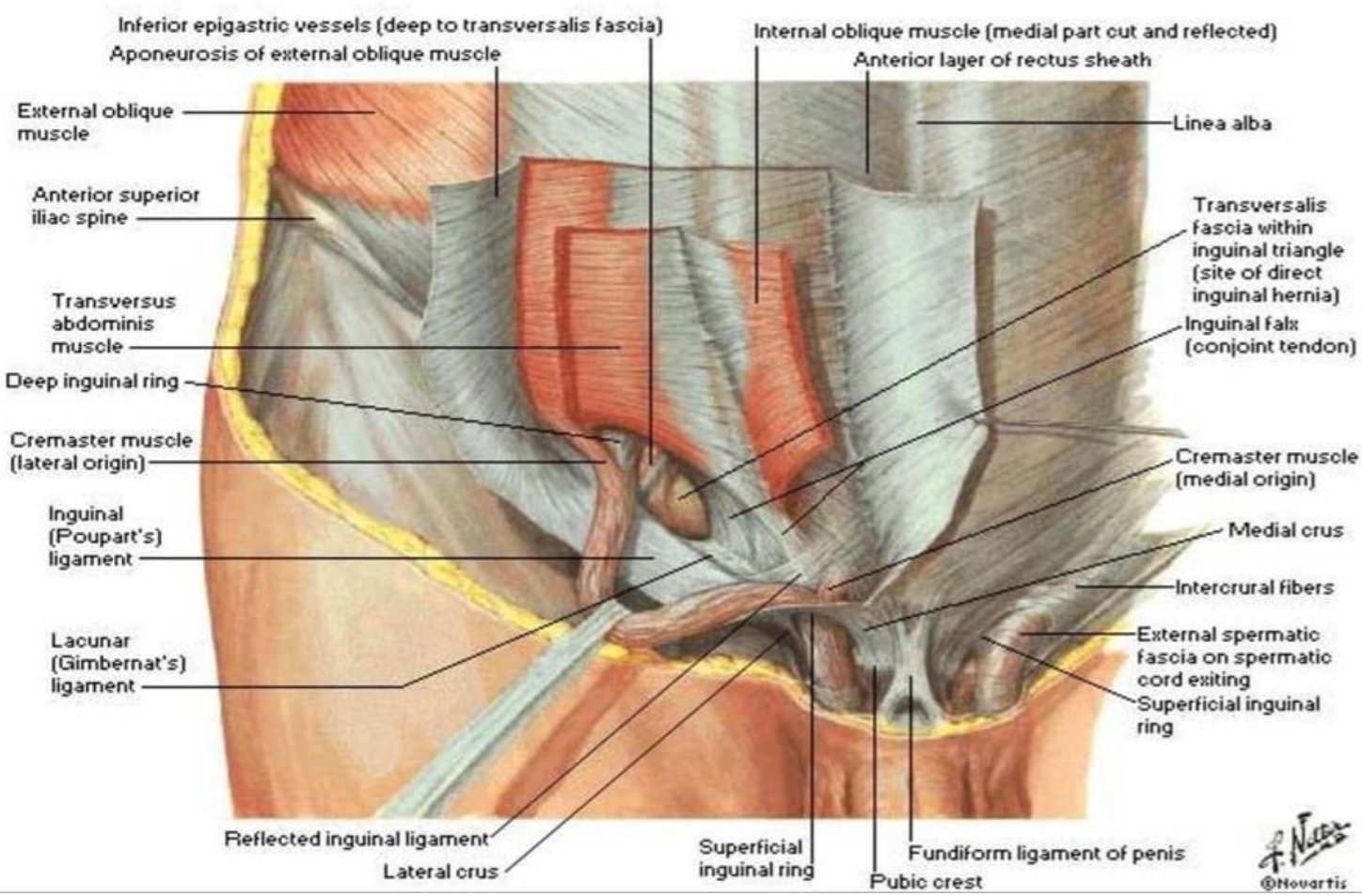
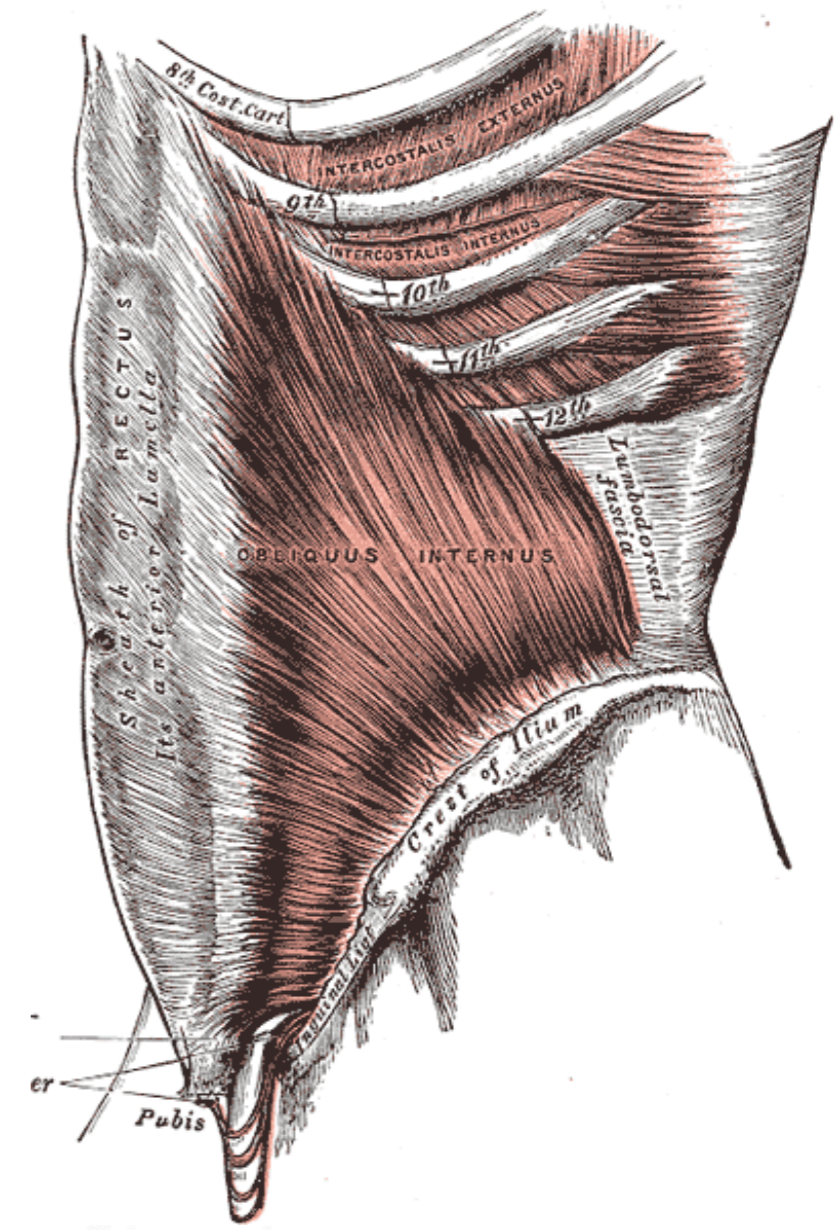
1. External oblique muscle

- The students should observe the following :
 1. Direction of the muscles fibers.
 2. The attachment of the aponeuroses part.
 3. The superficial inguinal ring.
 4. The inguinal ligament
 5. lacunar and pectineal ligaments



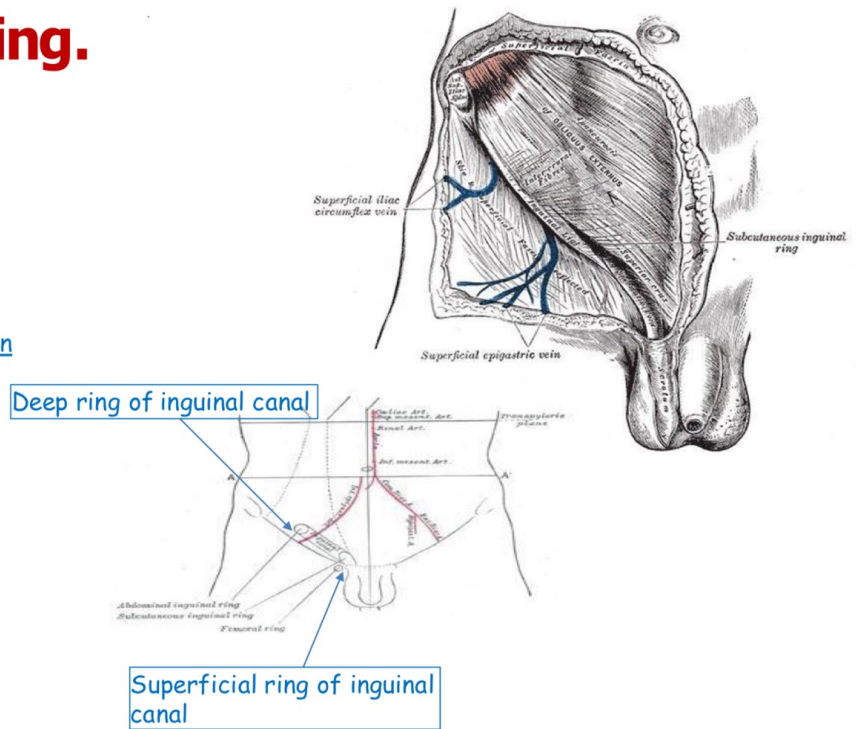
2. Internal oblique muscle

- The students should observe the following :
 1. Direction of the muscles fibers.
 2. The conjoint tendon
 3. The roof of inguinal canal .



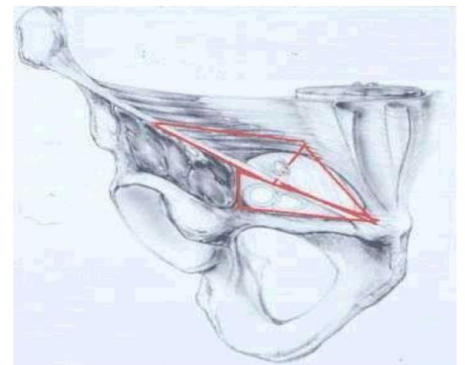
Superficial inguinal ring.

- 1- triangular shape
- 2- Defect in external oblique aponeurosis
- 3- lies immediately above and medial to the pubic tubercle
- 4 - Opening for passing the spermatic cord in males or round ligament of uterus in females

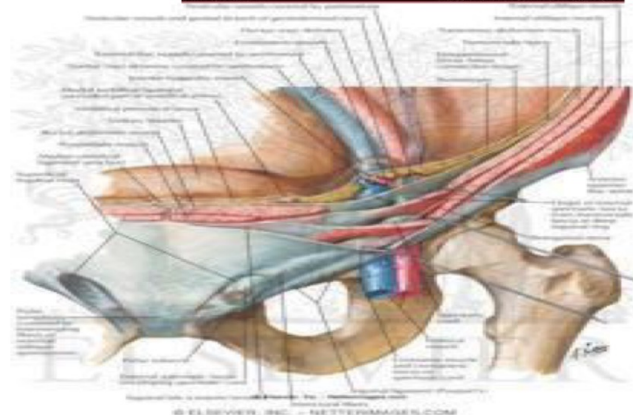


Inguinal ligament

- 1 Formed by folded backward the lower border of aponeurosis of external oblique muscle on itself
- 2 between ant. sup. iliac spine and the pubic tubercle



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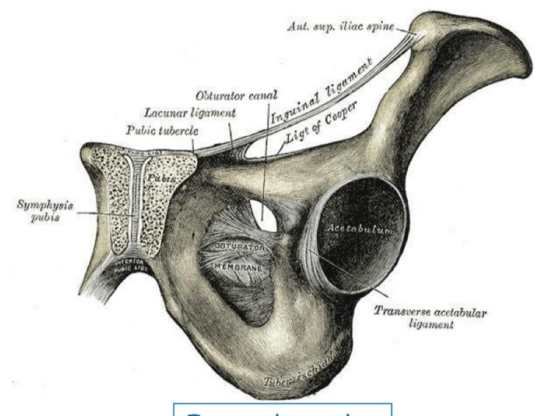


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Lacunar ligament

It's an extension of the inguinal ligament

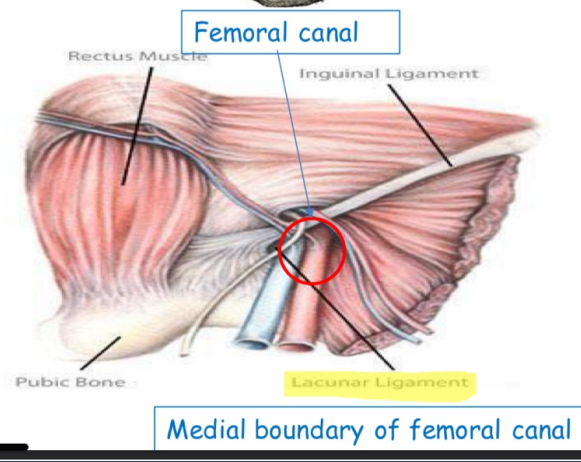
- 1 extension of aponeurosis of external muscle backward and upward to the pectineal line
- 2 on the superior ramus of the pubis
- 3 its sharp, free crescentic edge forms the medial margin of the femoral ring



Pectineal ligament

attached to ilio-pectineal line of pubis

- 1 Continuation of the lacunar ligament at pectineal line
- 2 Continuation with a thickening of the periosteum



Internal oblique muscle.....cont

The importance of the internal oblique: forming conjoint tendon

Conjoint tendon: Fusion of fibers between internal oblique and transverse abdominal muscle; so it also inserts into the superior ramus of the pubis, located in posterior border of inguinal canal and support it

- The lowest tendinous fibers of internal oblique which joint with transversus abdominis
- Attach medially to linea alba, it is also attached to the pectineal line, which is a ridge on the superior ramus of the pubic bone.
- Support the inguinal canal; it provides more strength as it is a reticular type of connective tissue.
- Has lateral free border

