

# Digestive System

University of Jordan

Faculty of Medicine

Batch of 2013-2019



Slide  Sheet  Handout  Other

Anatomy

Embryology

Physiology

Histology

Pathology

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Microbiology

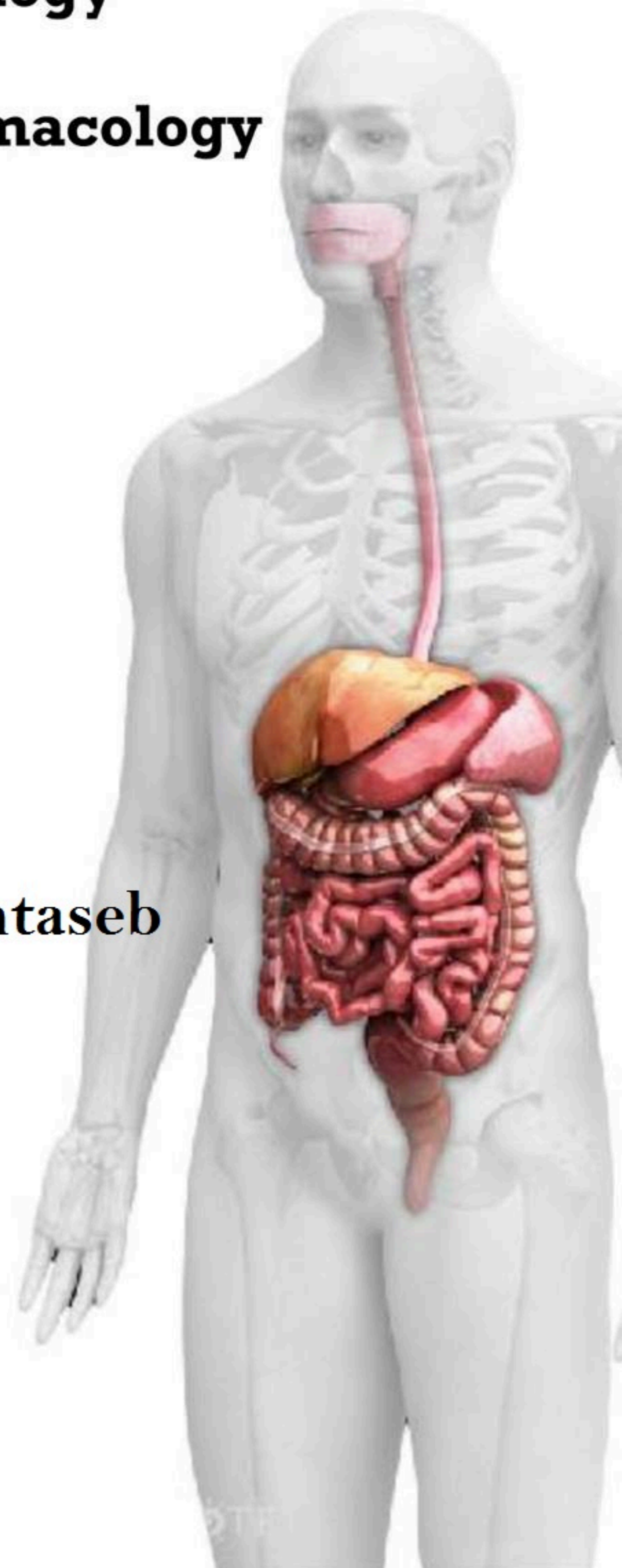
PBL

**Slide #:** 2

**Doctor:** Mohammad Al-Mohtaseb

**Date:** 23-3-2015

**Price:**



# Abdominal wall



# Borders of the Abdomen

- Abdomen is the region of the trunk that lies between the diaphragm above and the inlet of the pelvis below
- Borders

## Superior:

Costal cartilages 7-12.

Xiphoid process:

- Inferior:

Pubic bone and iliac crest:

Level of L4.

- Umbilicus:

Level of IV disc L3-L4

## Abdominal Quadrants

Formed by two intersecting lines:

Vertical & Horizontal  
Intersect at umbilicus.

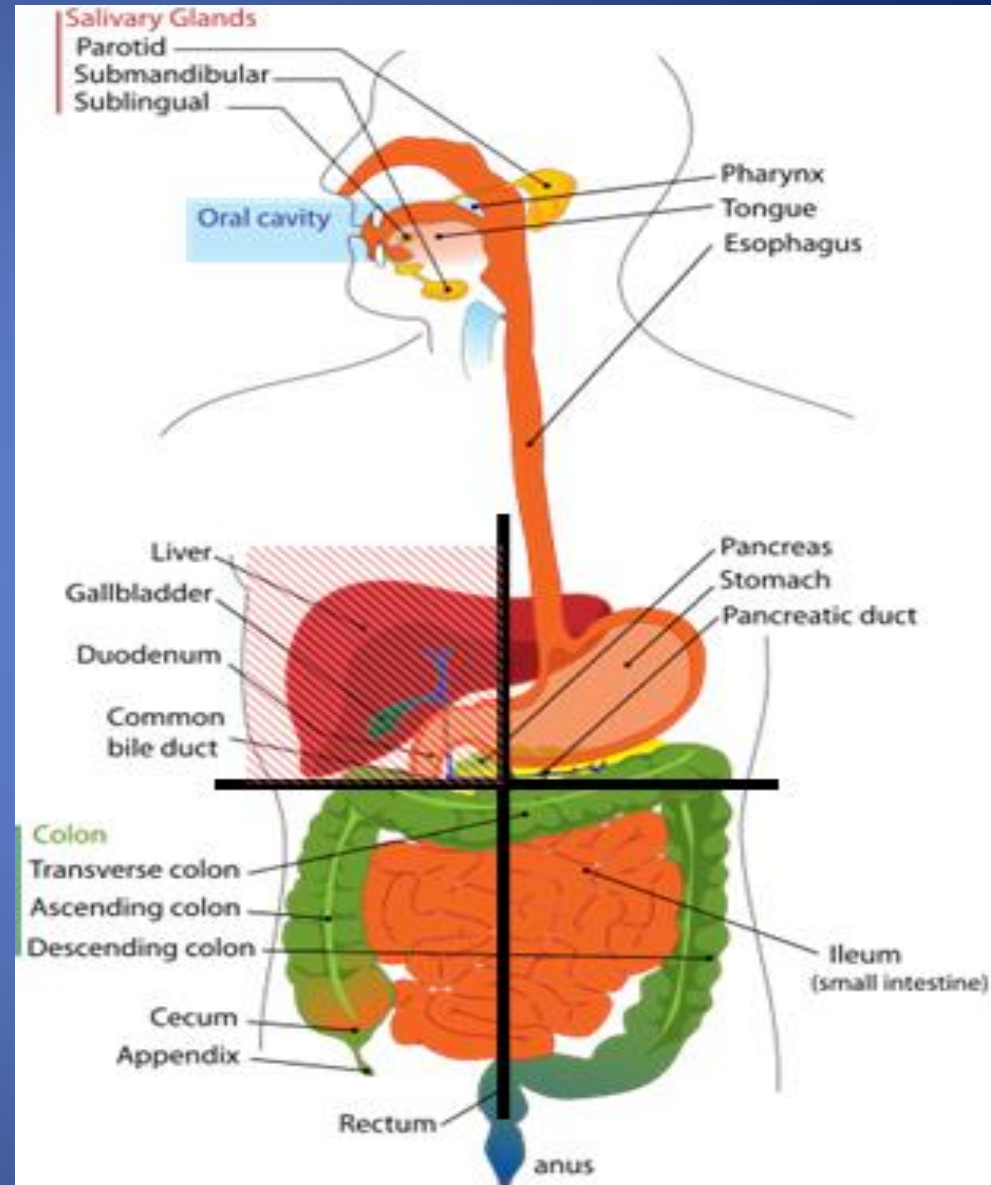
## Quadrants:

Upper left.

Upper right.

Lower left.

Lower right



# Abdominal Regions

Divided into 9 regions by two pairs of planes:

## 1- Vertical Planes:

- Left and right lateral planes
- Midclavicular planes
- passes through the midpoint between the ant.sup.ilic spine and symphysis pupis

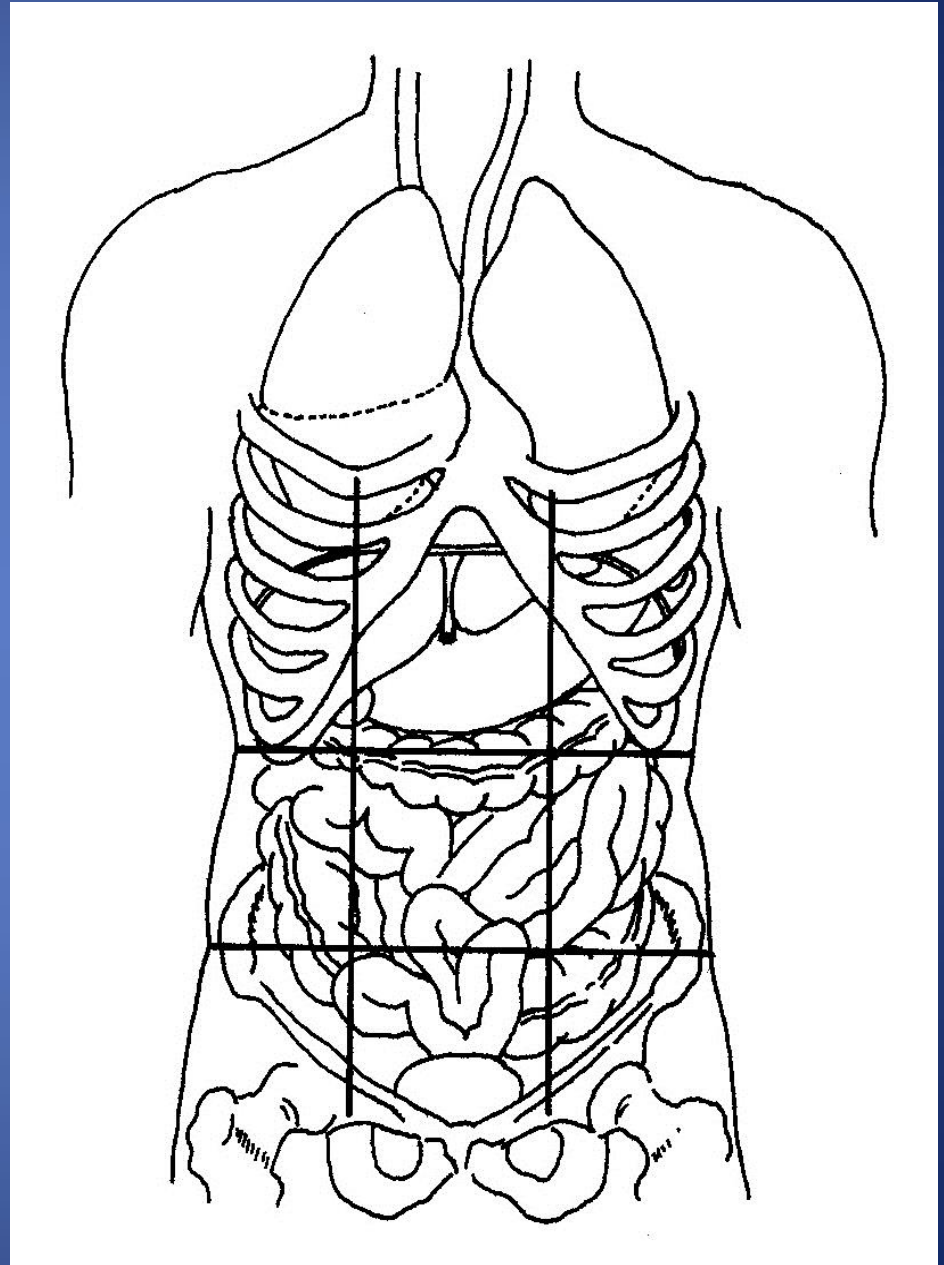
## 2- Horizontal Planes:

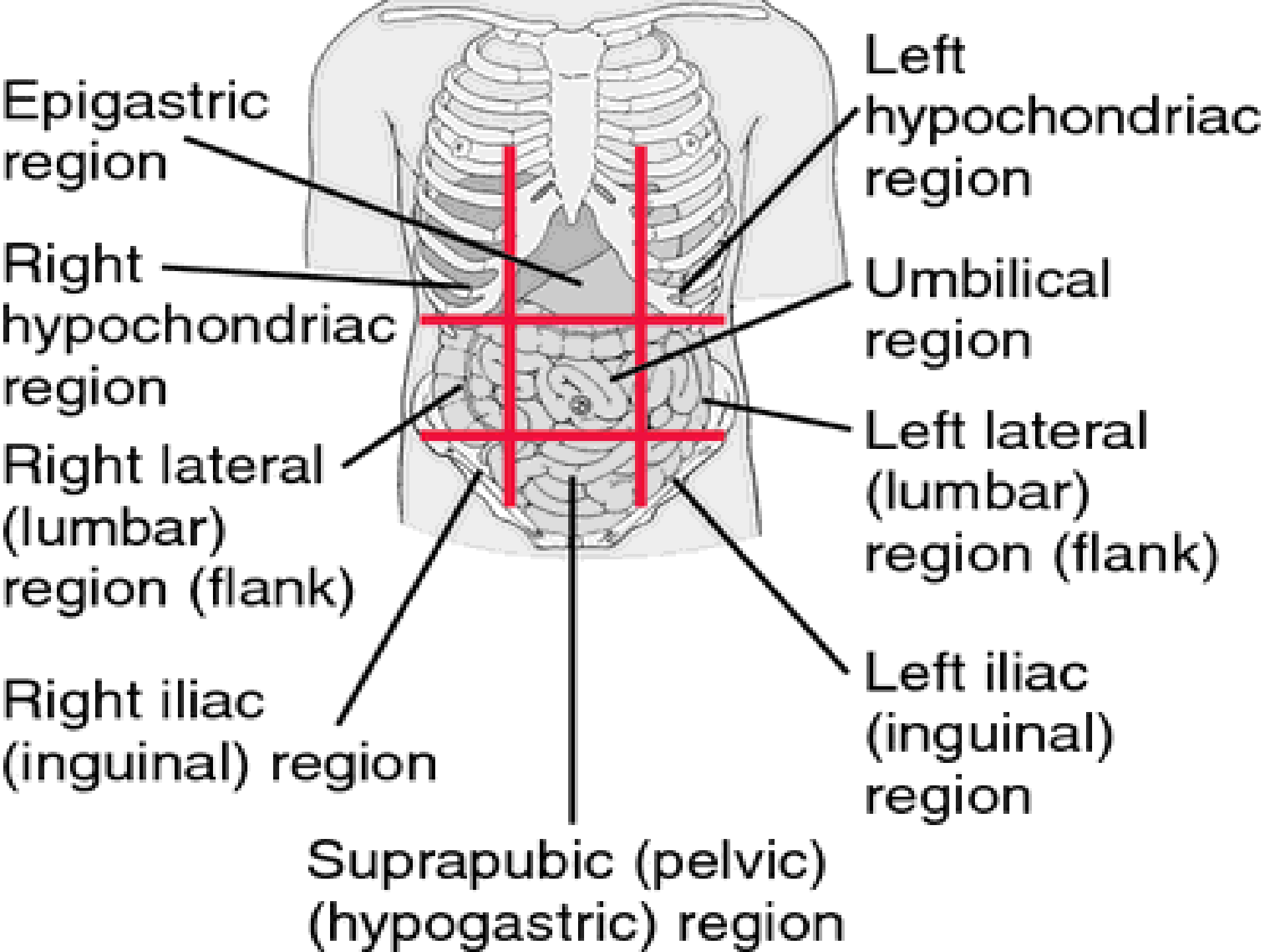
### **-Subcostal plane**

- at level of L3 vertebra
- Joins the lower end of costal cartilage on each side

### **-Intertubercular plane:**

- At the level of L5 vertebra
- Through tubercles of iliac crests.





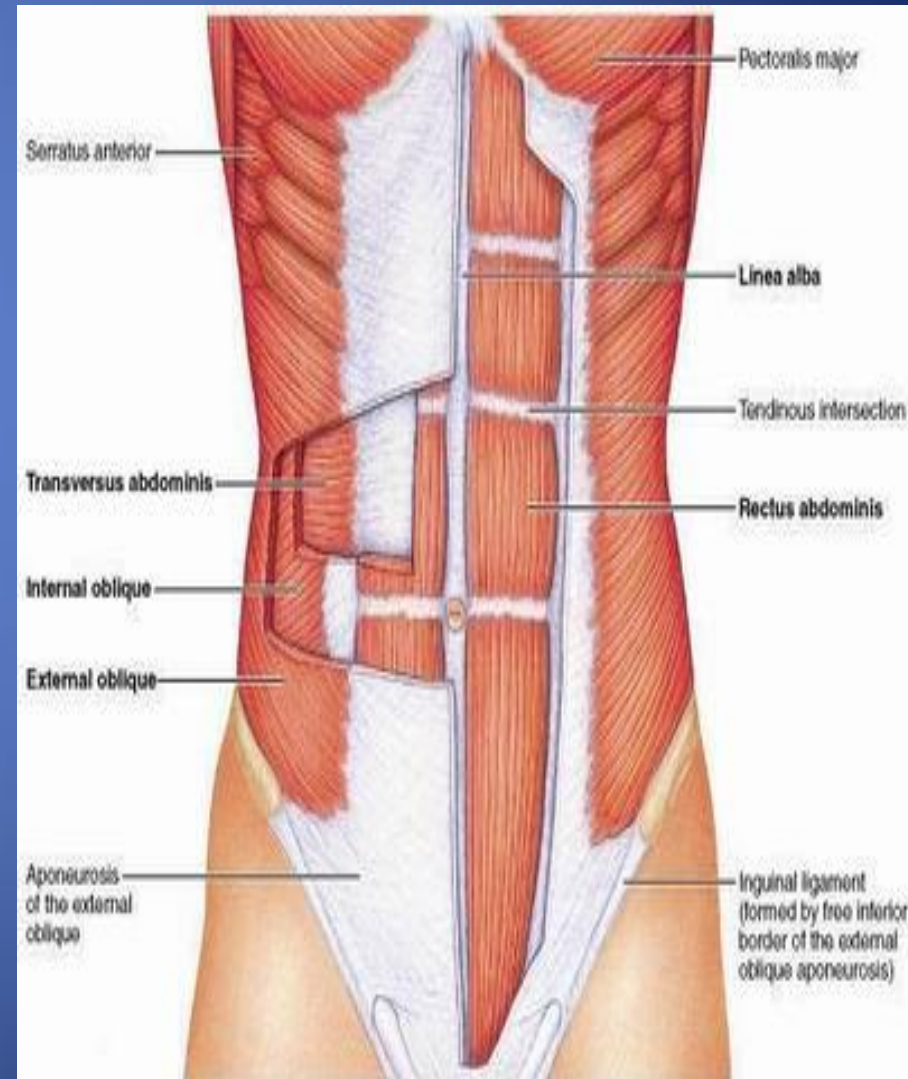
Abdominal wall divided into:-

 **Anterior abdominal wall**

 **Posterior abdominal wall**

# What are the Layers of Anterior Abdominal Wall

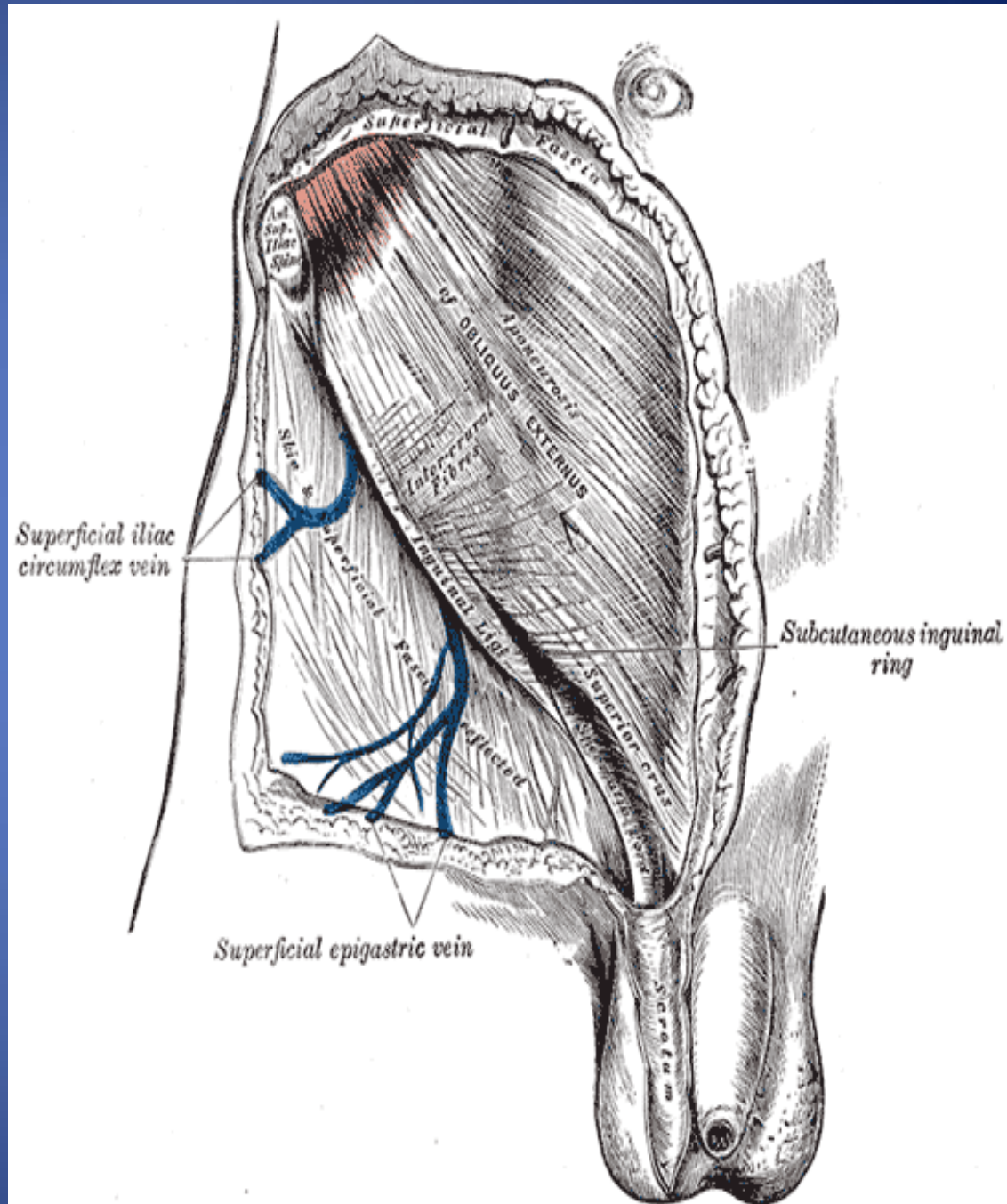
- ✓ **Skin**
- ✓ **Superficial Fascia**
  - Above the umbilicus one layer
  - Below the umbilicus two layers
    - Camper's fascia - fatty superficial layer.
    - Scarp's fascia - deep membranous layer.
- ✓ **Deep fascia :**
  - Thin layer of C.T covering the muscle may absent
- ✓ **Muscular layer**
  - External oblique muscle
  - Internal oblique muscle
  - Transverse abdominal muscle
  - Rectus abdominis
- ✓ **Transversalis fascia**
- ✓ **Extraperitoneal fascia**
- ✓ **Parietal Peritoneum**