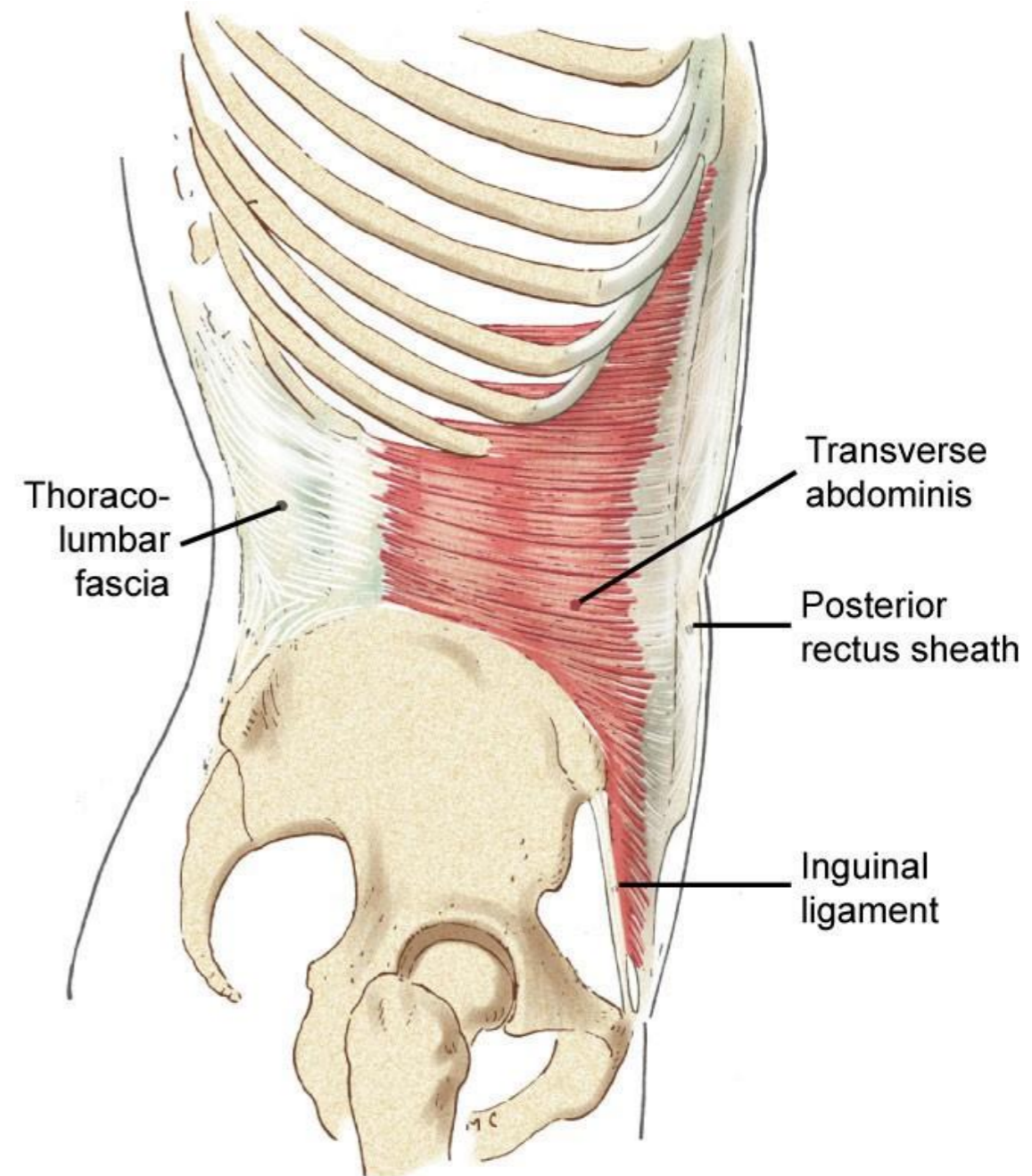
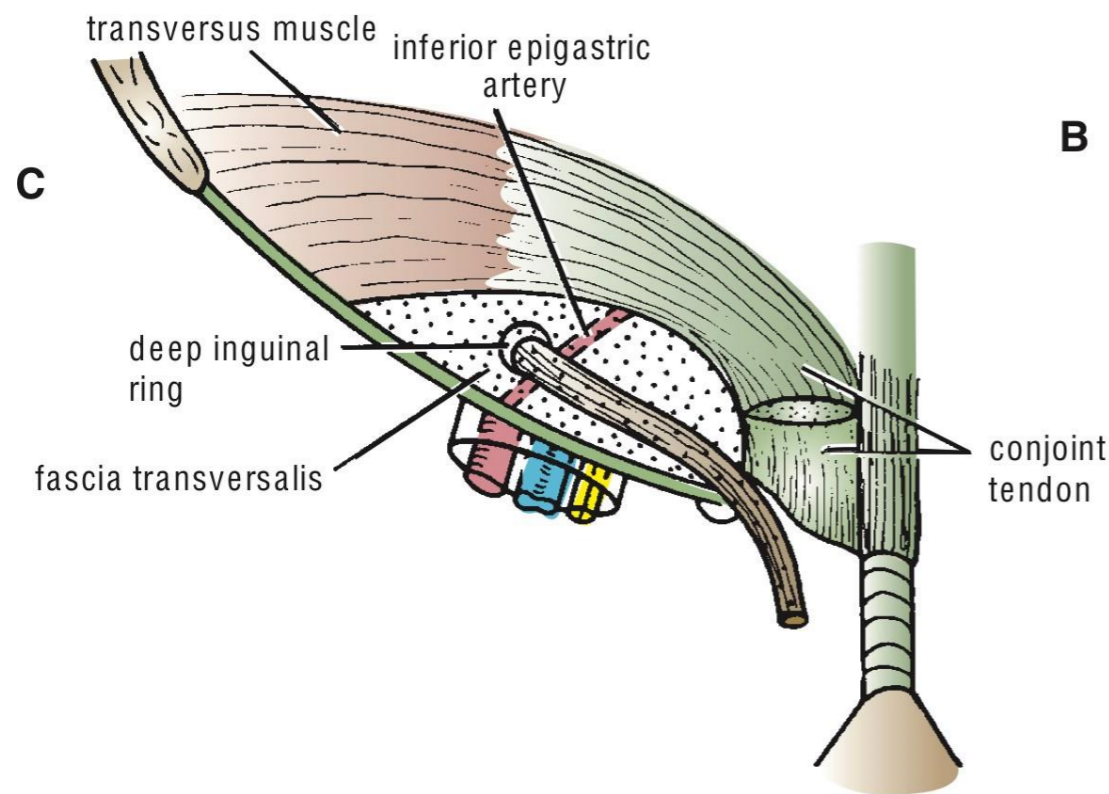
conjoint tendon is important for herniorrhaphy (repair of indirect inguinal hernia) because it's strong and attached to bone and periosteum, it is done by suturing through the conjoint tendon to repair the weakness of the inguinal canal floor. A weakness in the conjoint tendon could also cause a type of direct herniation!

Cremastric fascia

- Internal oblique has free lower border, arches over (surrounds) the spermatic cord (in males) or ligament of uterus (in females)
 - covers Cremastric muscle
 - Fascia
 - Int. abd. muscle assist in the formation of the Roof of the inguinal canal
- Vs. the external which forms the anterior wall of inguinal canal.

3. Transversus Abdominis muscle

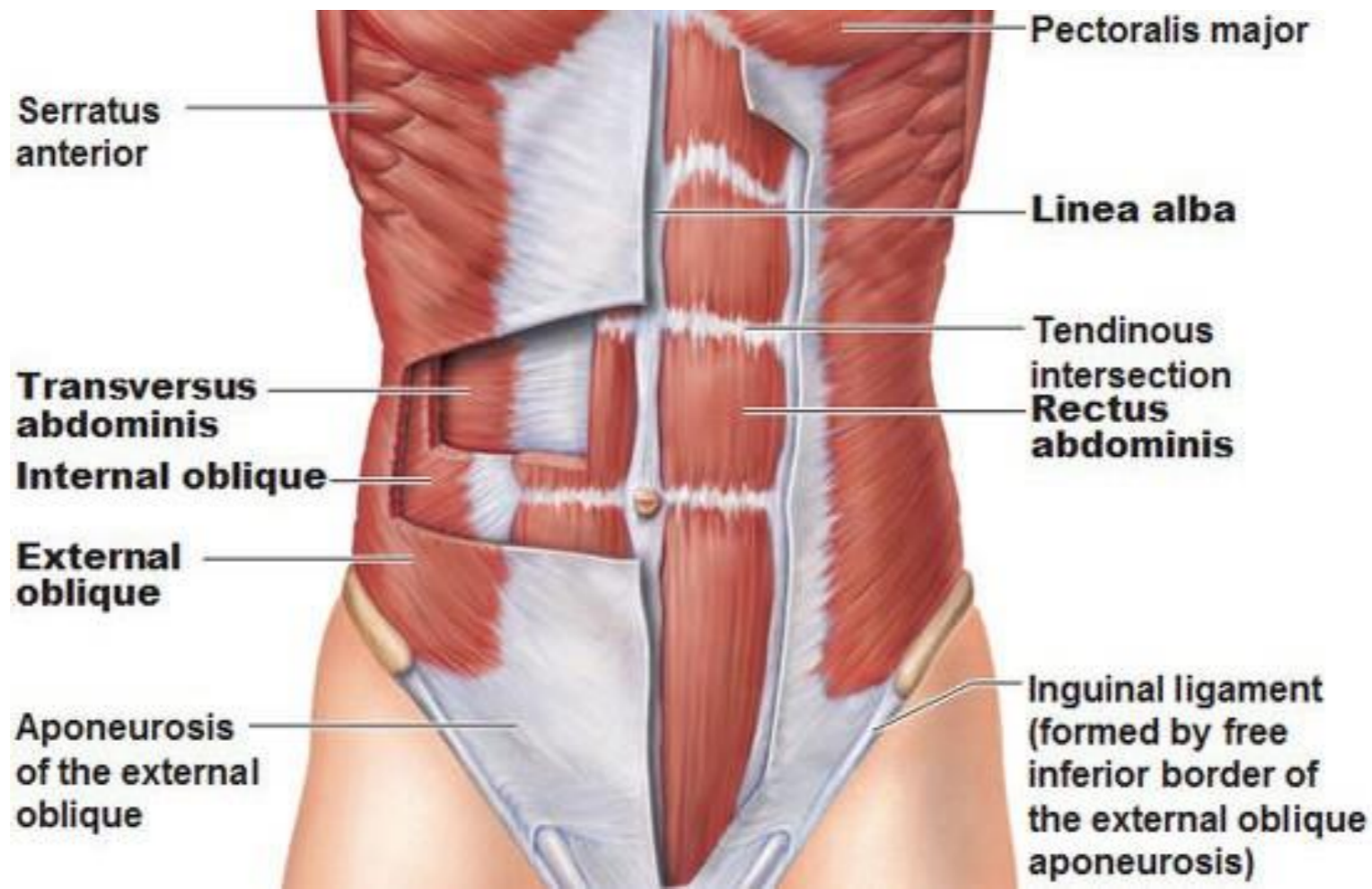
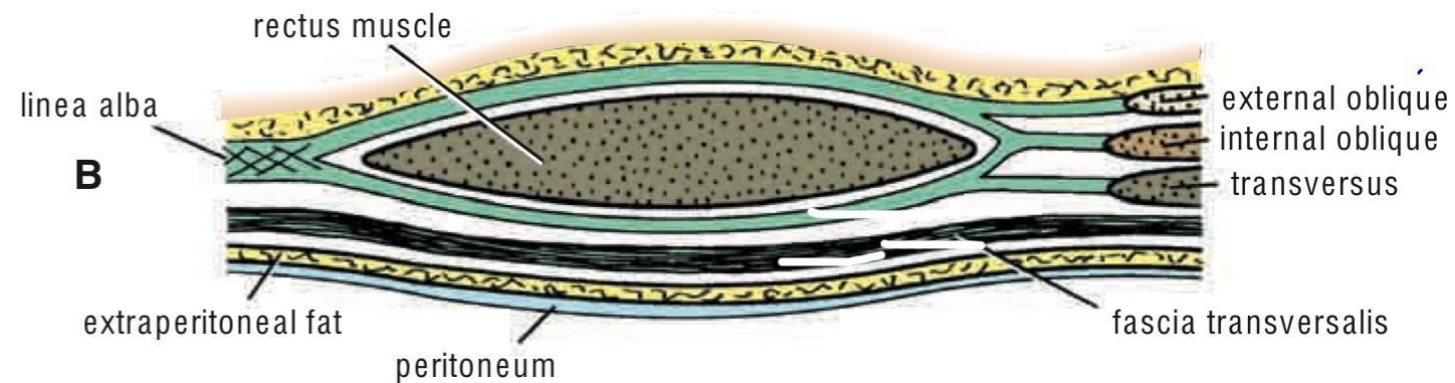
- The students should observe the following :
 1. Direction of the muscles fibers.
 2. The conjoint tendon



4. Rectus Abdominis muscle

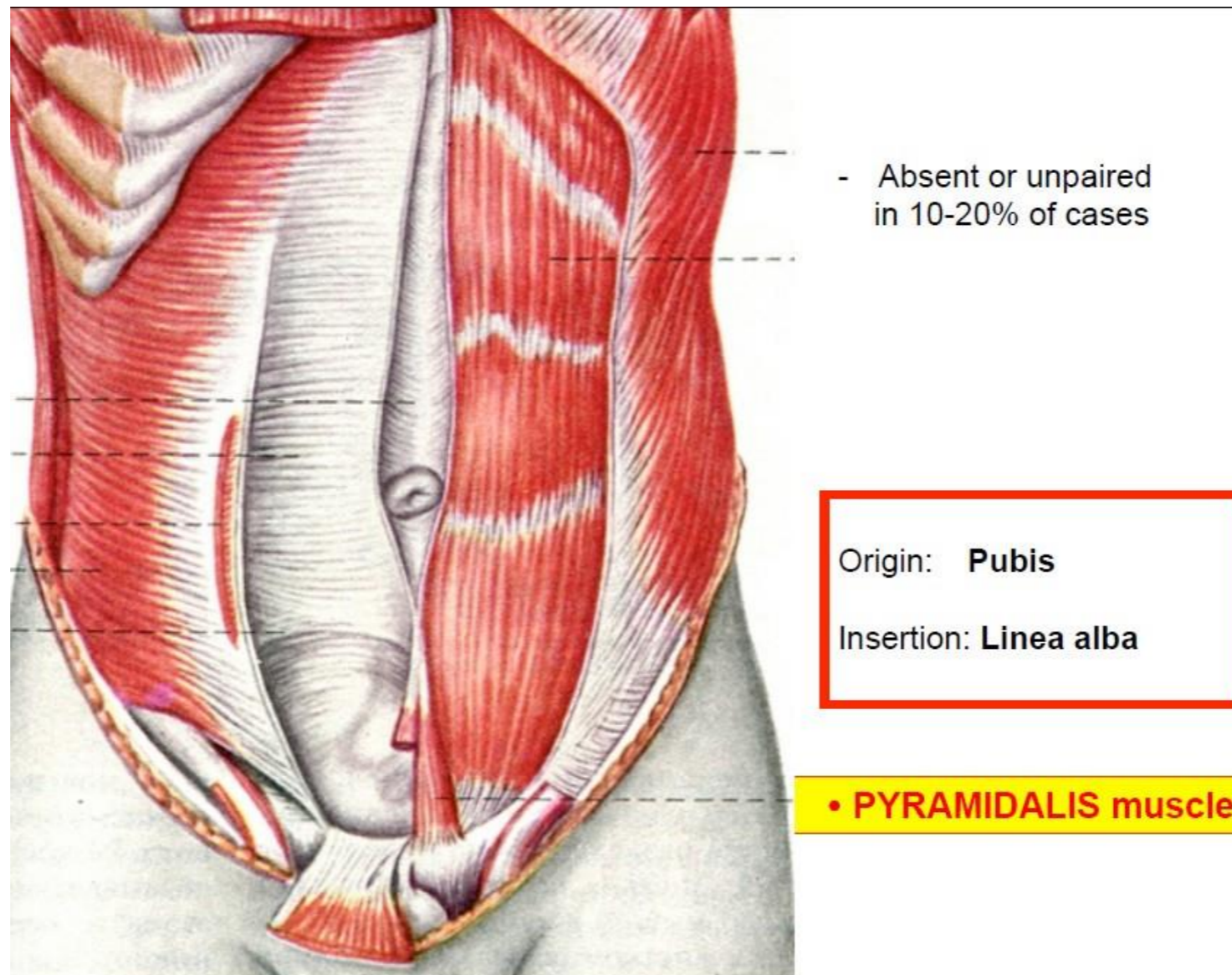
- The students should observe the following :

1. Direction of the muscles fibers.
2. Tendinous intersections
3. It lies in the rectus sheath.



5. Pyramidalis muscle

- The students should observe the following (if it is present):
 1. Attached to linea alba.
 2. it lies anterior to rectus abdominis inside the rectus sheath



Tendinous intersection: = Linea transverses

- 3 or 4 transverse fibrous bands
- divide the rectus abdominis muscle into distinct segments

Location of these transverse fibers:

1- one at level of

xiphoid process 2- one at level

of umbilicus and

3- one half way between these two

If there is a fourth, it will be found below the umbilicus but above the anterior superior iliac spine.

Note that **NO** transverse fibers can be found below the anterior superior iliac spine, all of them are superior to it, whether 3 or 4 in number.

- They can be palpated as a transverse depressions

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- The sheath ends at linea alba (fibrous line)



Pyramidalis muscle

Origin

Anterior Surface of the pubis

Insertion:

Linea alba

-It lies in front of the lower part of the rectus abdominis muscle inside the rectus sheath.

-Nerve supply

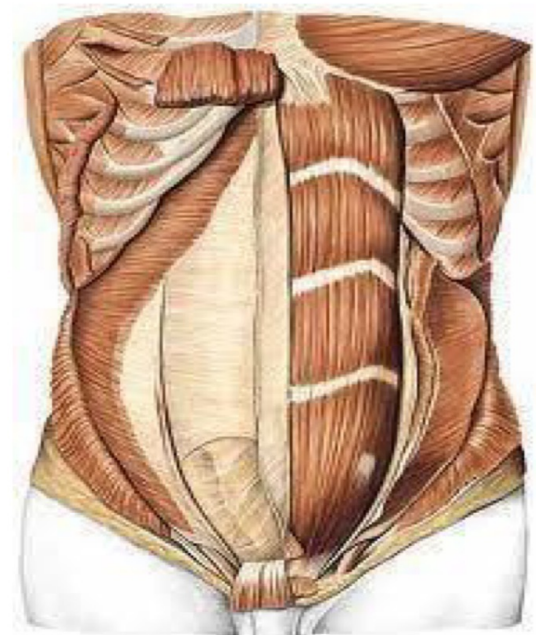
12th subcostal nerve (it is the last thoracic spinal nerve)

pyramidalis could be absent and sometimes we can use it in reconstruction operations -just like palmaris longus that is one of the forearm muscles, psoas minor that is one of the posterior abdominal muscle, or plantaris in the lower limb.

- Action:

Pulls linea alba downward and laterally (to the same side of the muscle)

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Rectus sheath.....cont

Contents

- Rectus abdominis muscle
- Pyramidalis muscle (if present)
- The anterior rami of the lower six thoracic nerves (the nerves enter the rectus sheath to supply the rectus abdominis muscle and then they end as anterior cutaneous nerves of abdomen, giving the skin of the abdomen)
- The superior and inferior epigastric vessels (vessels= veins & arteries)
 - superior epigastric artery origin: musculophrenic artery then internal mammary artery then subclavian artery ,
 - inferior epigastric from the external iliac artery (external iliac artery gives the femoral artery branch in the lower limb, before giving the femoral artery, it gives the inferior epigastric artery)
 - Inferior epigastric artery is a very important vessel surgically because using it, surgeons can differentiate between direct and indirect hernia
 - Direct inguinal hernia occurs in a triangle called inguinal triangle which is present in the anterior abdominal wall above inguinal ligament
 - Indirect inguinal ligament occurs in the inguinal canal
- Lymphatic vessels.

Between muscles and posterior wall

✦ Anterior abdominal wall.

B. Rectus Sheath

- There is three levels of rectus sheath, the students should notice the anterior and posterior layers of each level.
- Example : above and below the umbilicus, the anterior wall is formed by ???
- The student should observe the adherent of the tendinous intersection with the anterior wall of rectus sheath

Notes on the Previous Slide

Level one is at the level of the xiphoid and costal cartilages numbers 5, 6 and 7.

The anterior wall consists of the following contents (from superficial to deep):

- Skin
- Superficial Fascia
- Pectoralis Major Muscle (which is attached to the sternum)
- Aponeurosis of External Oblique

THE RECTUS MUSCLE IS BETWEEN THE CONTENTS OF THE ANTERIOR WALL AND POSTERIOR WALL.

The posterior wall consists of the following contents:

- 5th, 6th, and 7th Costal Cartilage
- Xiphoid process
- Intercostal muscles (these are the muscles located between the costal cartilages in the intercostal spaces)

**No internal oblique and transversus at this level.

Between the costal margin and the level of the anterior superior iliac spine - LEVEL 2

(Above and below umbilicus or around it)

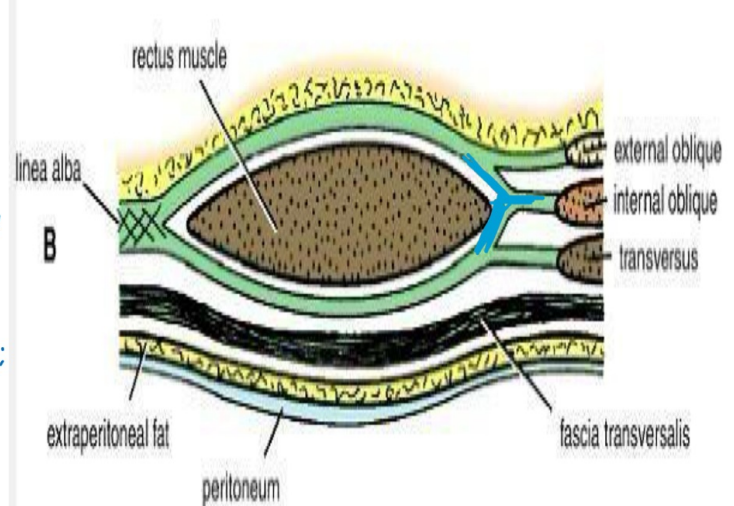
Above umbilicus means midway to xiphoid process & below means midway to symphysis pubis.

-The aponeurosis of the internal oblique splits to enclose the rectus muscle (divided to give 2 layers: one for anterior wall and one for posterior wall)

-The external oblique aponeurosis is directed in front of the muscle

-The transversus aponeurosis is directed behind the muscle.

* Knowing the layers is important for surgeons to make incisions.



Anterior: Skin, superficial fascia, external oblique aponeurosis, one layer of internal oblique.

Posterior: one layer of internal oblique, transversus, transversalis fascia, extraperitoneal fat & parietal peritoneum.

Between the level of the anterosuperioriliac spine and the pubis - LEVEL 3

(below arcuate line)

the anterior wall : the aponeurosis of all three muscles form (external oblique+ internal oblique + transversus abdominis), skin & superficial fascia.

The posterior wall is absent, and the rectus muscle lies in contact with the fascia transversalis, extraperitoneal fascia & parietal peritoneum.

What separates the three muscles from the transversalis fascia?
ANS: Arcuate Line

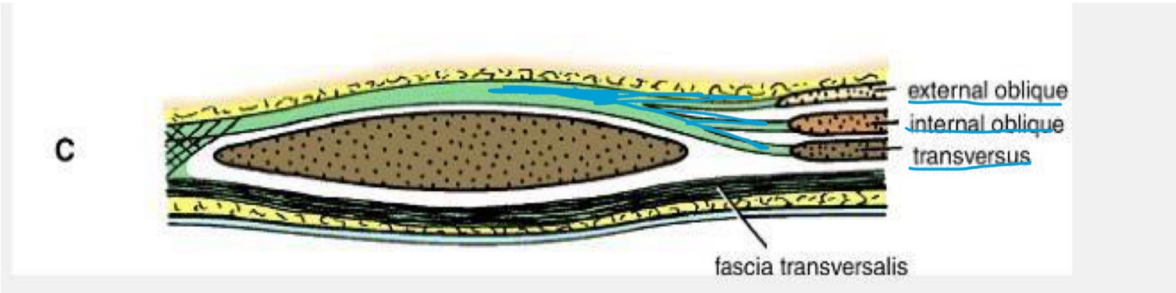
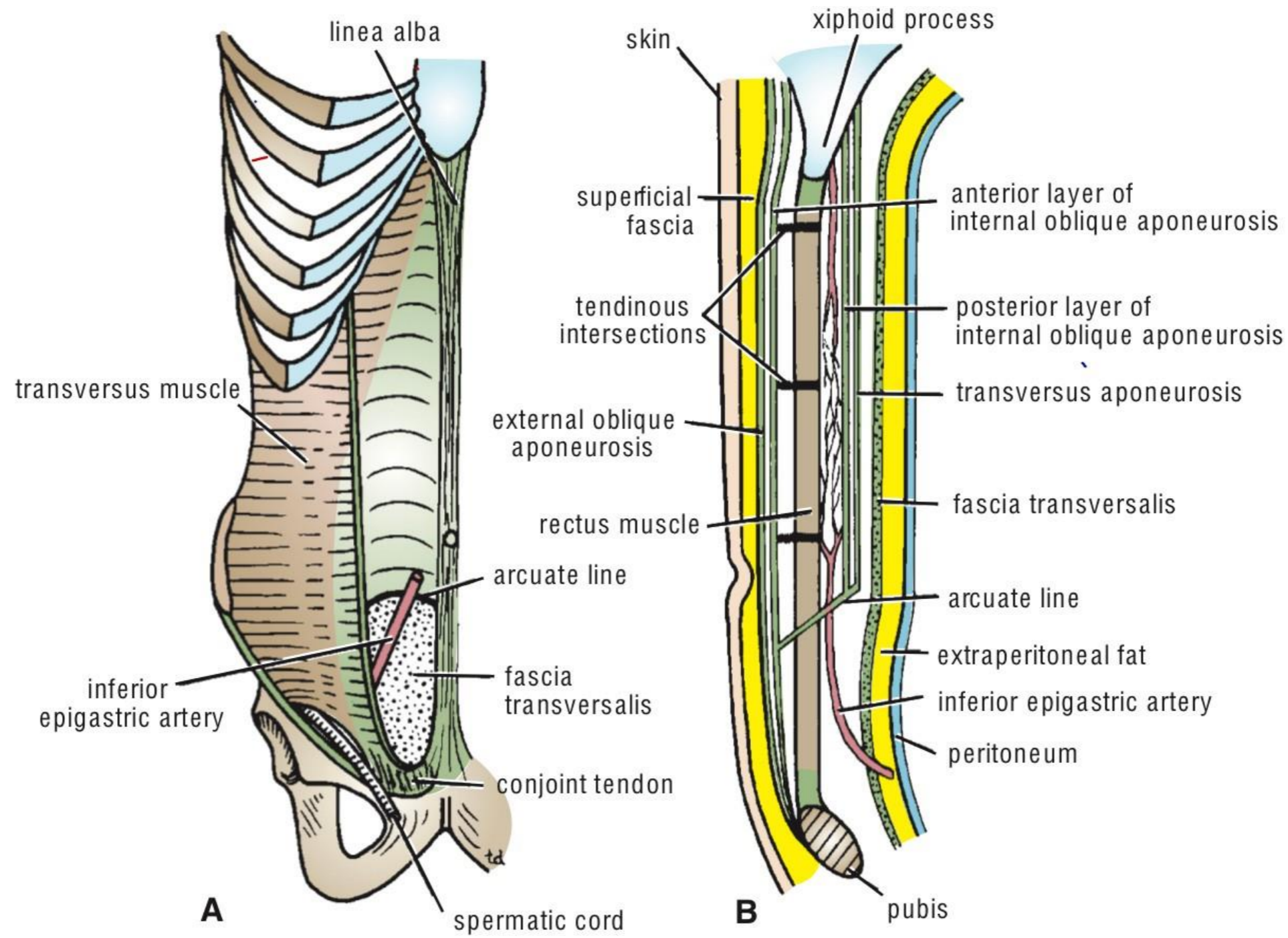


Figure 4-13 Transverse sections of the rectus sheath seen at three levels. **A.** Above the costal margin. **B.** Between the costal margin and the level of the anterior superior iliac spine. **C.** Below the level of the anterior superior iliac spine and above the pubis.

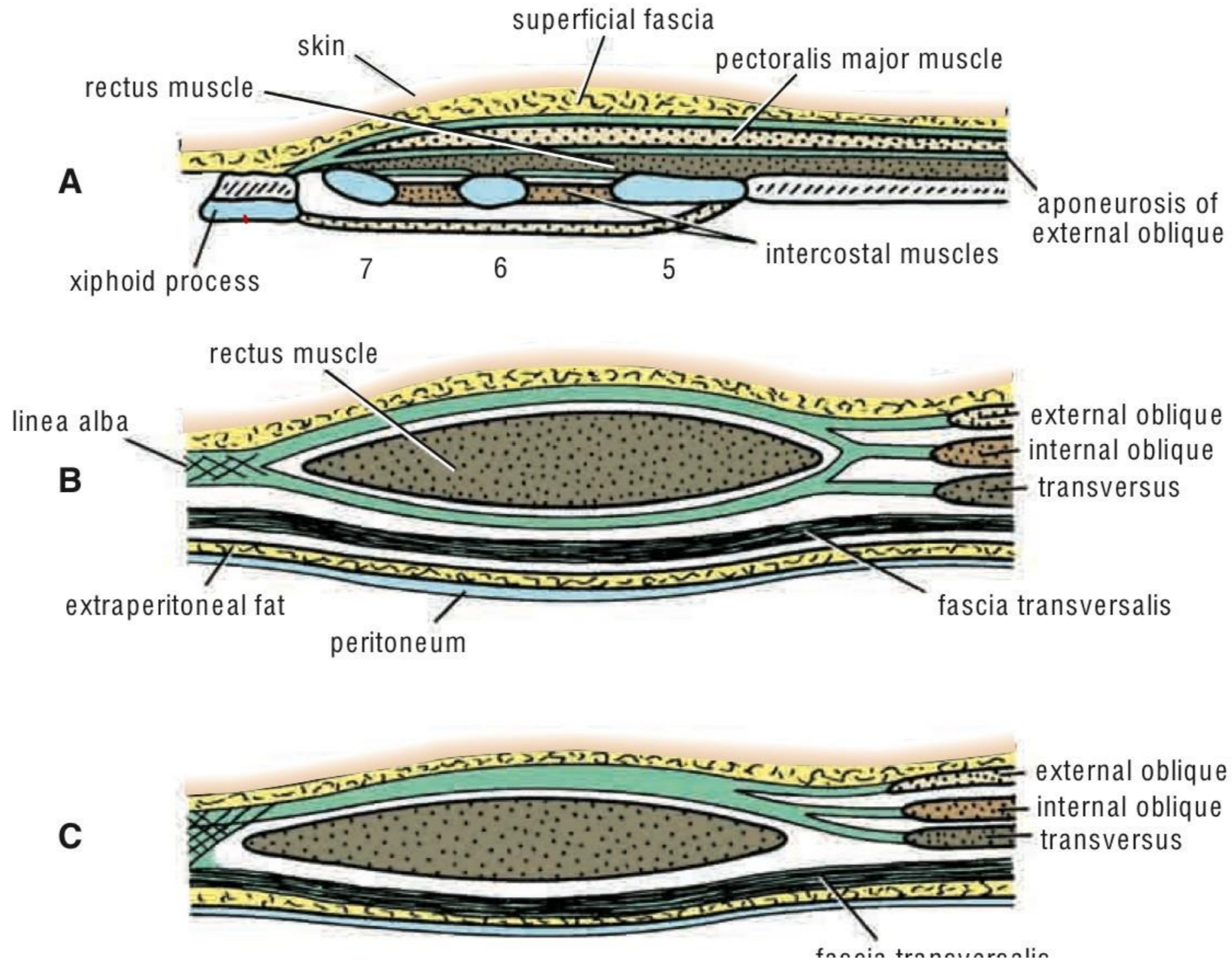
✦ Anterior abdominal wall.

B. Rectus Sheath



✦ Anterior abdominal wall.

B. Rectus Sheath



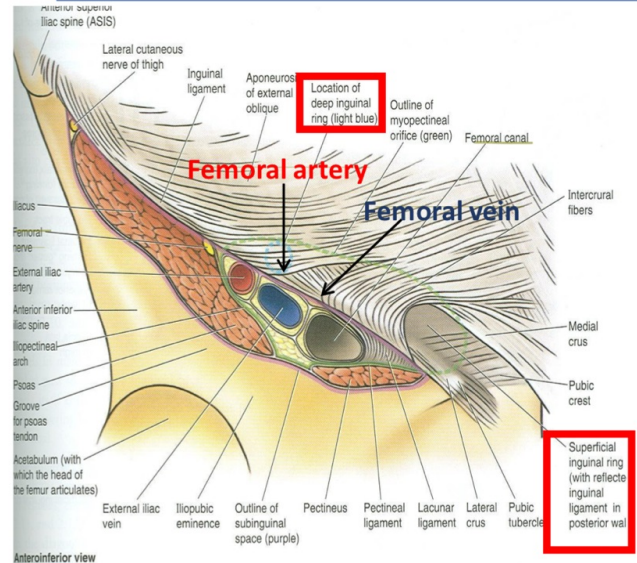
✱ Inguinal canal.

- The students should know and identify the :
 1. deep and superficial inguinal rings
 2. boundaries of Inguinal canal
 3. contents of Inguinal canal
 4. clinical points (hernia)

Deep Inguinal Ring

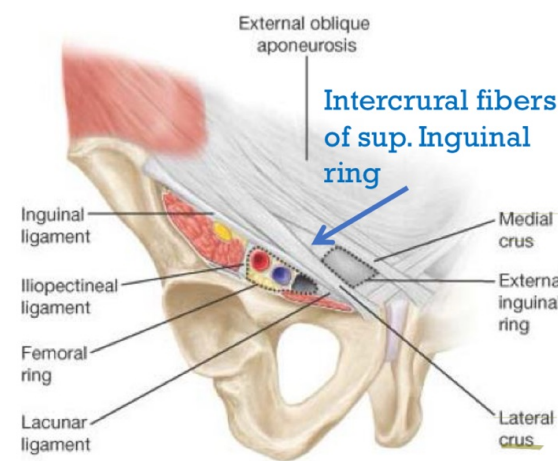
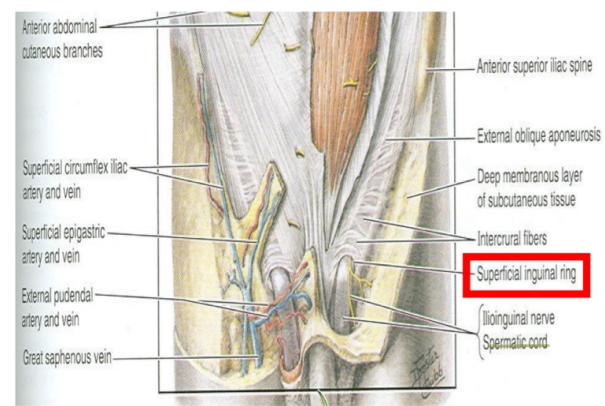
- Is an **oval opening** in the **fascia transversalis** (which is a layer from the anterior abdominal wall),
- Details next slide →
- Lies about **½ inch (1.3cm)** above the **inguinal ligament** midway between the **anterosuperior iliac spine** and the **symphysis pubis**
- So in order to locate the deep ring in the physical examination, we'll put a finger (about 1-2 cm above the point of pulsation of the femoral artery)
- Margins of the ring give attachment to the **internal spermatic fascia**.