# Superficial Fascia

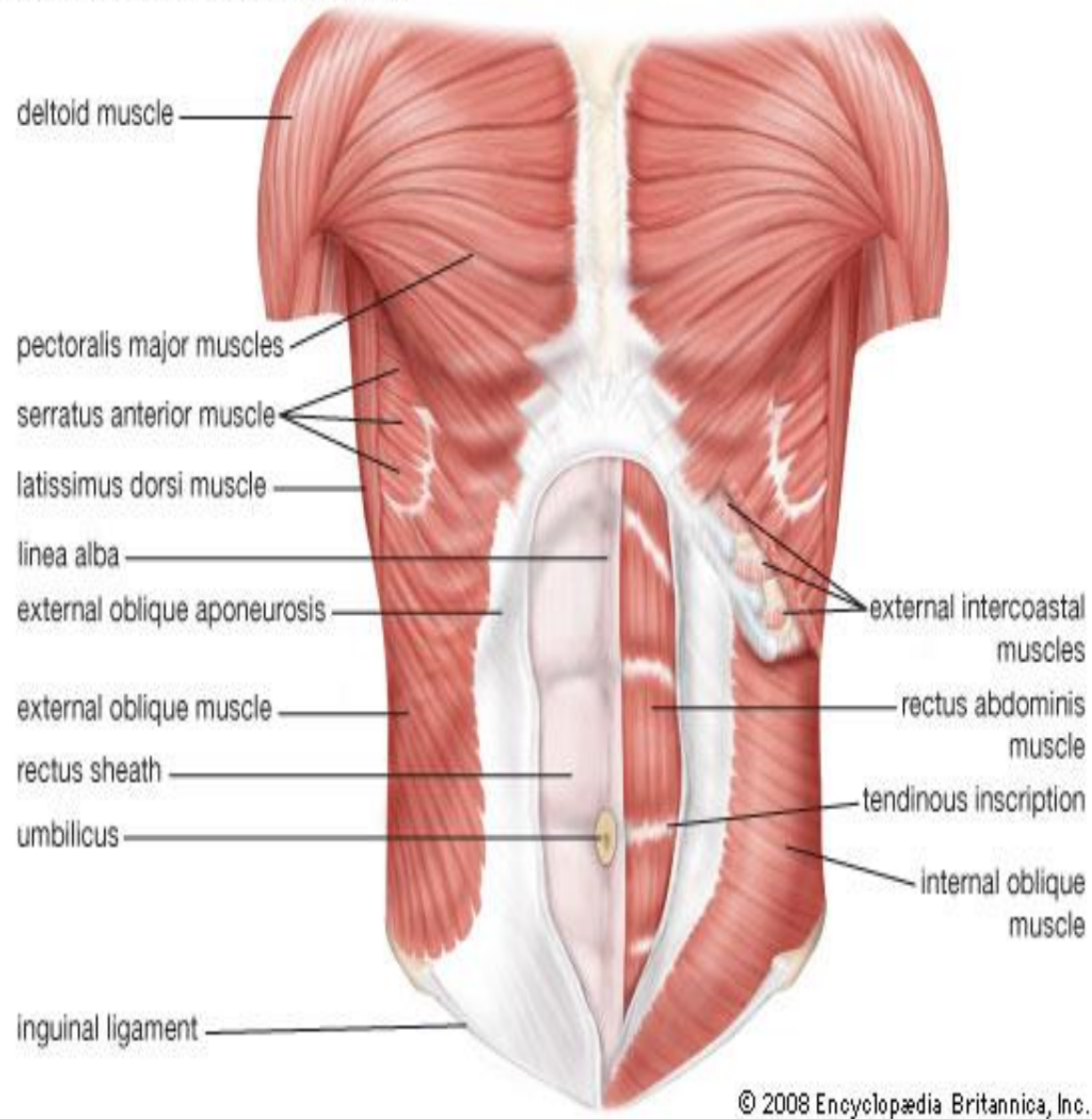
- Camper's fascia – fatty layer= dartos muscle in male
- Scarpa's fascia – membranous layer.
- Attachment of Scarpa's fascia= membranous fascia
  - INF: Fascia lata
  - Sides: Pubic arch
  - Post: Perineal body
- Membranous layer in scrotum referred to as Colles' fascia
- Rupture of penile urethra lead to extravasations of urine into (scrotum, perineum, penis & abdomen)



## ✓ Muscles

- Rectus abdominis
- External oblique muscle
- Internal oblique muscle
- Transverse abdominal muscle

Muscles of the abdominal wall



## External oblique muscle

-Broad

-Thin

✓ Direction:

Downward forward medially

✓ Origin

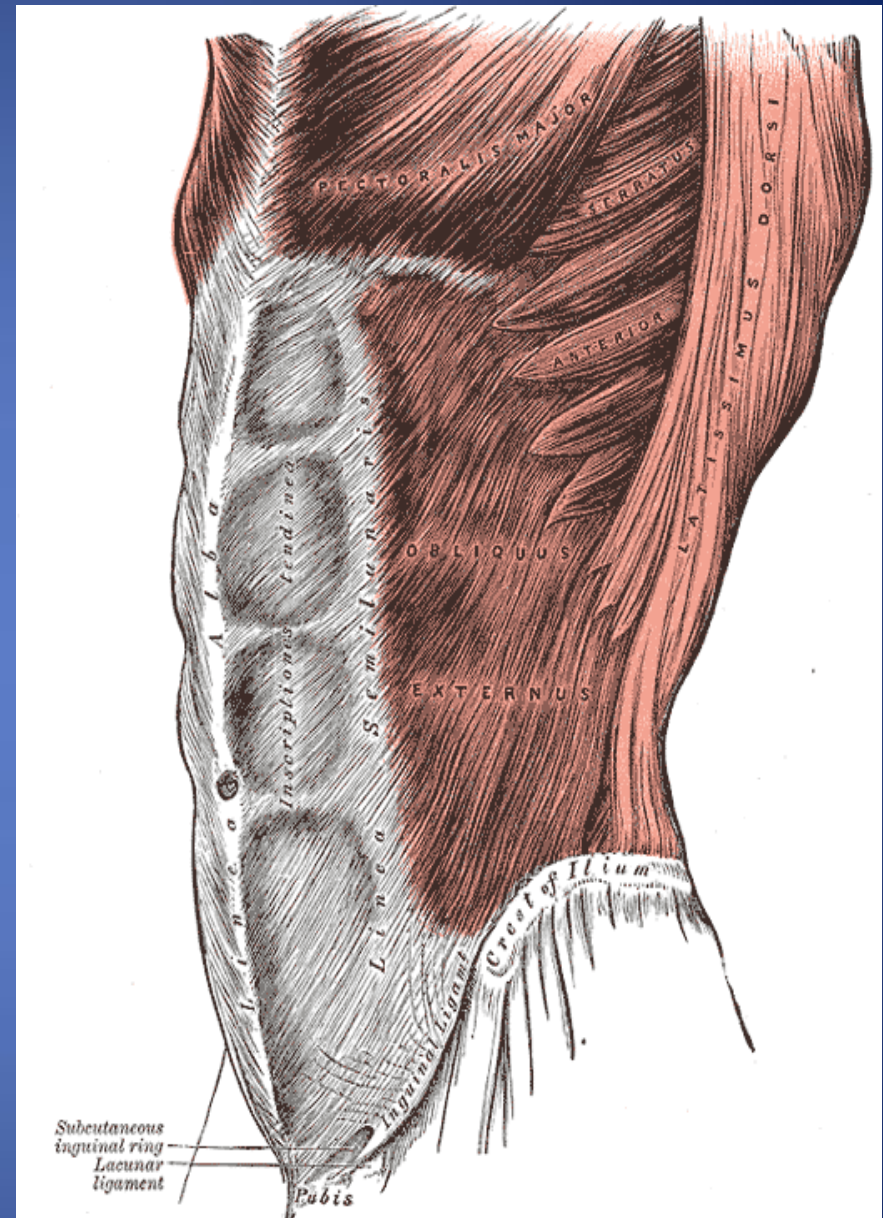
outer surface of lower 8 ribs.

✓ Insertion

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

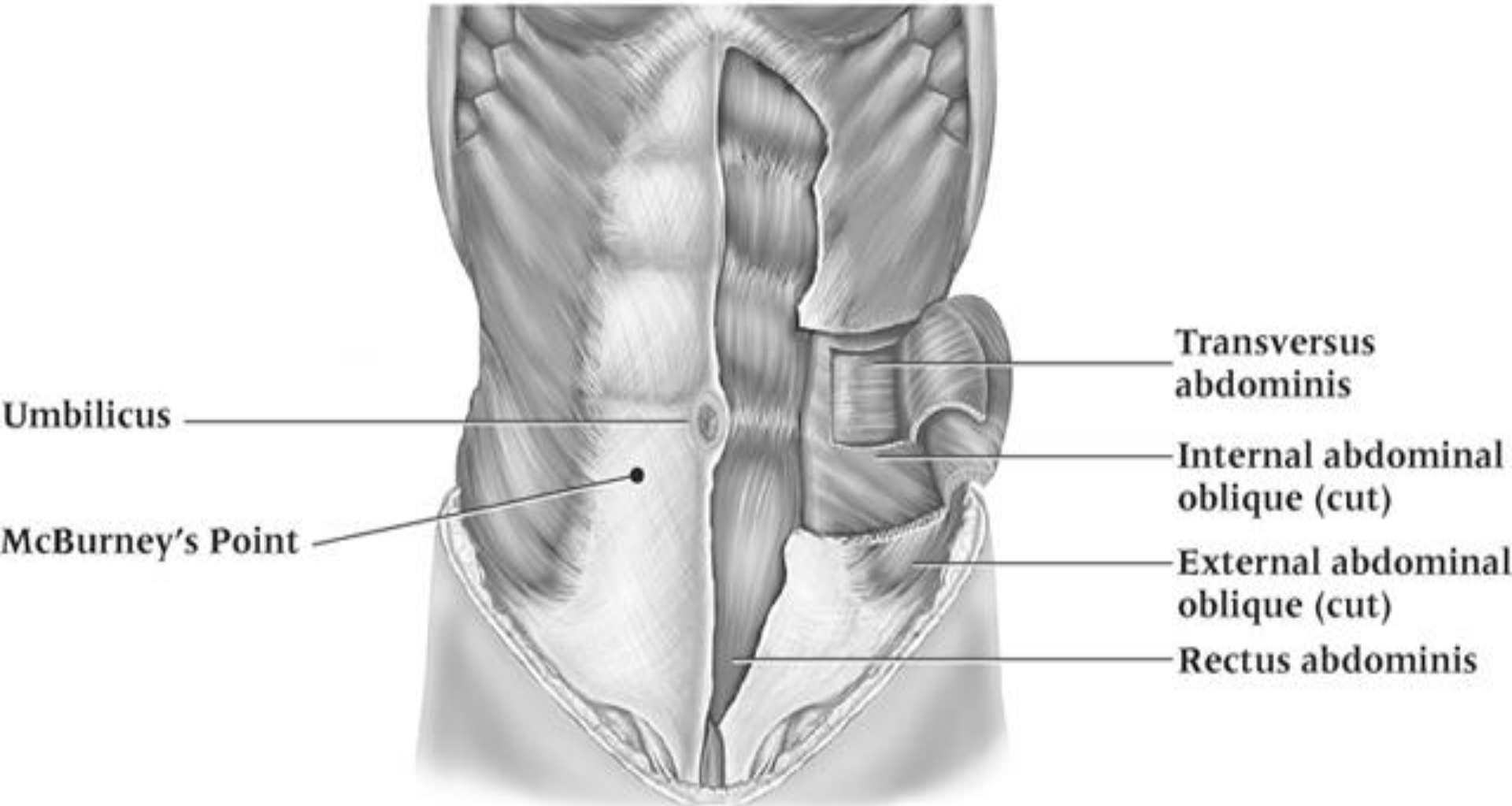
✓ Nerve Supply

- 1- Lower 6<sup>th</sup> thoracic nerves
- 2- L1( iliohypogastric n., ilioinguinal n.)