Remember: What has been highlighted in this pic belongs to **femoral sheath**



Superficial Inguinal Ring

- Triangular in shape**
- It's formed due to **Defect in the aponeurosis of the external oblique muscle**
- Lies immediately above and medial to the **pubic tubercle**
- Its margins sometimes called **crura (Med & lat crus)**, give attachment to the **external spermatic fascia**



Again; what makes up the superficial opening?? Defect in external oblique muscle aponeurosis

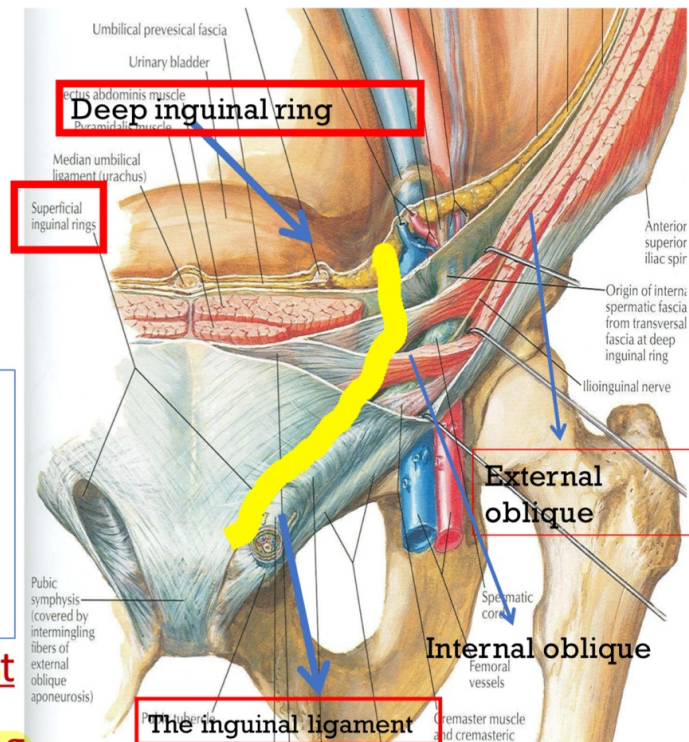
It has 2 cruses made up by 2 muscles Medial crus and Lateral crus

Anterior Wall of Inguinal Canal

- It (Anterior wall of inguinal) is formed along its entire length by aponeurosis of the external oblique muscle (in front of the inguinal canal)
- It is reinforced in its lateral third (lateral curve) by the origin of the internal oblique aponeurosis by a fleshy fibers from the inguinal ligament
- By then these fibers will make arching in order to form the roof

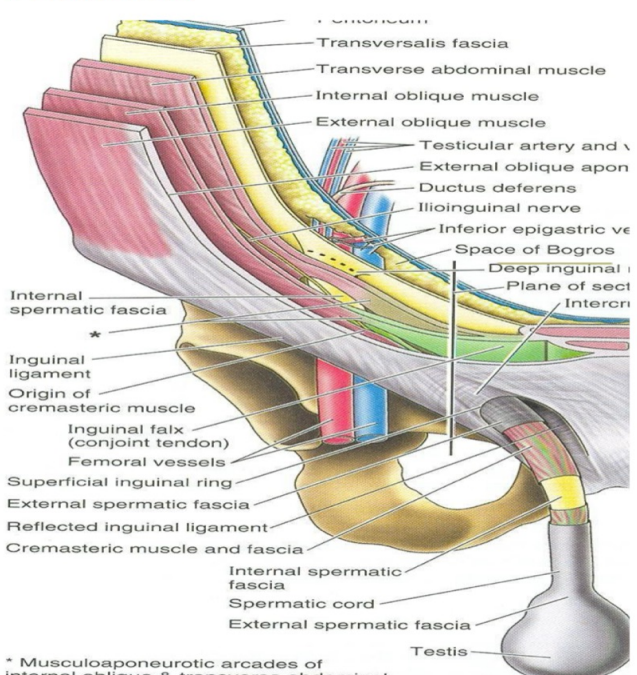
The internal oblique support is more than the external oblique, that's why the internal is opposite to the deep ring which is considered weak point in the anterior abdominal wall because it's the opening in the transversalis fascia and spermatic cord enters through it.
 ** origin of the internal oblique will support the lateral third of the anterior wall opposite to the deep ring.

- This wall (lateral third) is strongest where it lies opposite the weakest part of posterior wall, that is deep inguinal ring



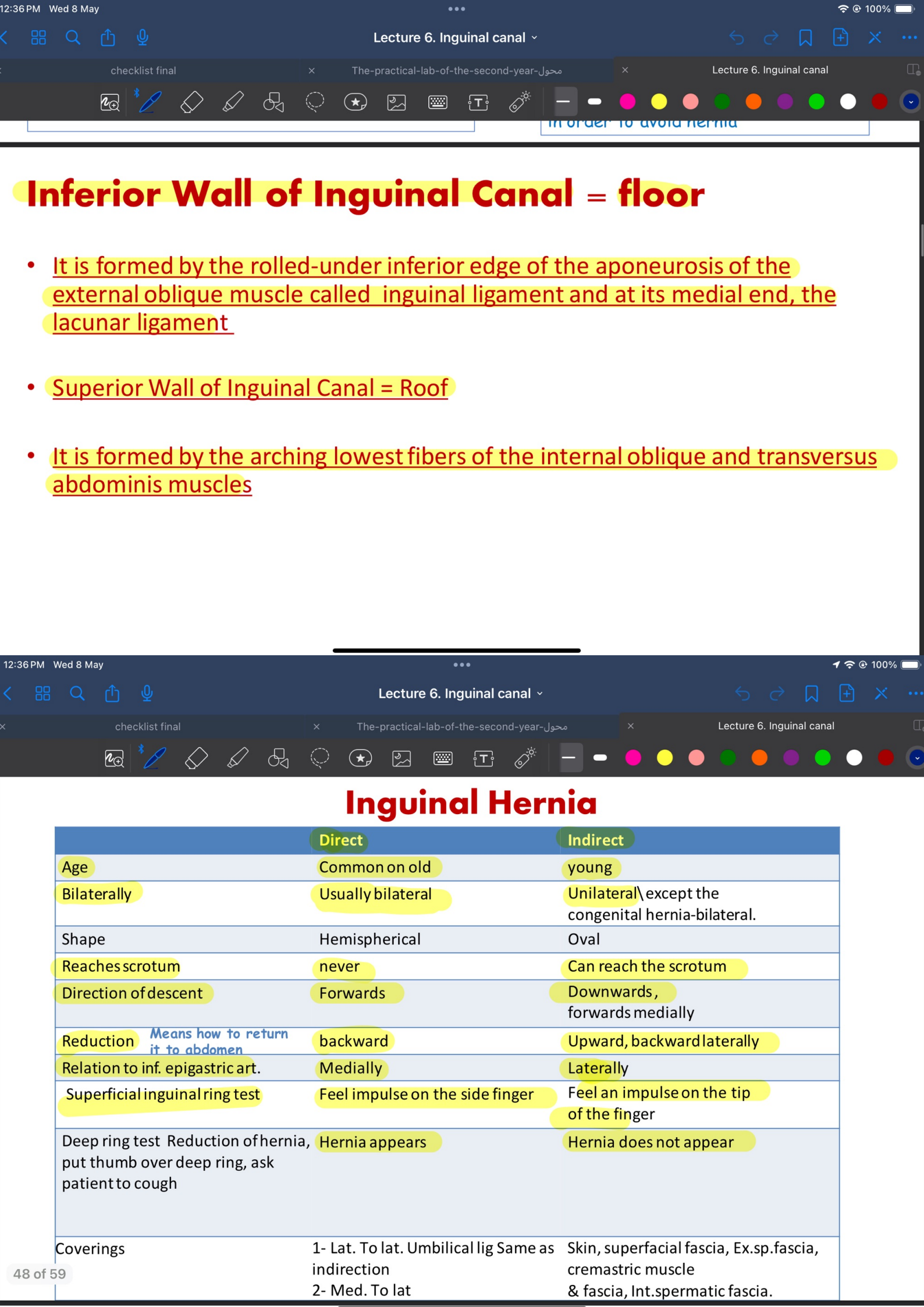
Posterior Wall of Inguinal Canal

- It is formed along its entire length by the fascia transversalis
- It is reinforced in its medial third by conjoint tendon, the common tendon of insertion of internal oblique and transversus, attached to the pubic crest in the superior ramus of pubis and pectineal line
- This wall is strongest where it lies opposite the weakest part of the anterior wall, that is superficial inguinal ring



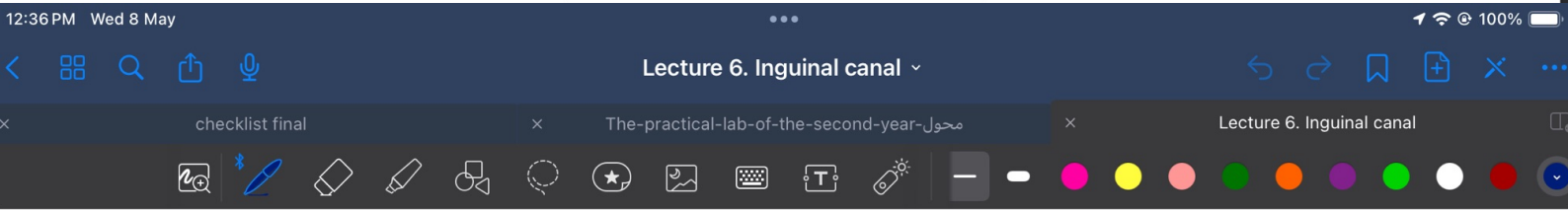
Anterior wall is reinforced by internal oblique muscle opposite to the deep ring (weak in posterior)
 Posterior wall is reinforced by conjoint tendon opposite to superficial ring (weak in anterior)

Why do we need all this reinforcements for each structure? in order to avoid hernia



Inferior Wall of Inguinal Canal = floor

- It is formed by the rolled-under inferior edge of the aponeurosis of the external oblique muscle called inguinal ligament and at its medial end, the lacunar ligament
- Superior Wall of Inguinal Canal = Roof
- It is formed by the arching lowest fibers of the internal oblique and transversus abdominis muscles



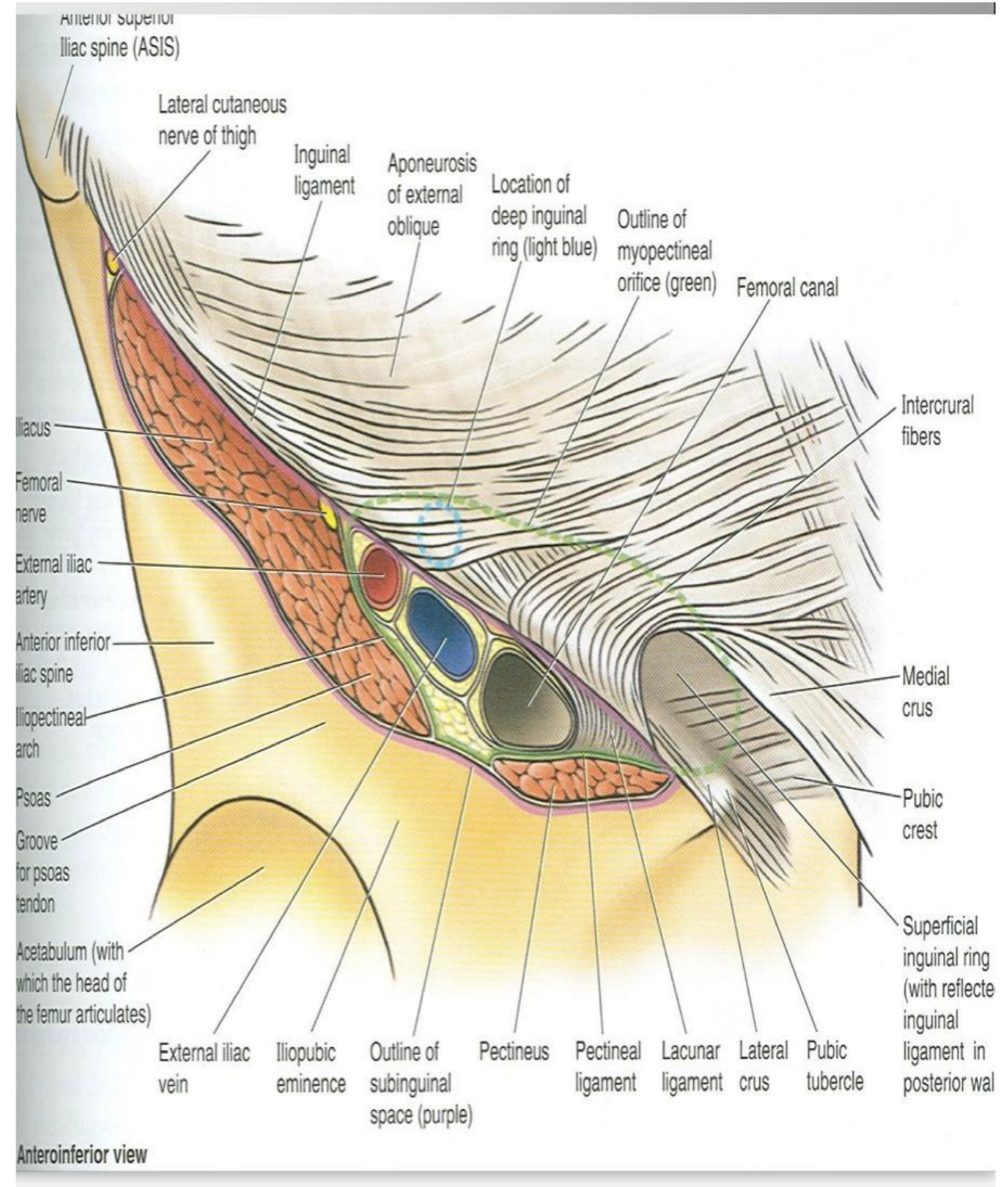
Inguinal Hernia

	Direct	Indirect
Age	Common on old	young
Bilaterally	Usually bilateral	Unilateral\ except the congenital hernia-bilateral.
Shape	Hemispherical	Oval
Reaches scrotum	never	Can reach the scrotum
Direction of descent	Forwards	Downwards, forwards medially
Reduction <small>Means how to return it to abdomen</small>	backward	Upward, backward laterally
Relation to inf. epigastric art.	Medially	Laterally
Superficial inguinal ring test	Feel impulse on the side finger	Feel an impulse on the tip of the finger
Deep ring test Reduction of hernia, put thumb over deep ring, ask patient to cough	Hernia appears	Hernia does not appear
Coverings	1- Lat. To lat. Umbilical lig Same as indirect 2- Med. To lat	Skin, superficial fascia, Ex.sp.fascia, cremastic muscle & fascia, Int.spermatic fascia.