# Muscles of the anterior abdominal wall

Anterior view



# ✓ Aponeurosis of external oblique muscle

Superficial inguinal ring.

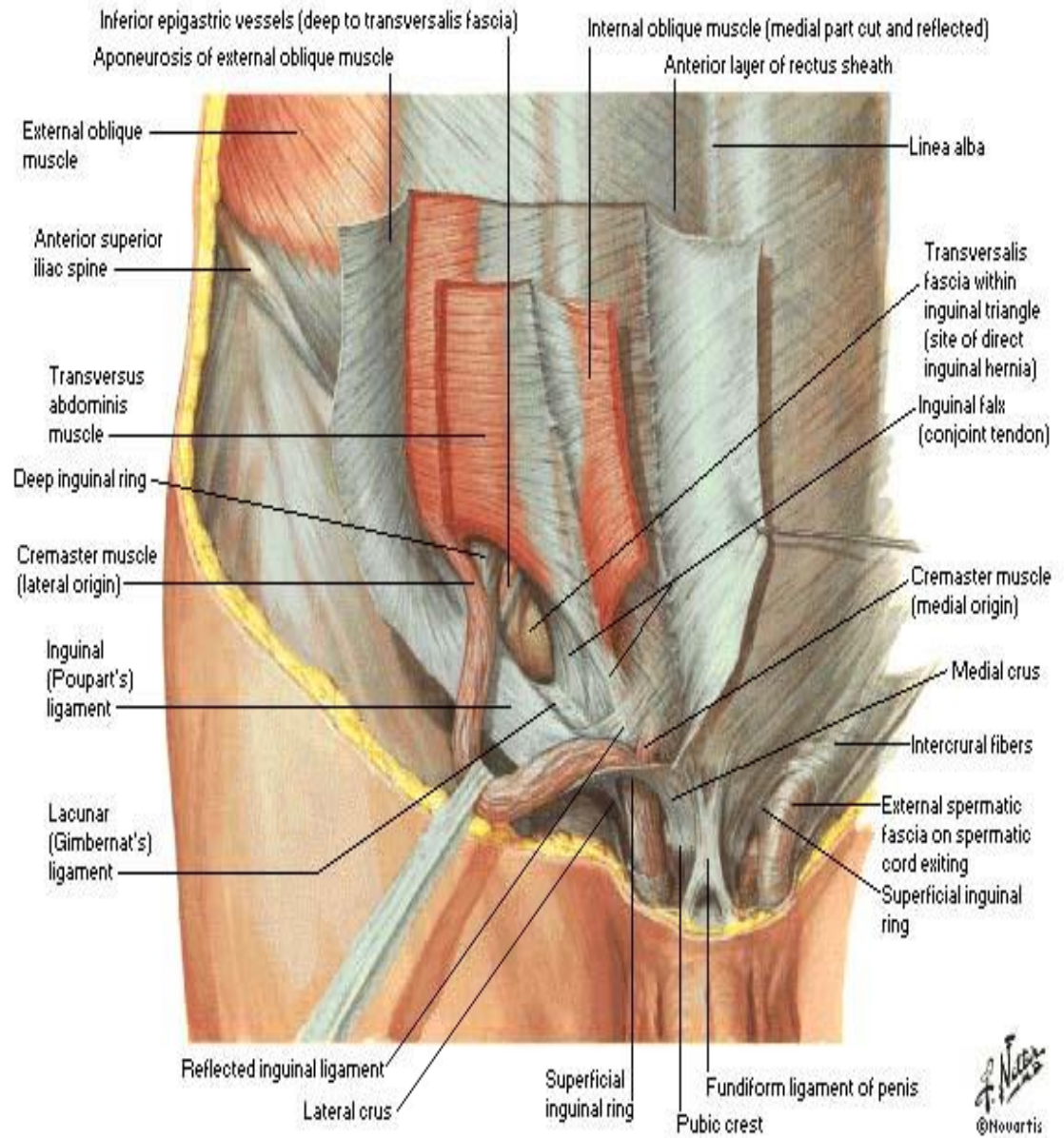
Inguinal ligament

Lacunar ligament

Pectineal ligament

Boundaries of inguinal canal

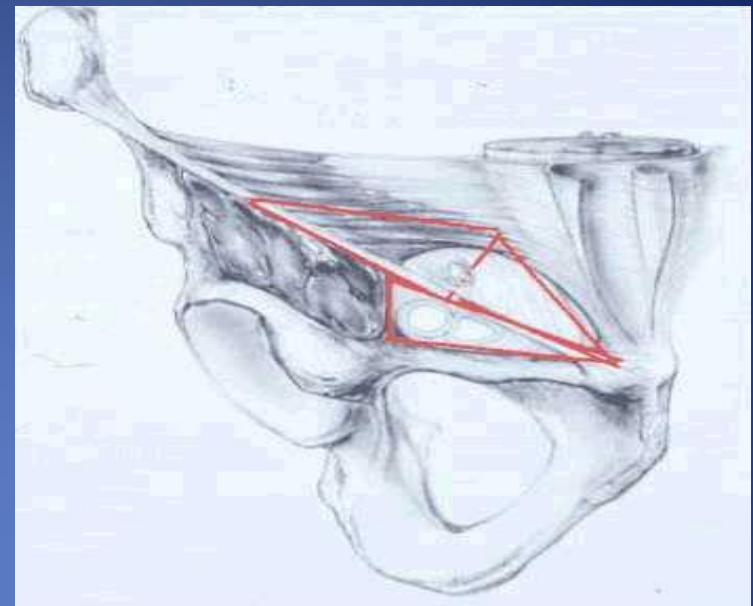
Formation of rectus sheath (



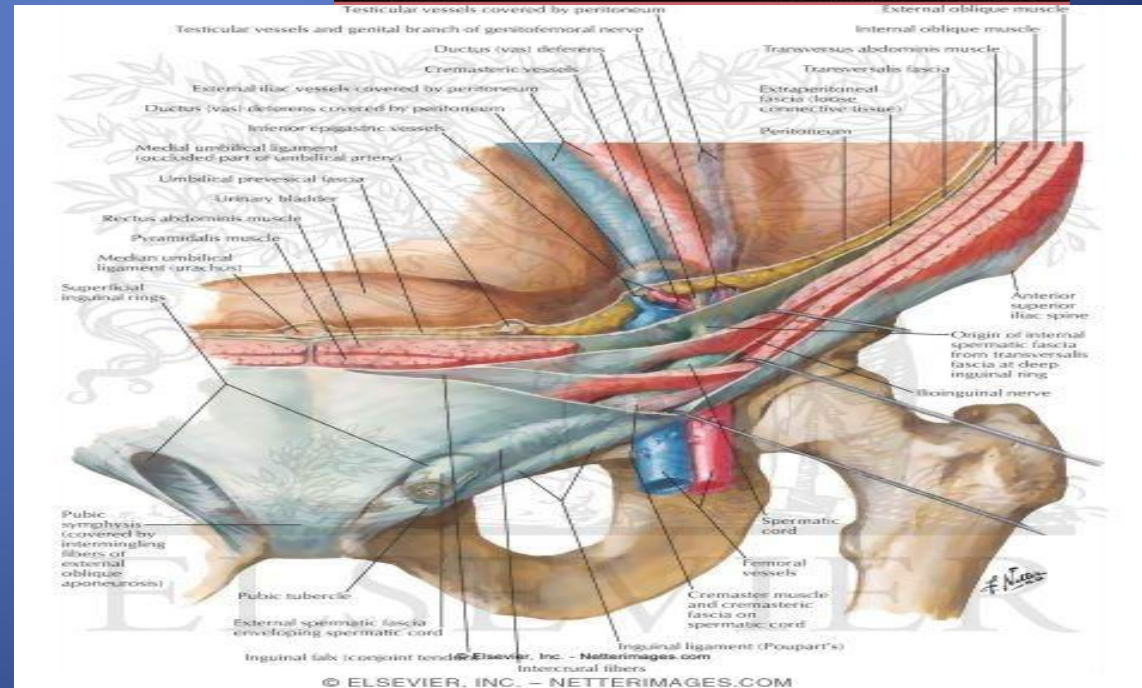
# Inguinal ligament

1- folded back ward the lower border of aponeurosis of external muscle on it self

2- between ant.sup.ilic spine and the pupic tubercle

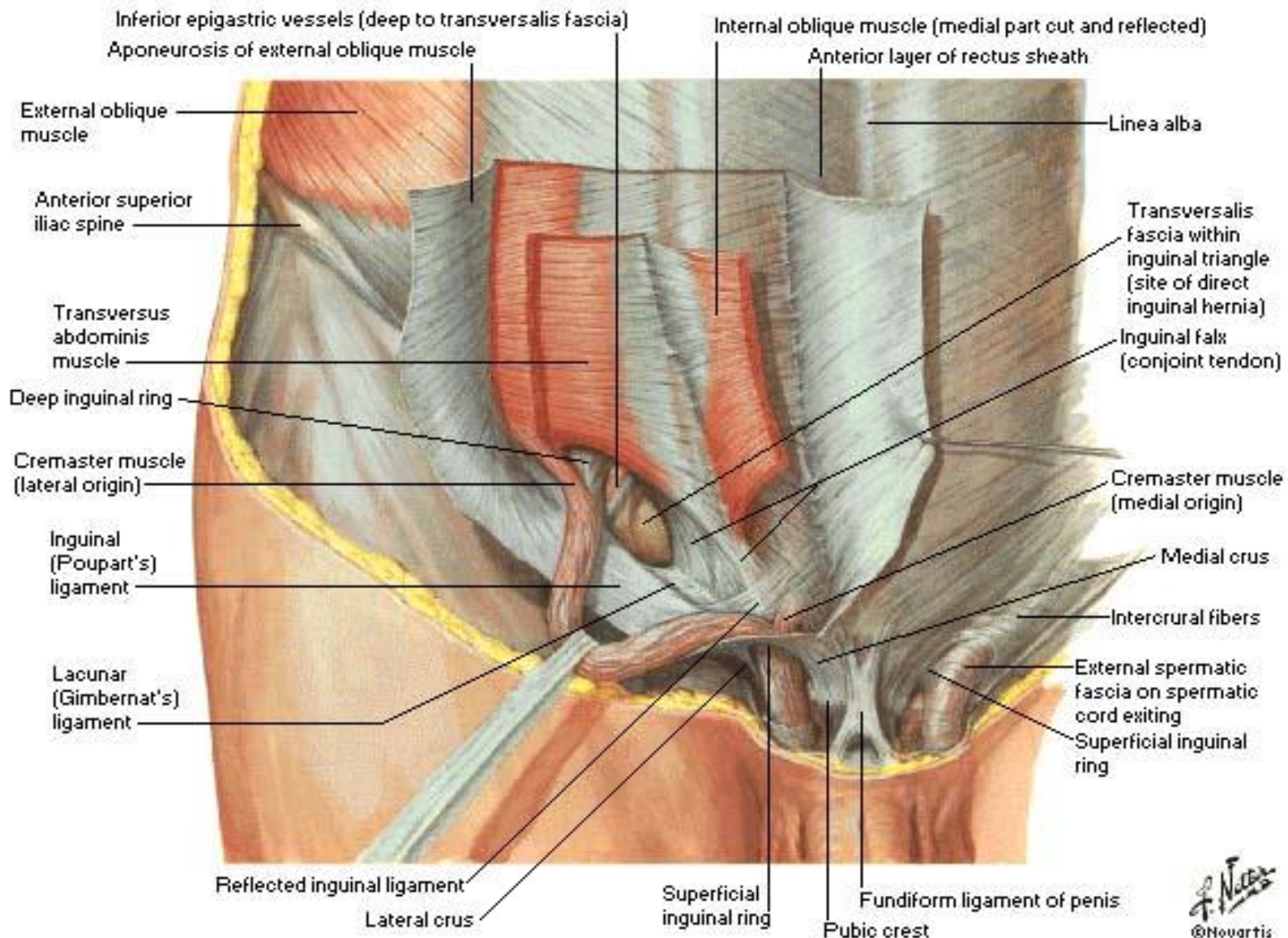


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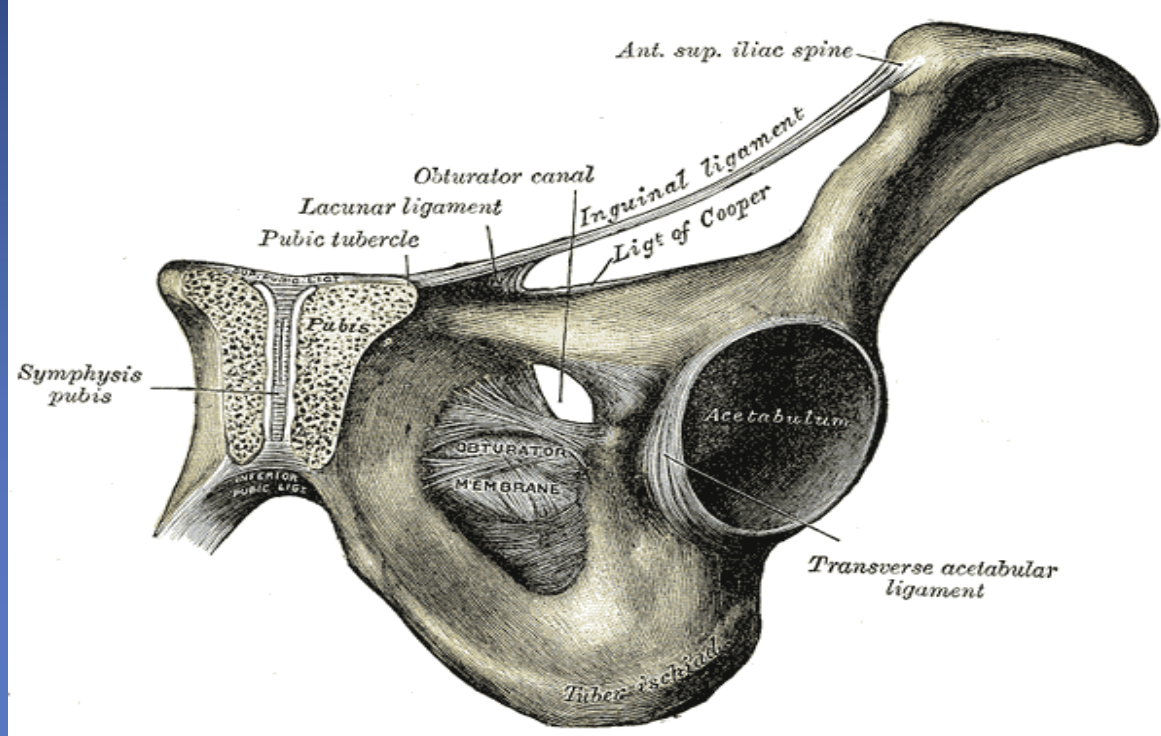






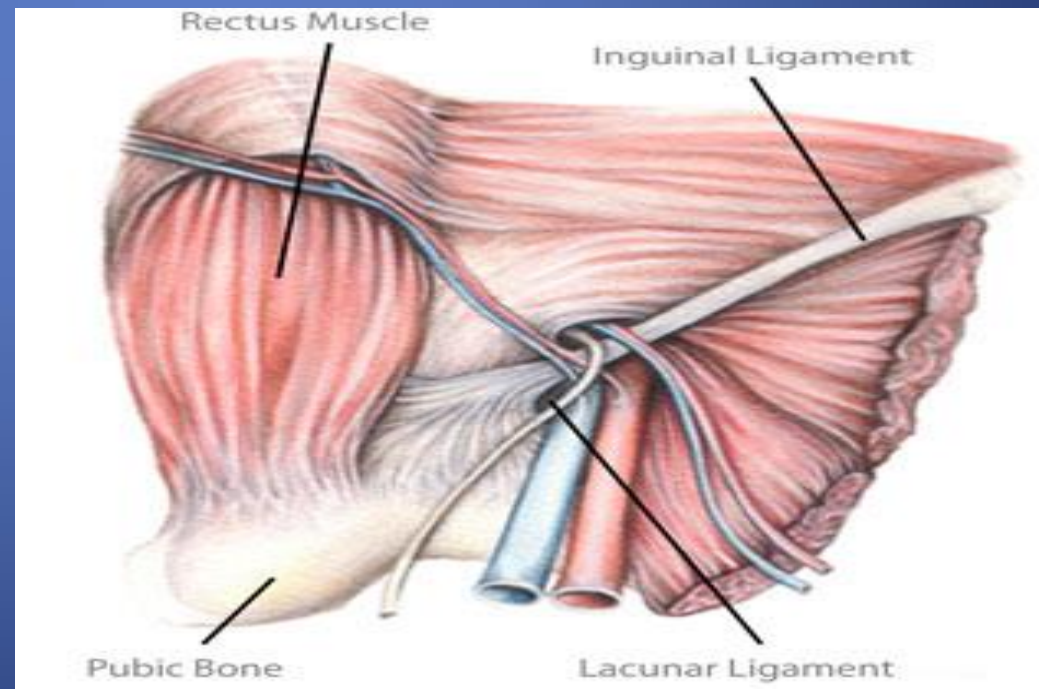
## Lacunar ligament

- 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 crecentric edge forms the medial margin of the femoral ring



## Pectineal ligament

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



# Internal Oblique

## ✓ Direction:

upward forward medially

## ✓ Origin

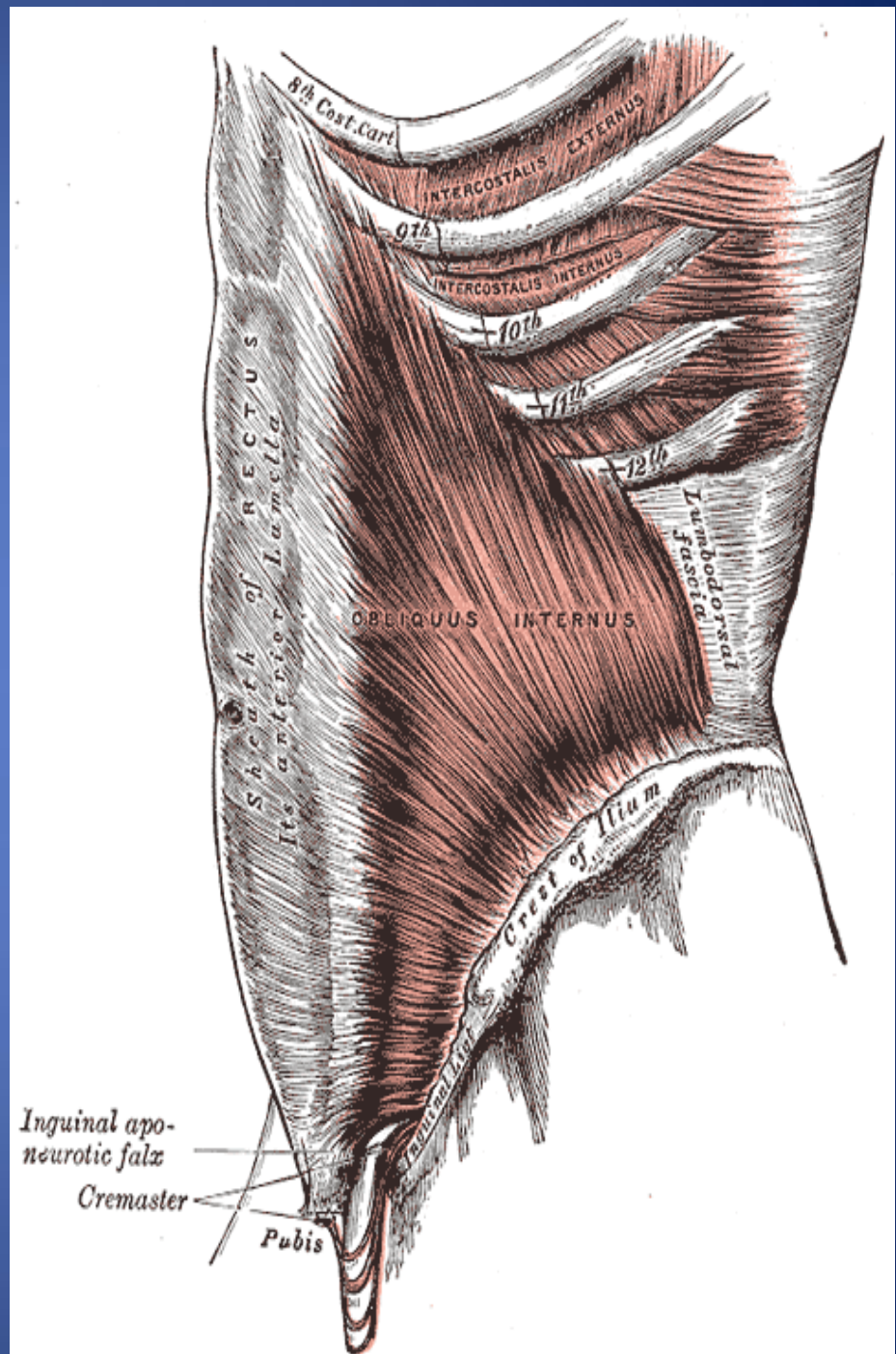
Lumbar Fascia, Ant 2/3 iliac crest,  
lateral two thirds of inguinal  
ligament.

## ✓ Insertion

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

## ✓ Nerve Supply

Lower 6<sup>th</sup> thoracic nerves,  
iliohypogastric n & ilioinguinal  
n → L1.