1. Deep and superficial inguinal rings

- The students should observe the following :

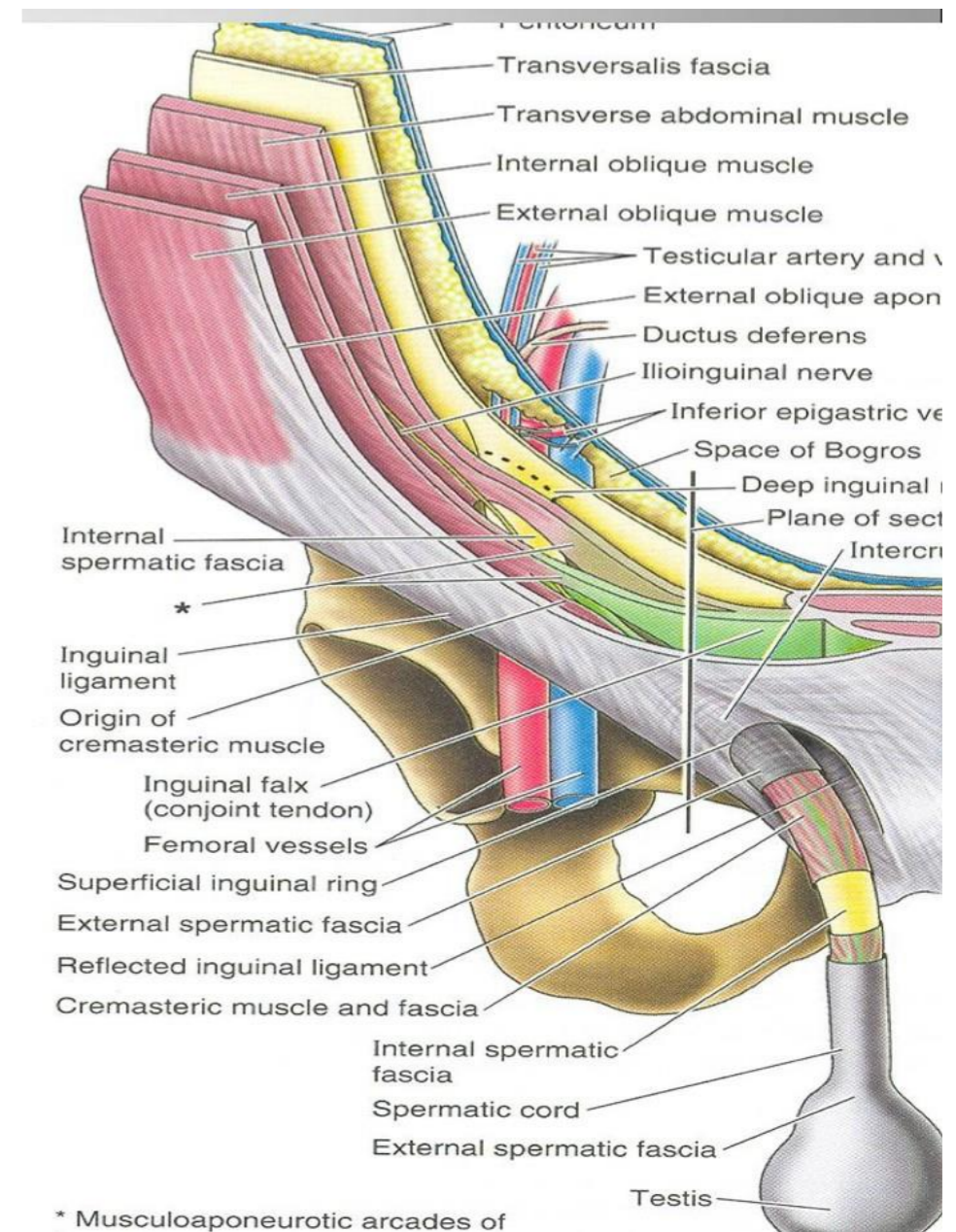
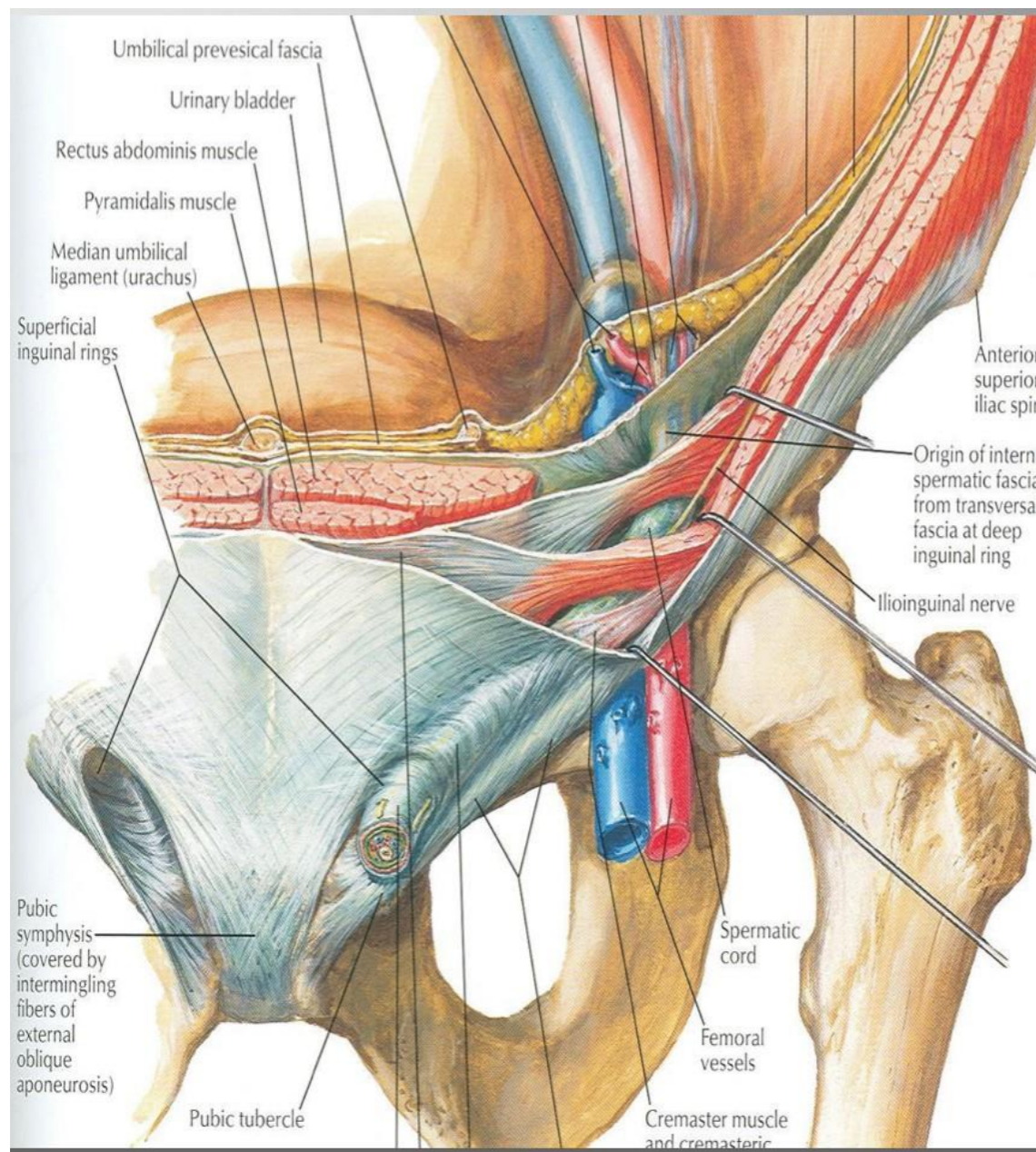
1. relation of deep ring to femoral artery.
2. relation of the superficial inguinal ring to pubic tubercle
3. the structures which crosses each ring ???



2. Boundaries of Inguinal canal

- The students should observe the following :

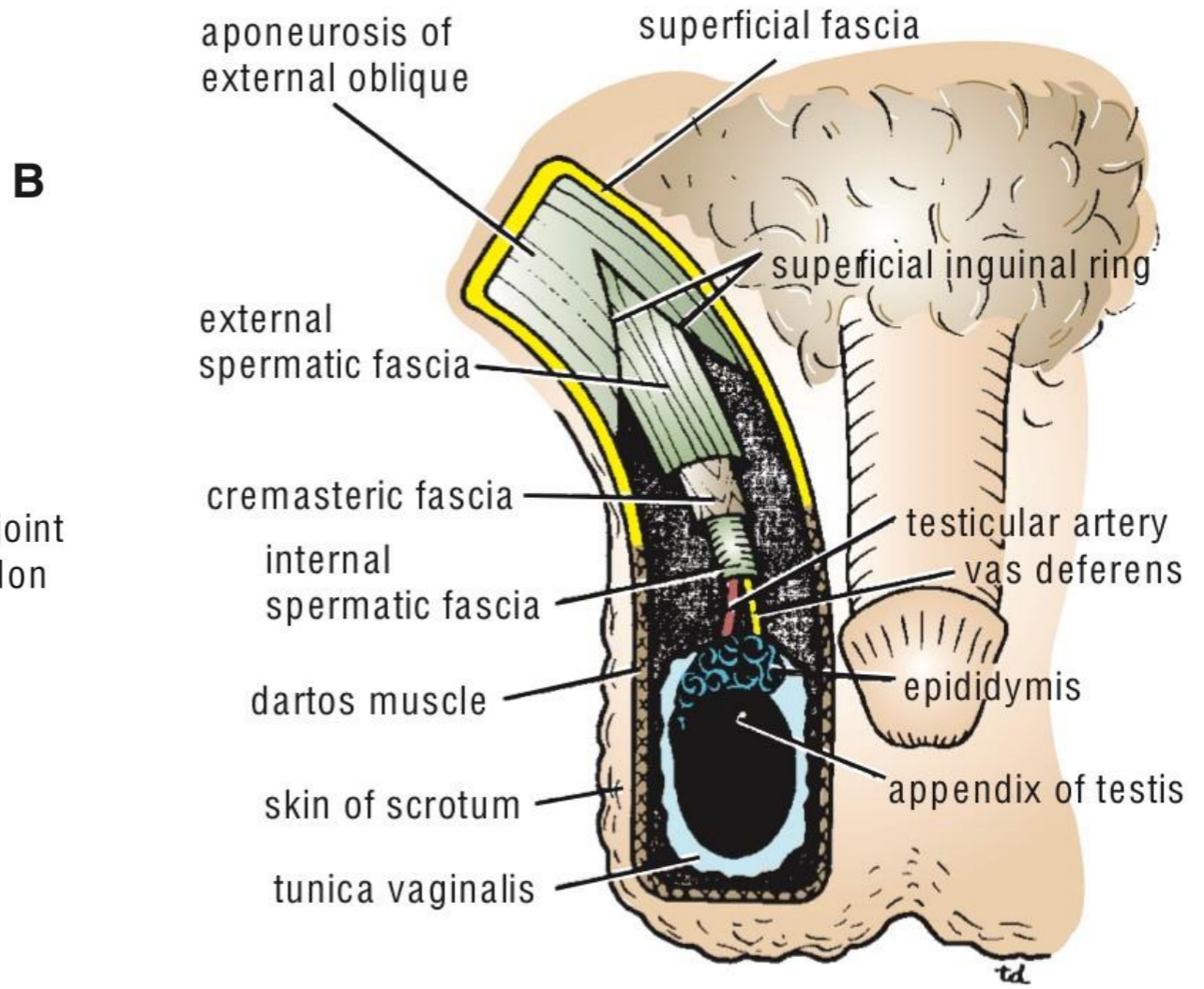
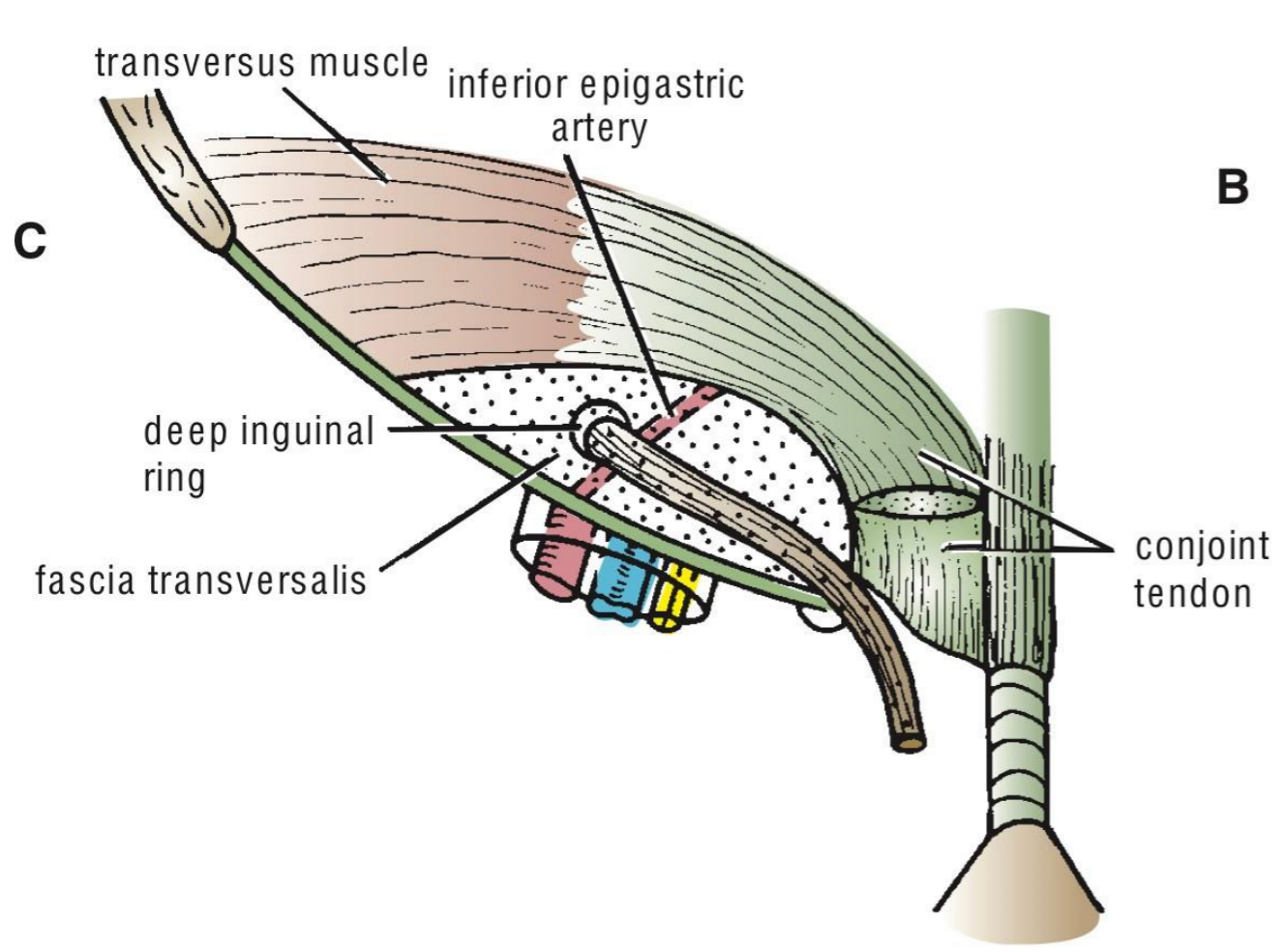
1. The boundaries of inguinal canal (ant wall, post wall, roof and floor)



3. contents of Inguinal canal

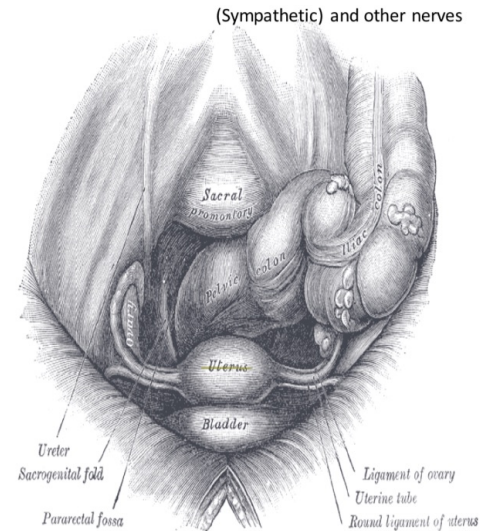
• The students should observe the following :

1. The contents of inguinal canal
2. The relation of deep ring to inferior epigastric vessels *medial*

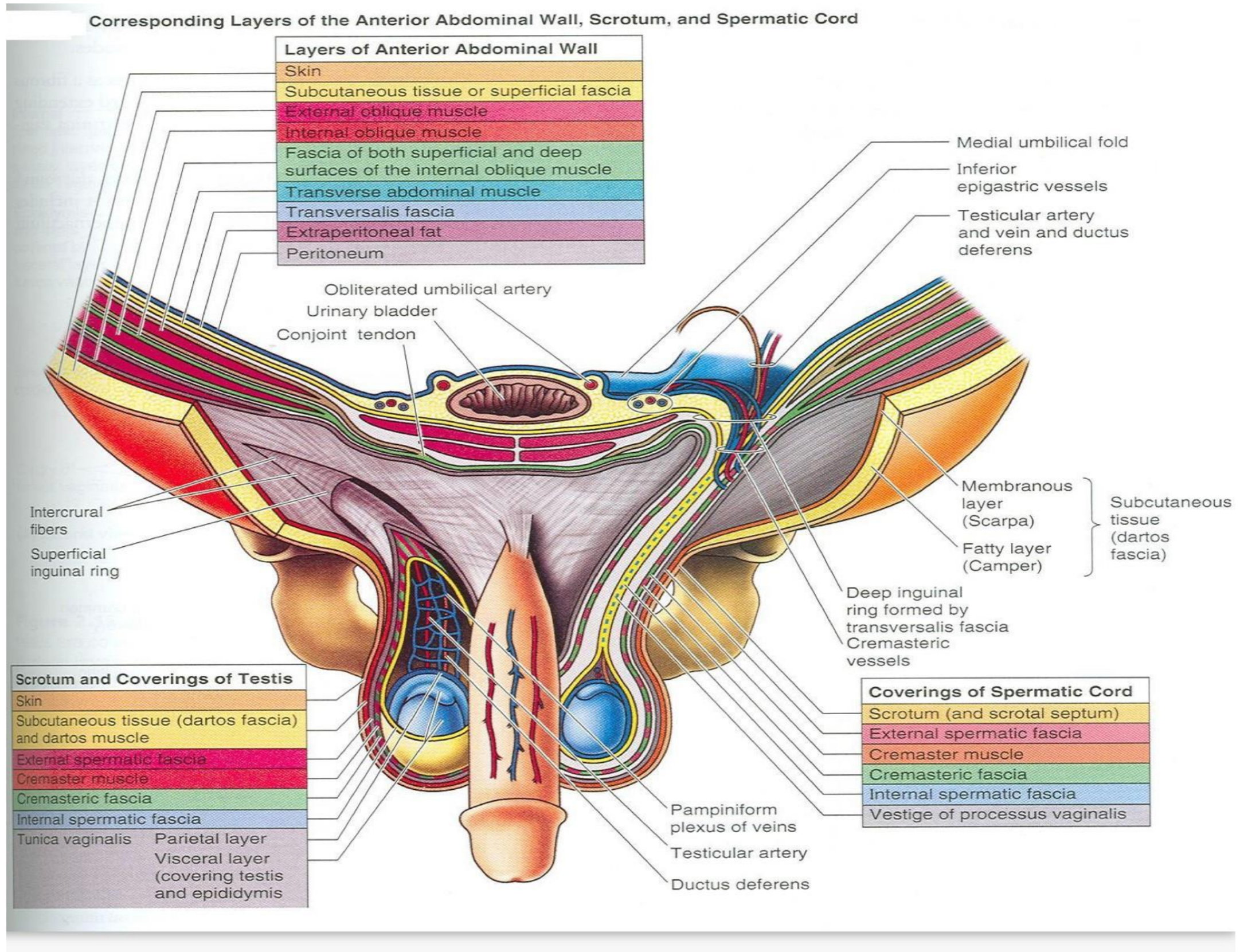


Contents of inguinal canal

- **Spermatic cord & its contents in male** (we'll take more details in pelvis)
- **Round ligament in female**
- **Genital branch of genitofemoral nerve** (supply cremasteric muscle which enclosed by cremasteric fascia)
- **Ilioinguinal nerve** : Enter the canal through the **posterior wall** (doesn't pass through the deep inguinal ring)

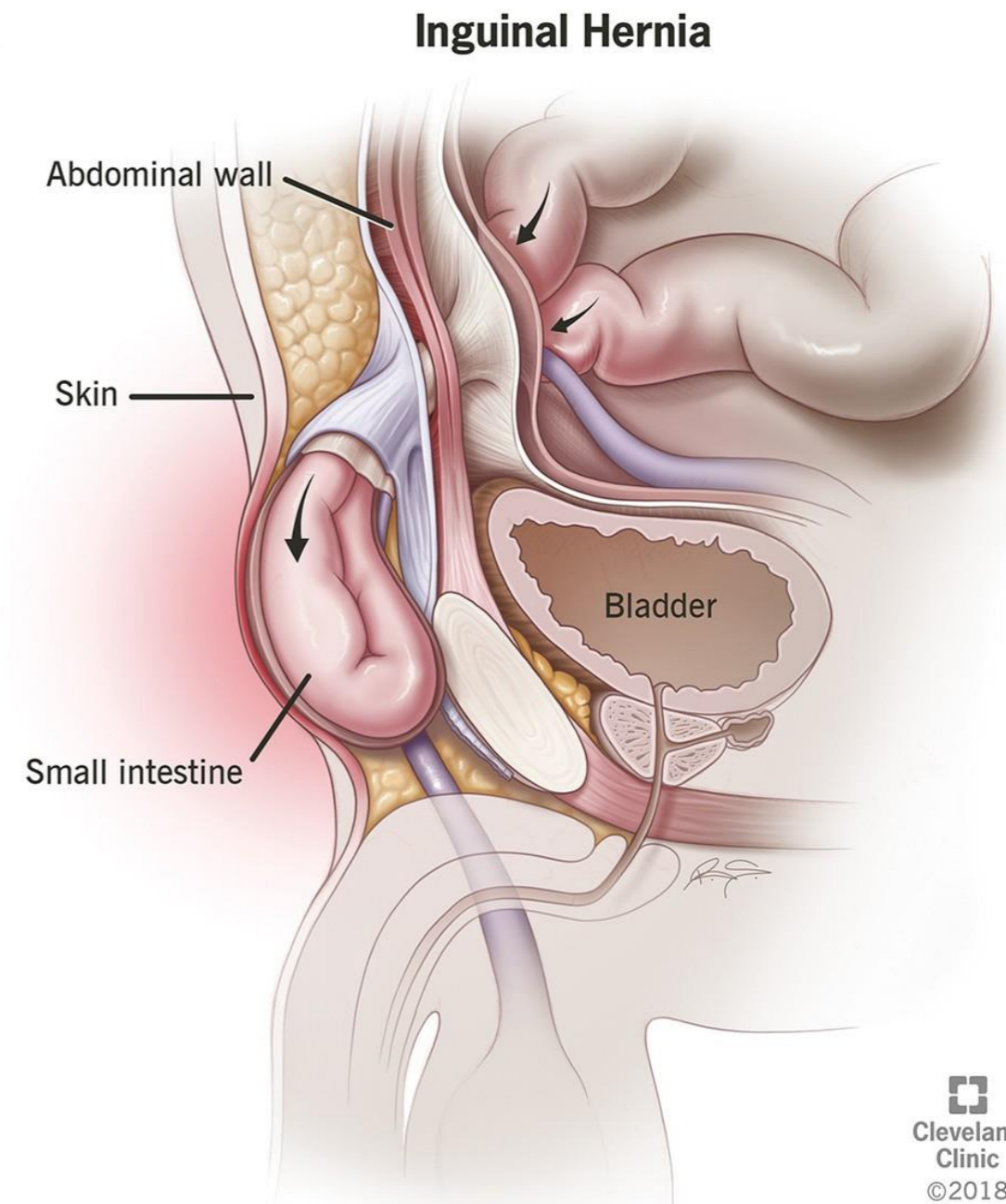
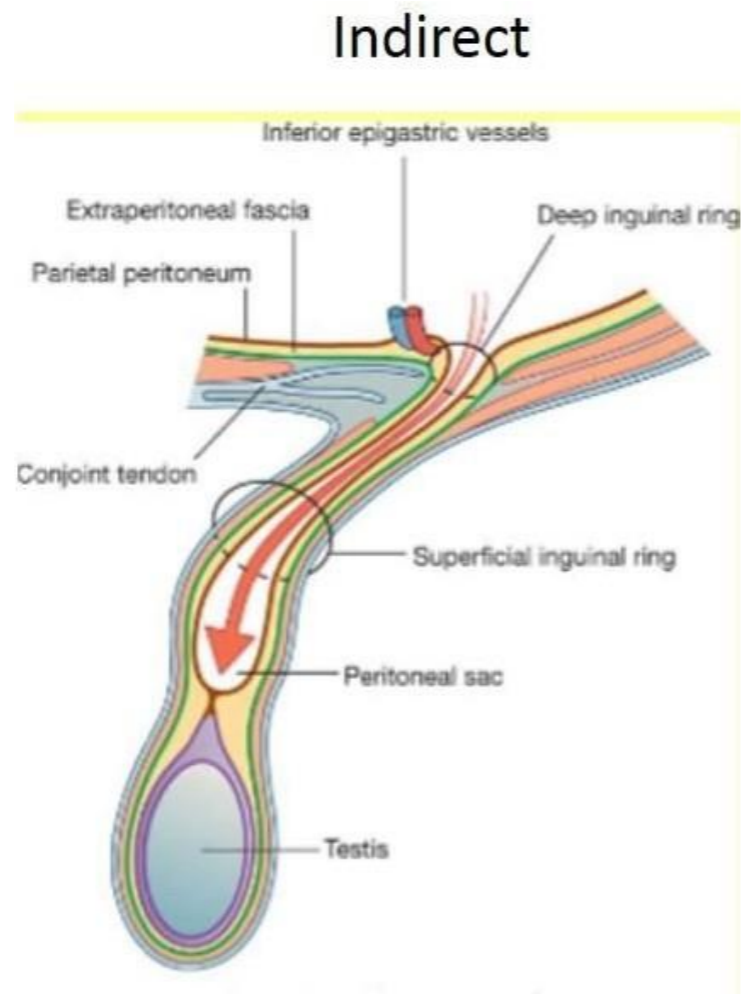


3. contents of Inguinal canal



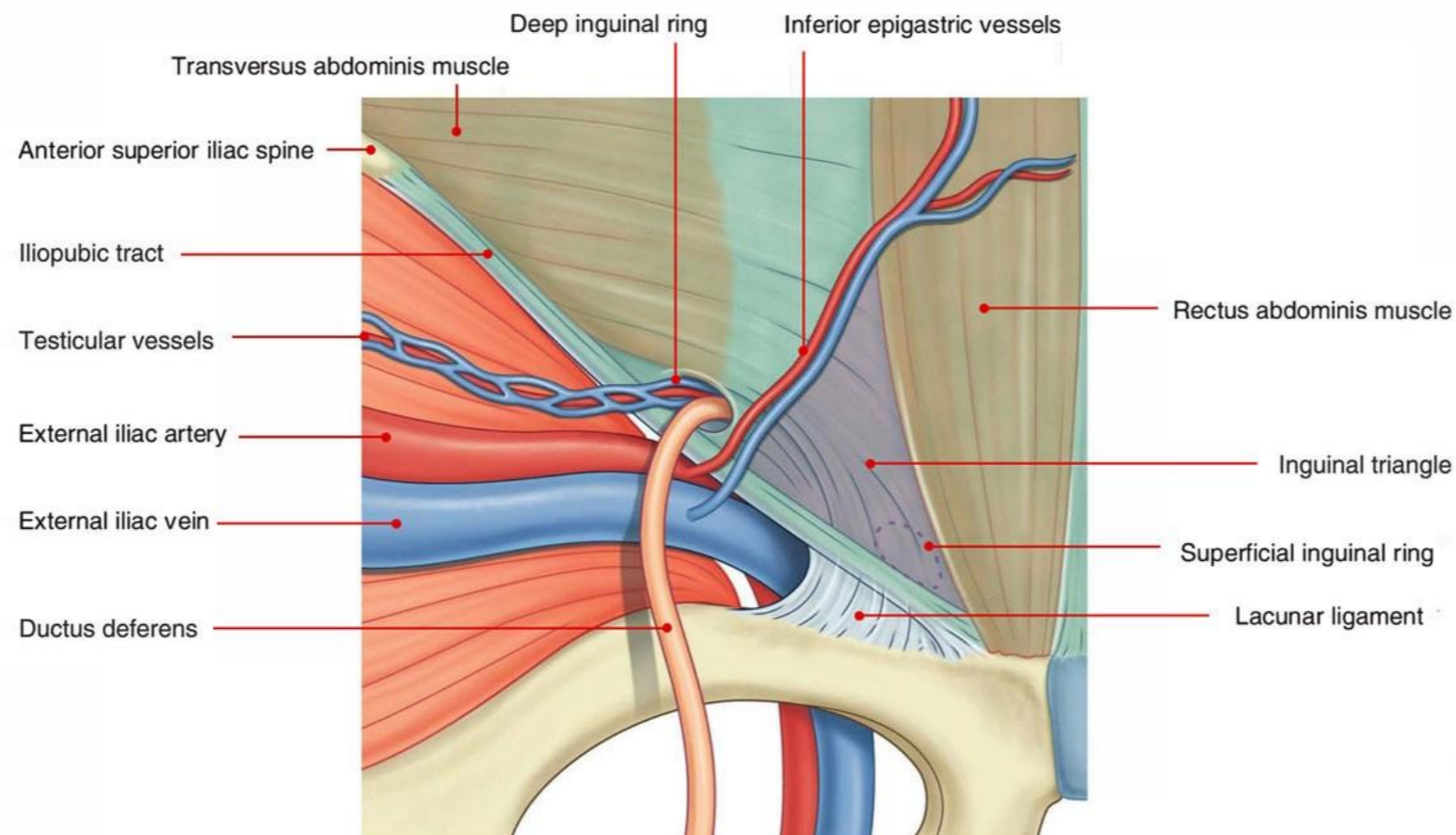
4. Indirect inguinal hernia

- The students should know the following :
 1. Type of the hernia.
 2. its relations to inferior epigastric vessels
 3. the direction of hernia and it may reach the scrotum



✘ Inguinal triangle.

- The students should know and identify the :
 1. Boundaries of inguinal triangle
 2. Type of hernia (direct inguinal hernia)
 3. its relations to inferior epigastric vessels
 4. the direction of hernia and it has no relation with the inguinal canal
- note: know the differences between direct and indirect inguinal hernia



Inguinal triangle

- Region of the abdominal wall
- Also called Hesselbach's triangle.

Borders:

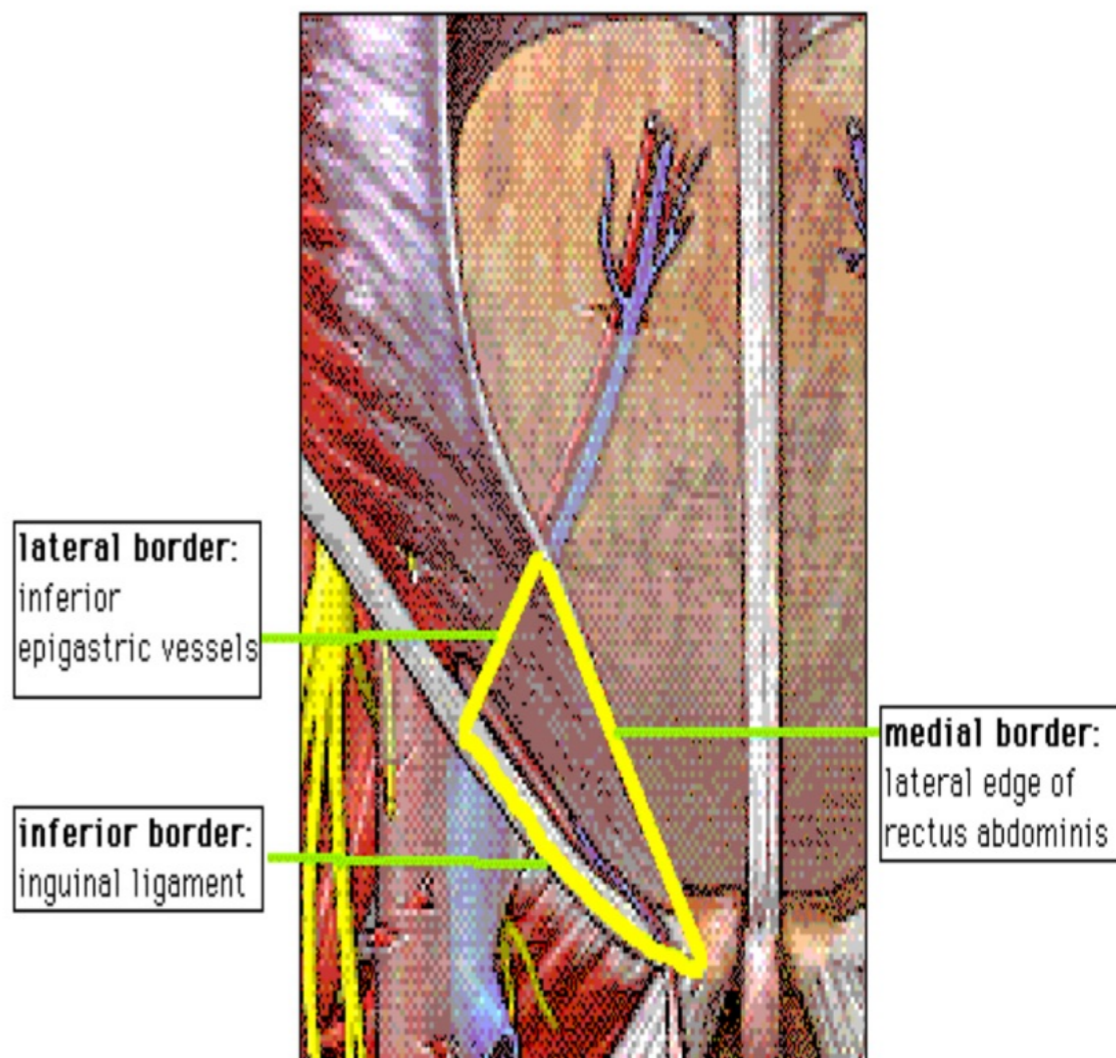
- Medial border: Lateral margin of the rectus sheath, also called linea semilunaris
- Superolateral border: Inferior epigastric vessels (mainly the artery)
- Inferior border: Inguinal ligament

Inferior epigastric artery separates the direct from indirect hernia, HOW??