# Internal oblique muscle.....cont

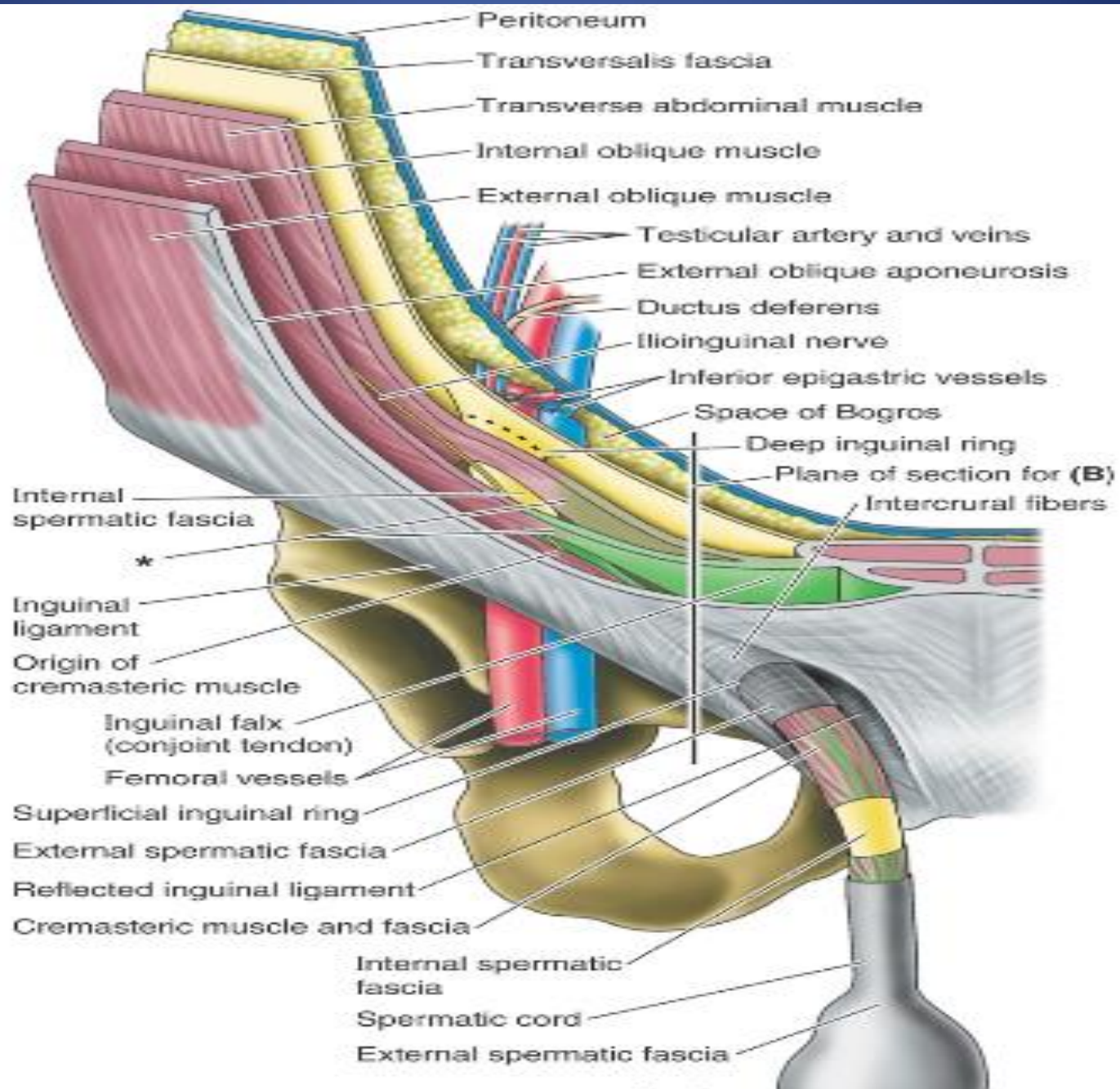
## Conjoint tendon

- The lowest tendinous fibers of internal oblique which joint with transversus abdominis
- Attach medially to linea alba
- Support the inguinal canal
- Has lateral free border

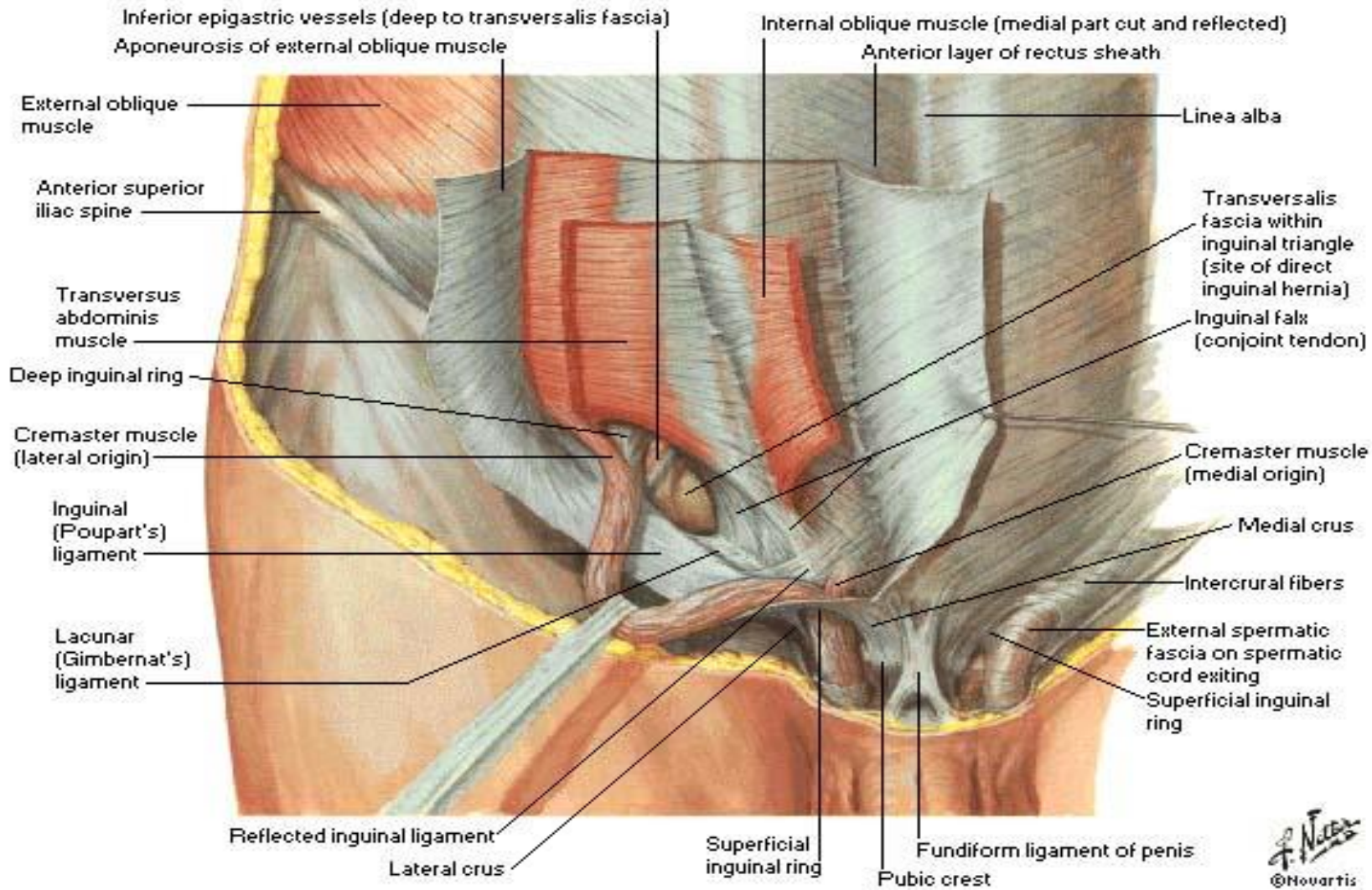
## Cremastric fascia

Internal oblique has free lower border arches over the **spermatic cord** or **ligament of uterus**

- Cremastric muscle
- Fascia
- Int. abd.muscle assist in the formation of the **Roof of the inguinal canal**



# Conjoint tendon & Cremasteric fascia



# ❖ Transversus Abdominis

## Direction

- Its fibers run horizontally forward under the internal oblique

## ✓ Origin

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

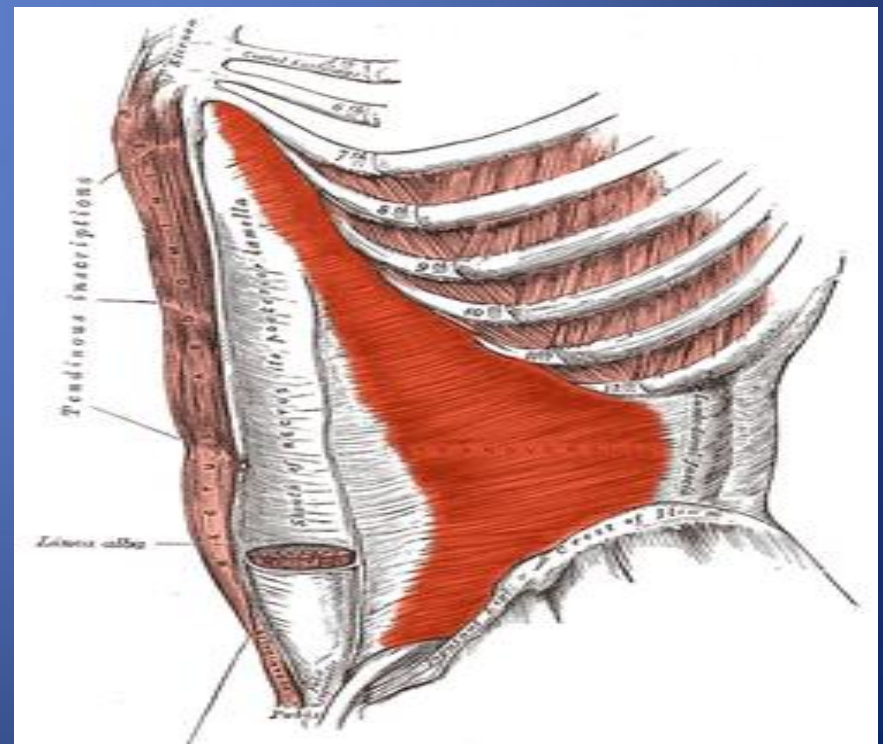
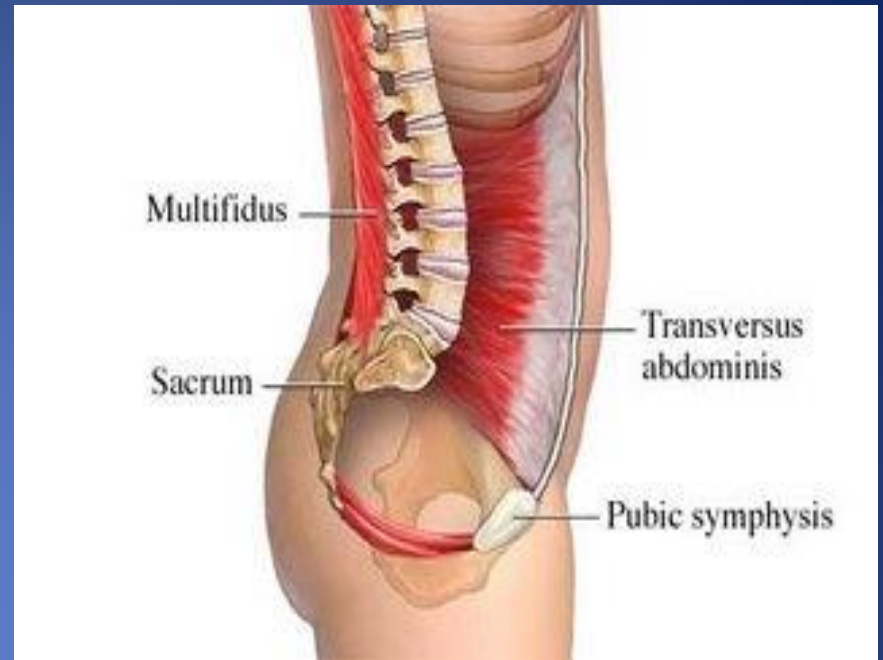
## ✓ Insertion

Xiphoid process, Linea alba, symphysis pubis.