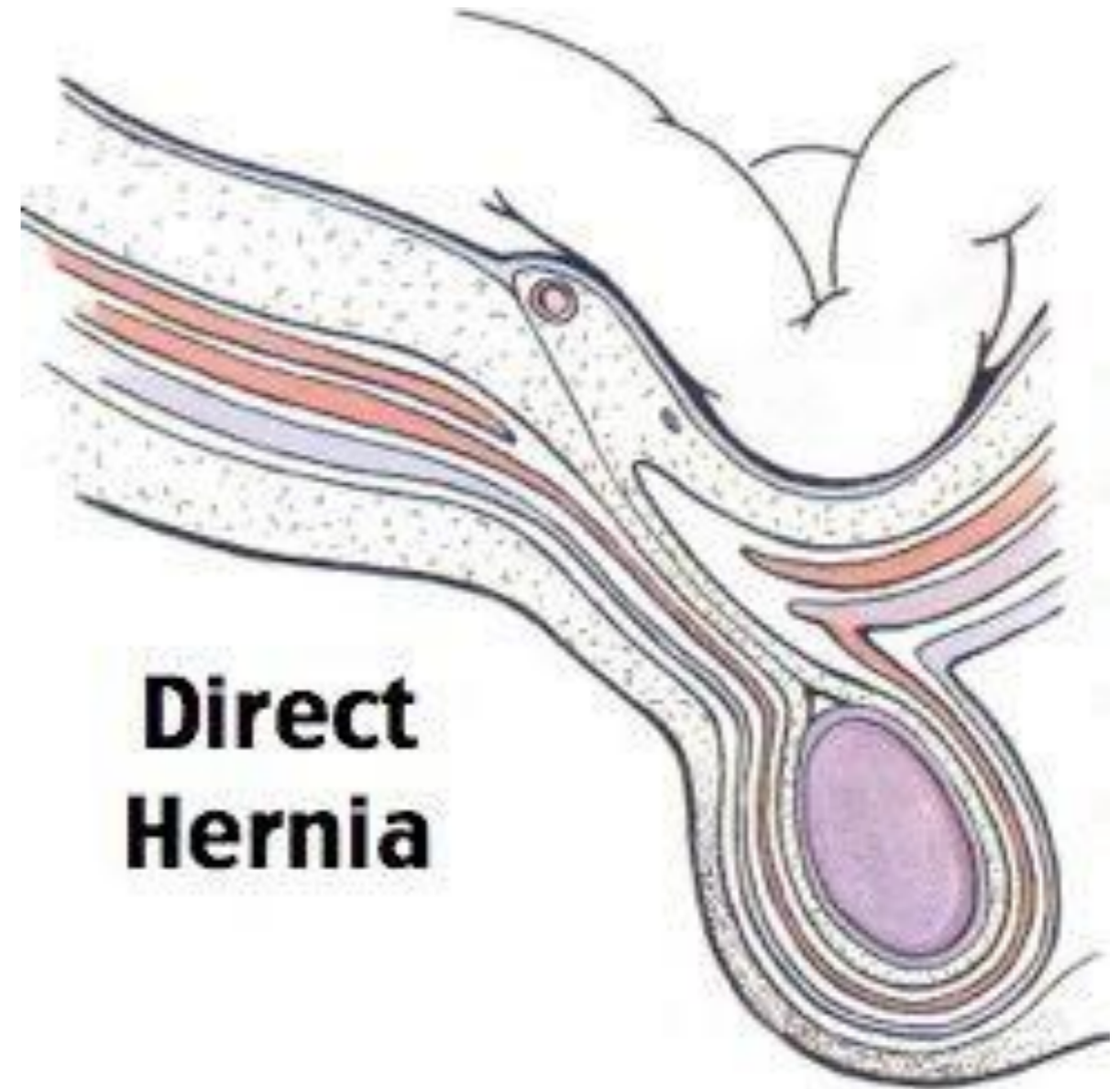
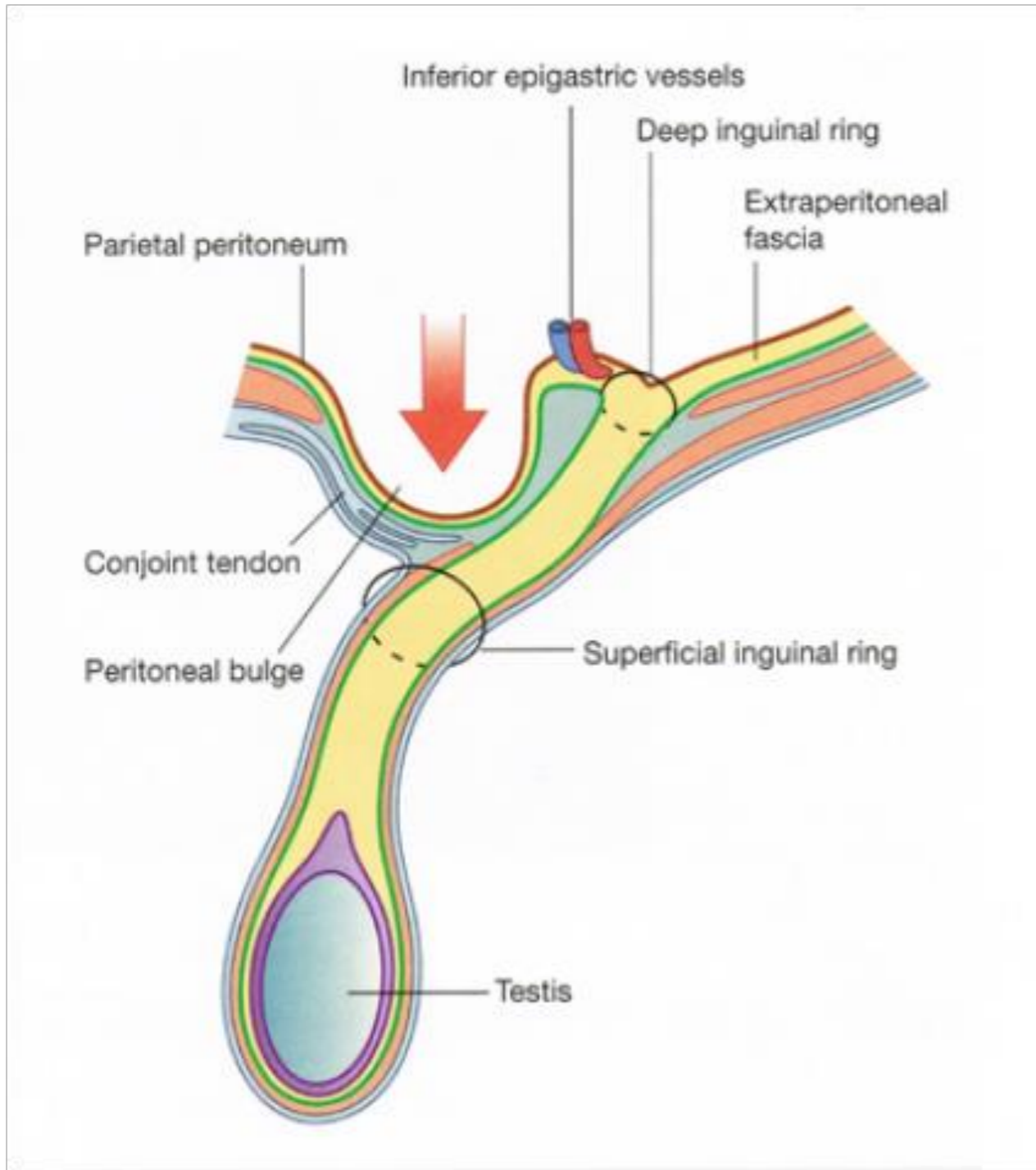
- Direct hernia happens MEDIAL to the vessels

- Indirect hernia happens LATERAL to the vessels

Inguinal hernia can occur in :
Inguinal TRIANGLE (direct)
Inguinal CANAL (indirect)



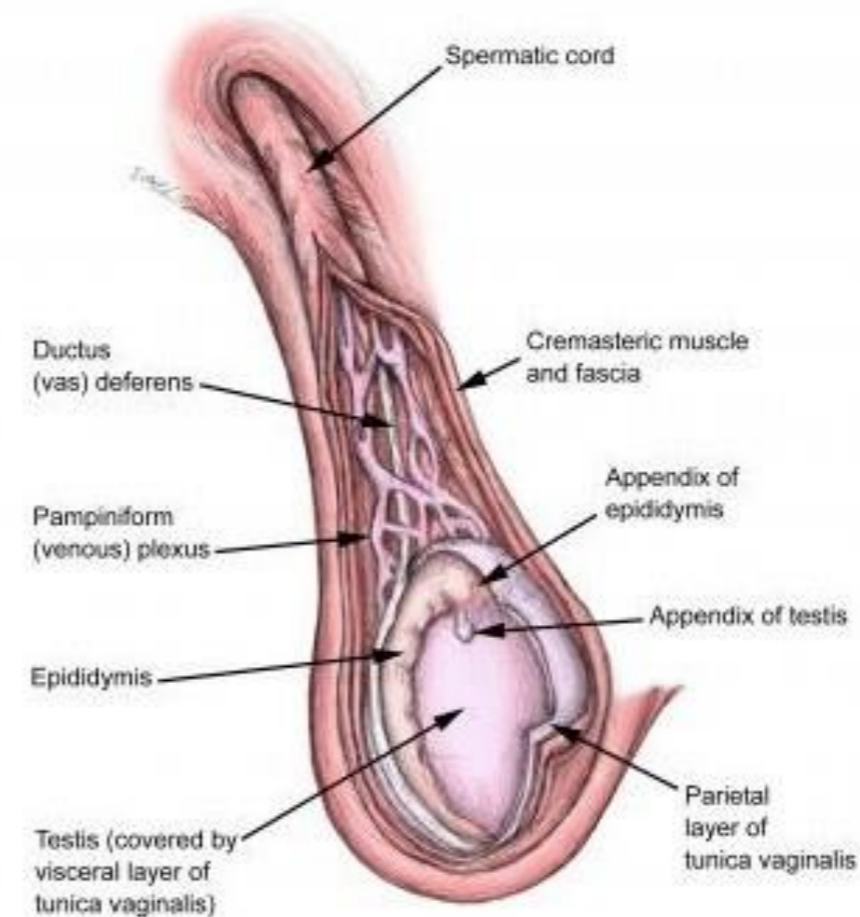
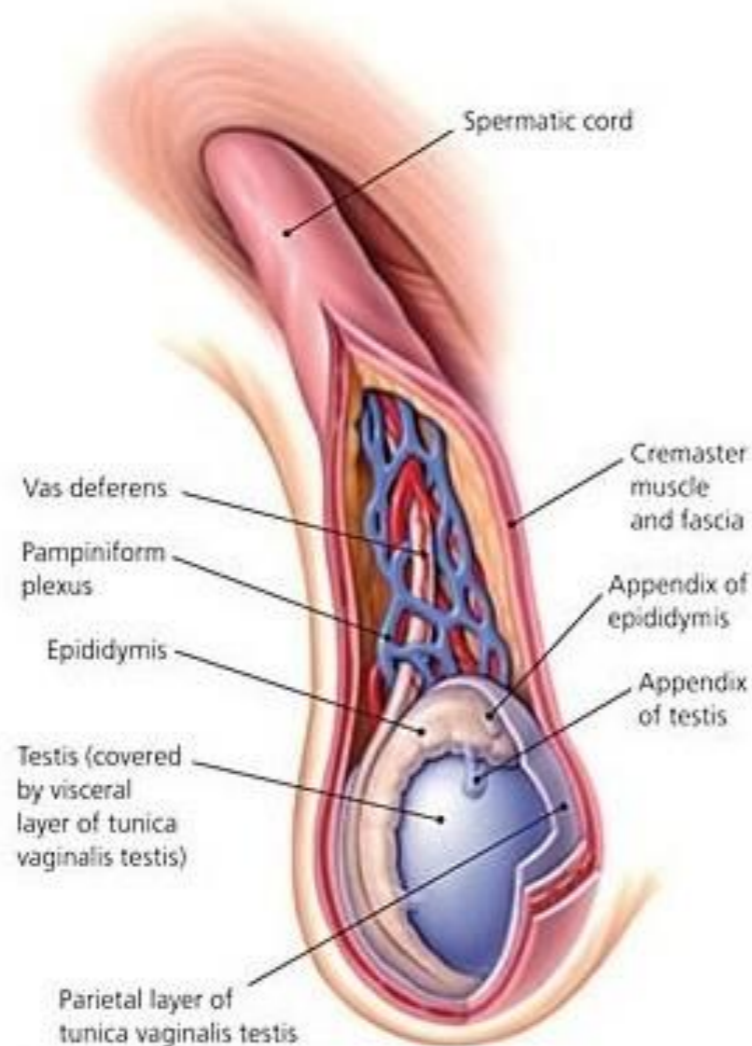
✦ Inguinal triangle.



**Direct
Hernia**

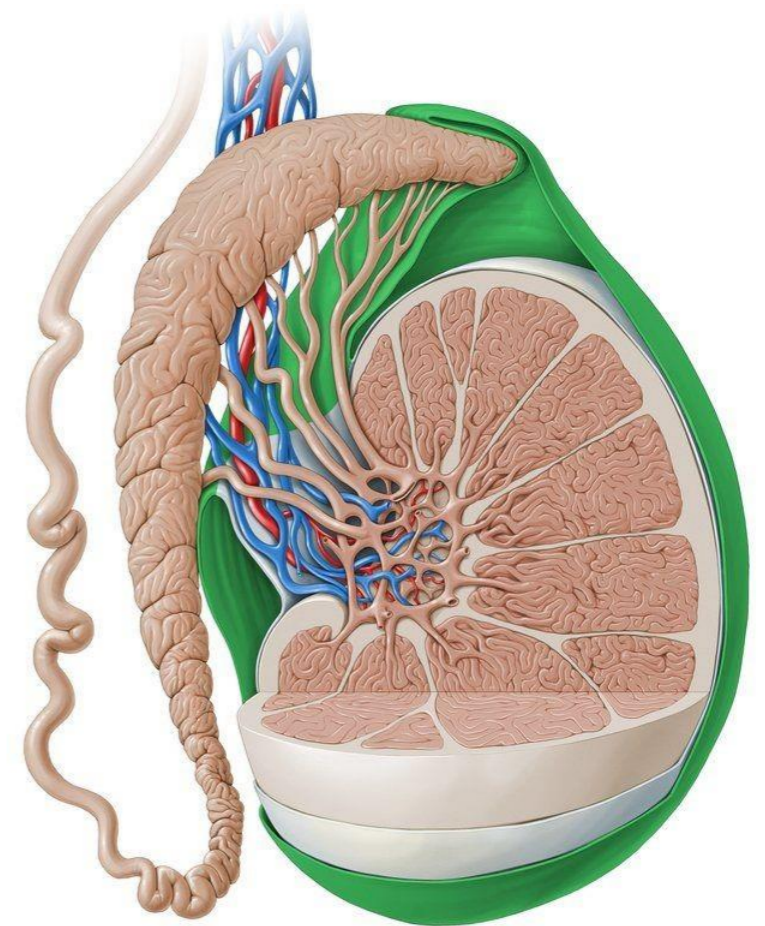
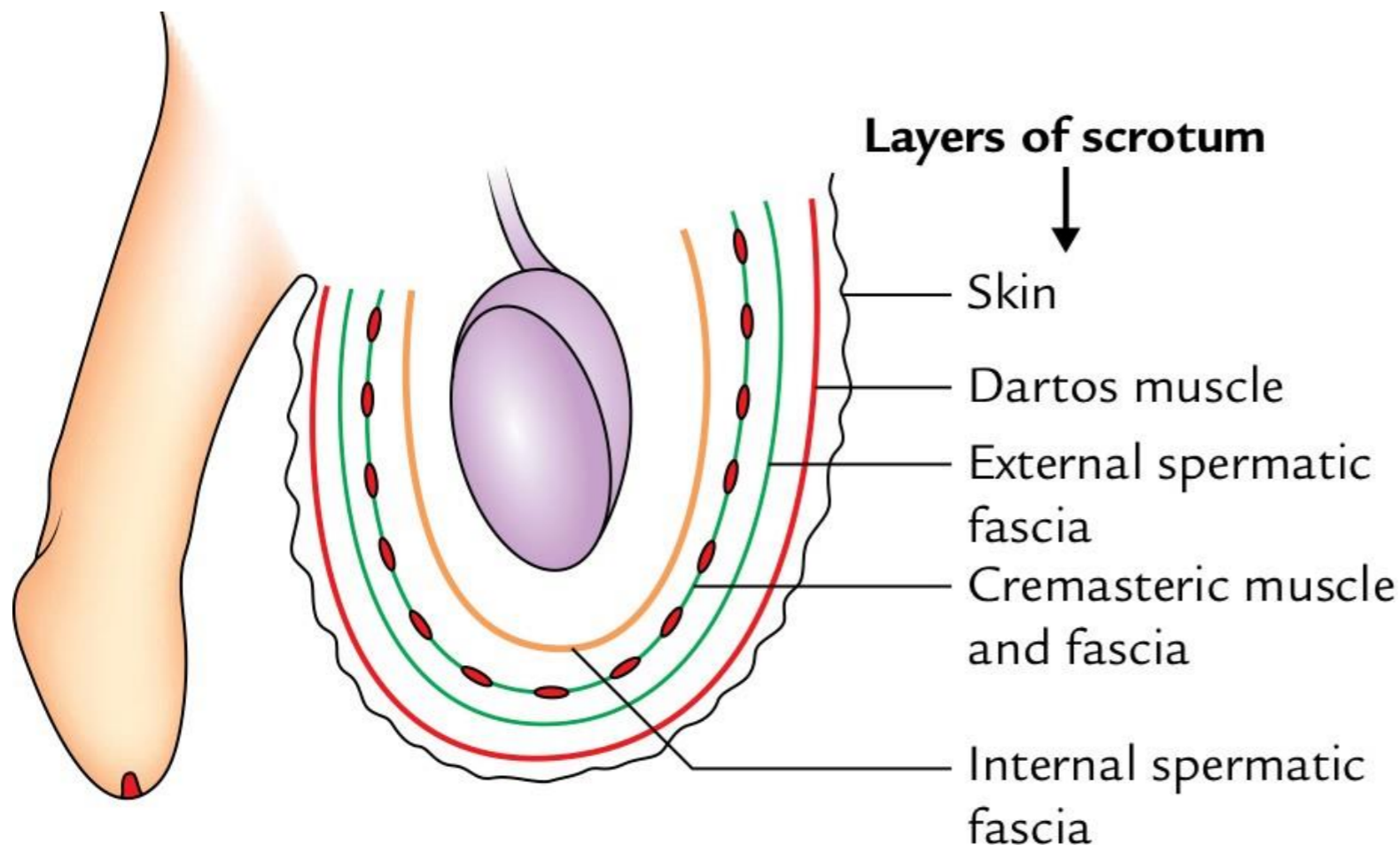
❖ Spermatic cord.

- The students should know and identify the :
 1. Contents of the spermatic cord
 2. passage of the spermatic cord (beginning and the ending)
 3. the vas deferens as cord like structure inside the cord



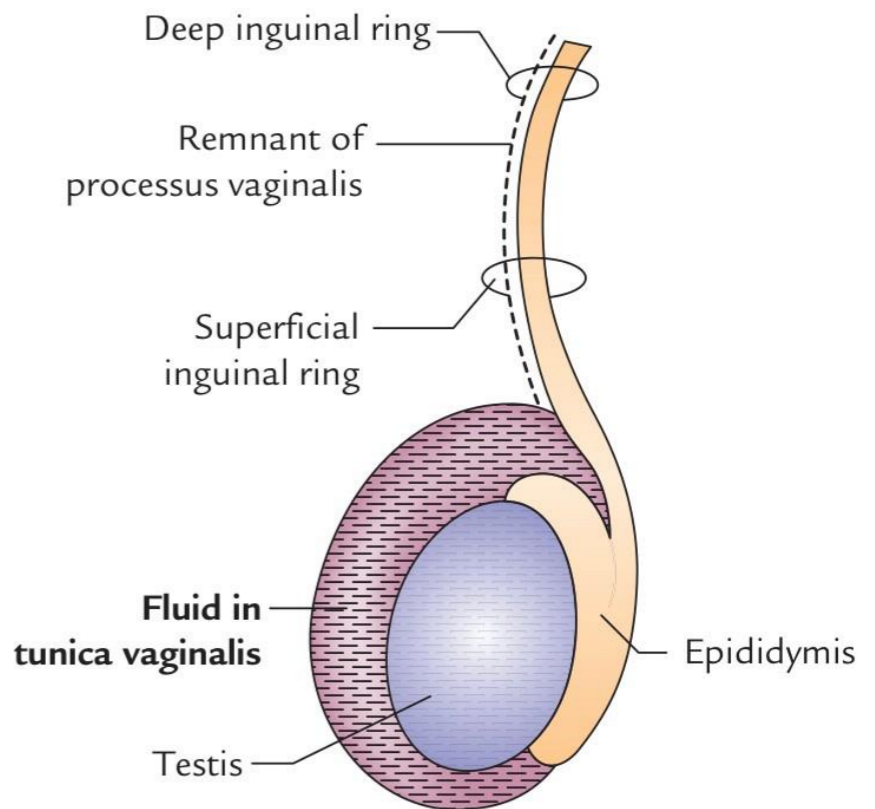
✦ Scrotum

- The students should observe the :
 1. layers of the scrotum from outside to inside
 2. the site of testis inside the scrotum
 3. the relation of tunica vaginalis to testis
 4. clinical point (notice the hydrocele in relation to tunica vaginalis and tunica albuginia it lies between the to layers

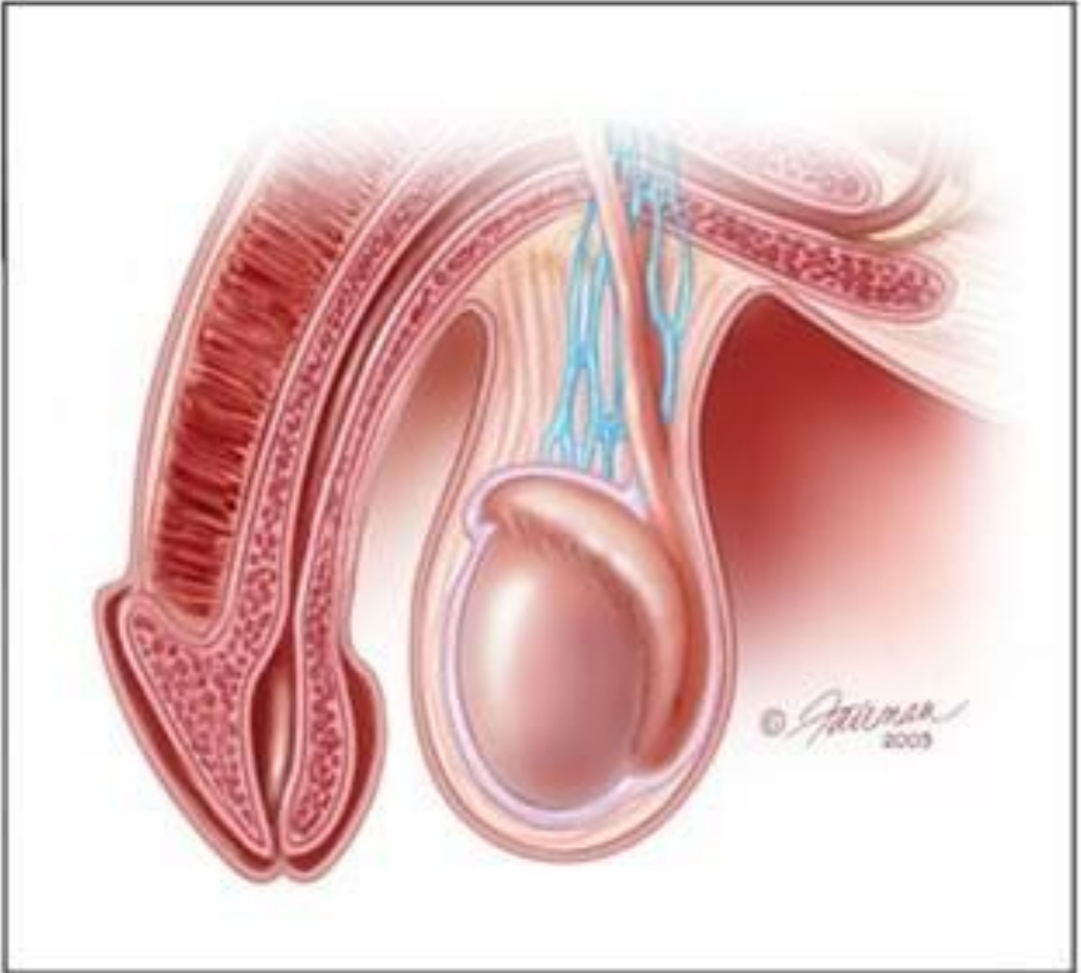


✦ Scrotum

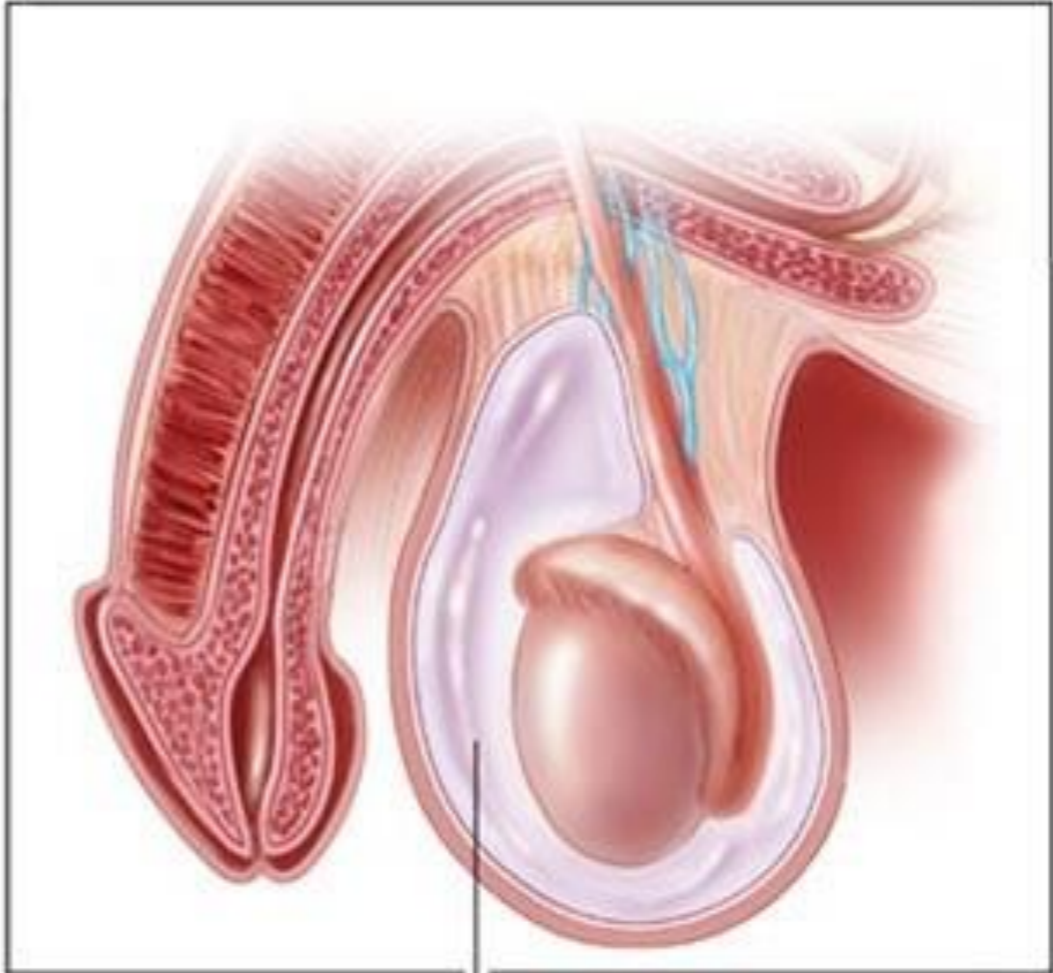
Hydrocele



NORMAL

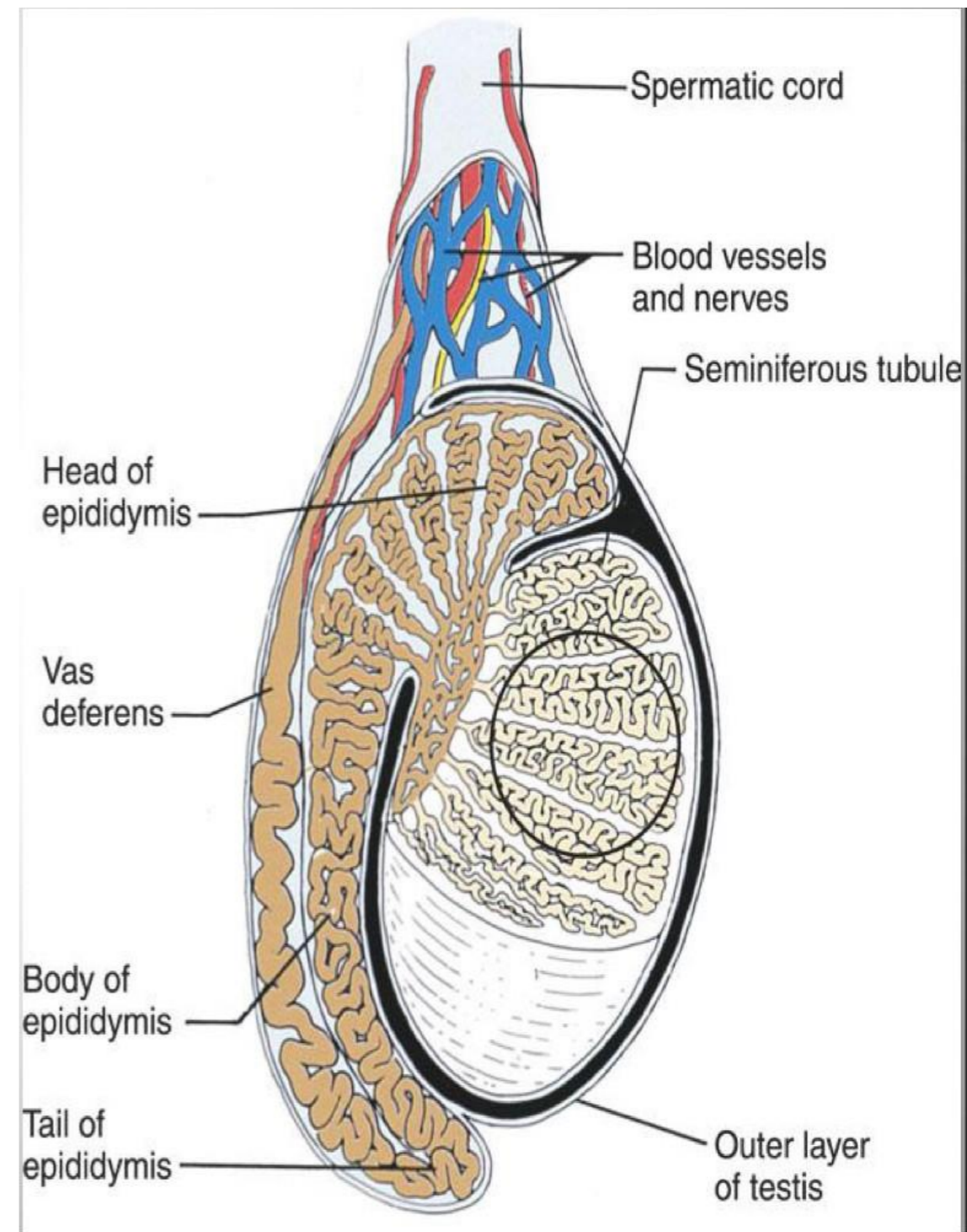


ABNORMAL



✘ Testis

- The students should observe the :
 1. how the tunica albuginea covering the testis
 2. relations of the testis to epidydimis
 3. blood supply, venous drainage, and lymphatic drainage of the testis



✦ Testis