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

## ✓ Nerve Supply

Lower six thoracic nerves, L1 ( iliohypogastric n.& ilioinguinal n.)



# Transversus Abdominis.....cont

Assist in the formation of

- Conjoint tendon
- Rectus sheath

# RECTUS ABDOMINIS

- Long strap muscle
- Extends along the whole length of the anterior abdominal wall
- In the rectus sheath

## ✓ Origin

Symphysis pubis, pubic crest

## ✓ Insertion

5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> costal cartilage & xiphoid process.

## ✓ Nerve Supply

Lower 6<sup>th</sup> thoracic nerves





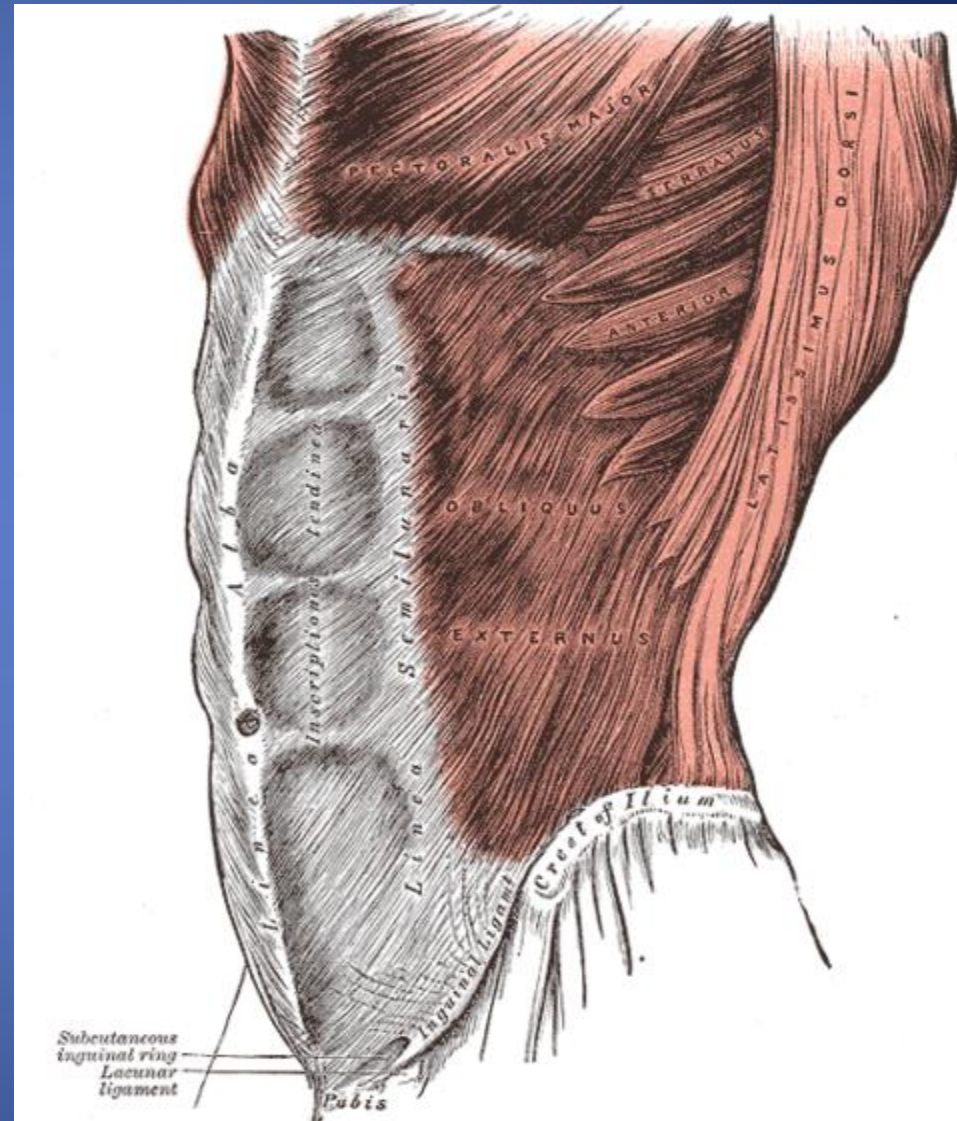
# Rectus abdominis muscle.....cont

- *Linea semilunaris*
- *Tendinous intersection:*

# Lines & Land marks of the Anterior Abdominal Wall

## Linea alba:

- Located along the midline.
  - Between the xiphoid process & symphysis pubis
  - Formed by the fusion of aponeuroses of three abdominal wall ( Ex.In, Tran. Abd.muscle)
- 
- **Linea semilunaris**
  - Lateral margins of rectus abd. muscle
  - Can be palpated
  - Extend from 9<sup>th</sup> c.c to pubic tubercle



**Tendinous intersection:** = Linea  
transverses

- 3 transverse fibrous bands
- divide the rectus abdominis muscle into distinct segments
  - 1- one at level of xiphoid process
  - 2- one at level of umbilicus and
  - 3- one half way between these two
- They can be palpated as a transverse depressions



# Pyramidalis muscle

## Origin

Ant. Surface of the pubis

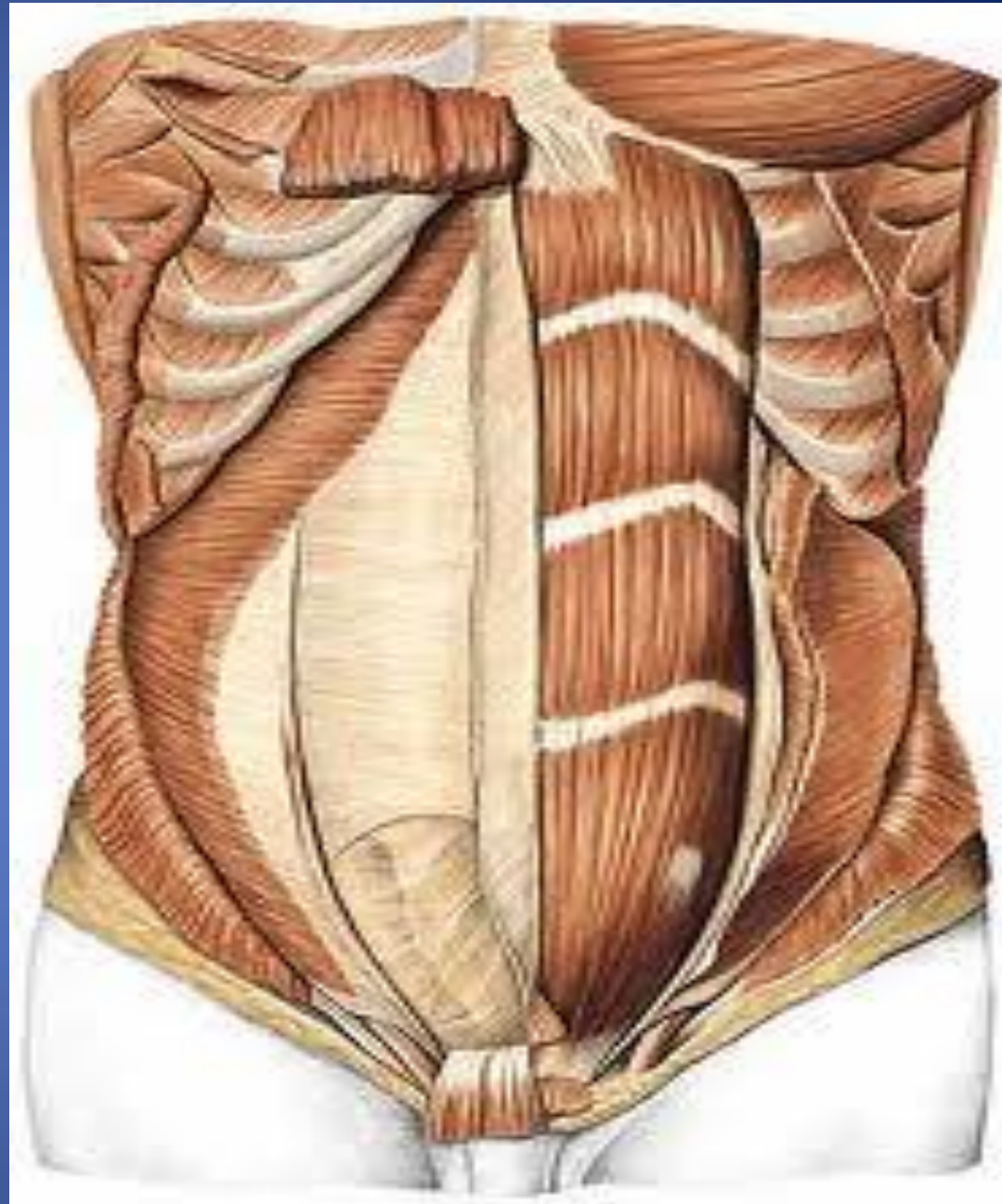
## Insertion:

Linea alba

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

## -Nerve supply

12<sup>th</sup> subcostal nerve



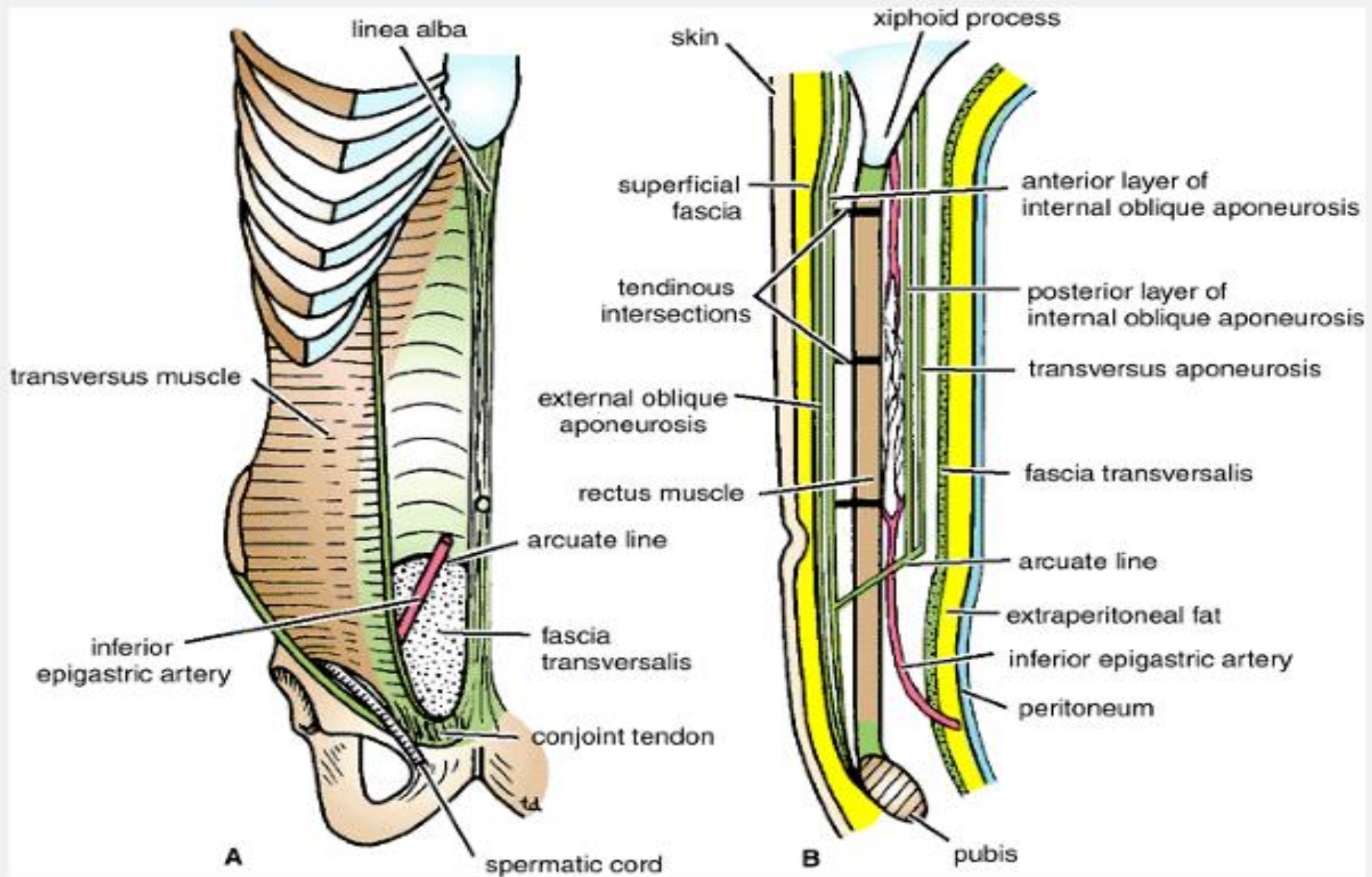
**Rectus sheath**

# Rectus sheath.....cont

- The rectus sheath is a long fibrous sheath
- Formed mainly by the aponeuroses of the three lateral abdominal muscles.
- **Contents**
  - Rectus abdominis muscle
  - Pyramidalis muscle (if present)
  - The anterior rami of the lower six thoracic nerves
  - The superior and inferior epigastric vessels
  - Lymphatic vessels.

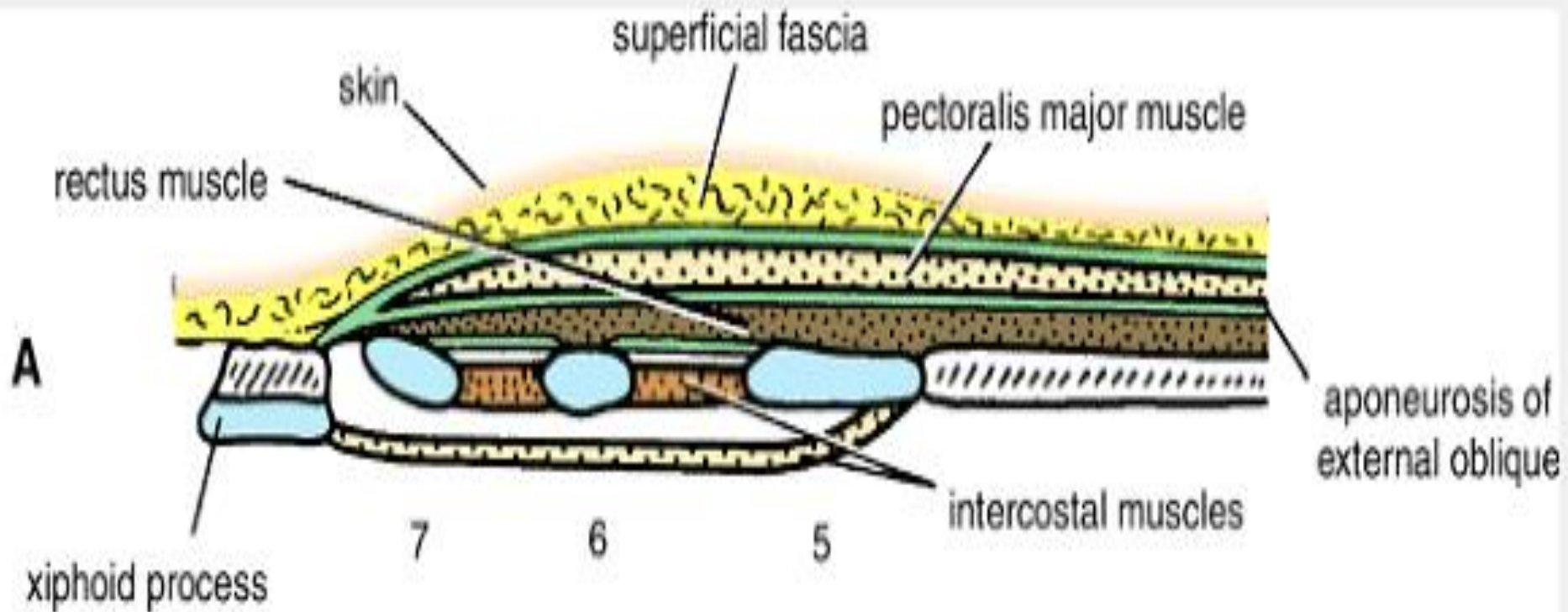
# Rectus sheath.....cont

- Description the rectus sheath is considered at three levels.
  - 1- Above the costal margin*
  - 2- Between the costal margin and the level of the anterior superior iliac spine*
  - 3- Between the level of the anterosuperior iliac spine and the pubis the anterior wall*



**Figure 4-10** Rectus sheath in anterior view (A) and in sagittal section (B). Note the arrangement of the aponeuroses forming the rectus sheath.



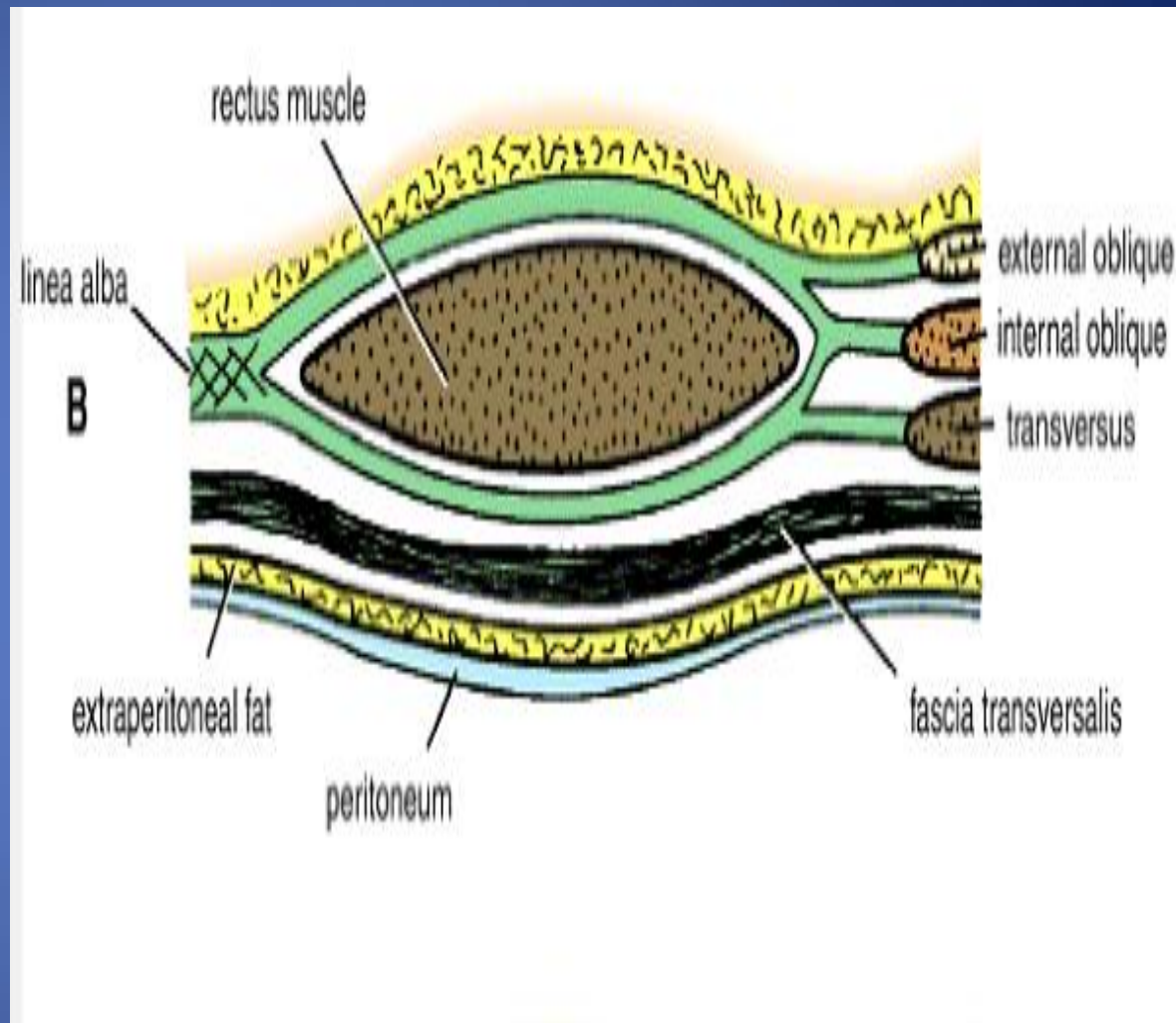


***ABOVE THE COSTAL MARGIN,***

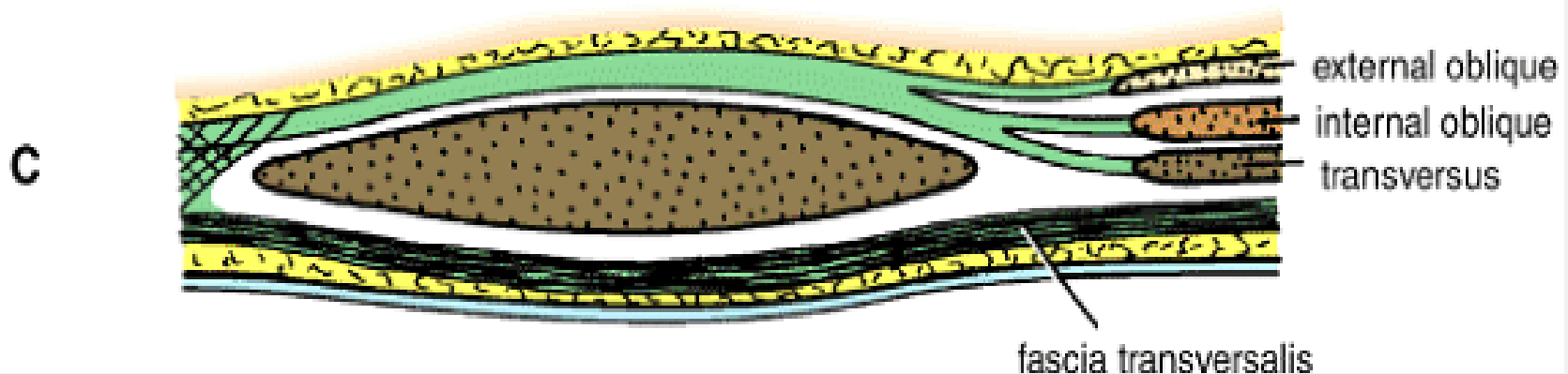
- ANTERIOR WALL # APONEUROSIS OF THE EXTERNAL OBLIQUE.
- POSTERIOR WALL # THORACIC WALL THAT IS, THE FIFTH, SIXTH, AND SEVENTH COSTAL CARTILAGES AND THE INTERCOSTAL SPACES.

***Between the costal margin  
and the level of the anterior  
superior iliac spine***

- The aponeurosis of the internal oblique splits to enclose the rectus muscle
- the external oblique aponeurosis is directed in front of the muscle
- the transversus aponeurosis is directed behind the muscle.



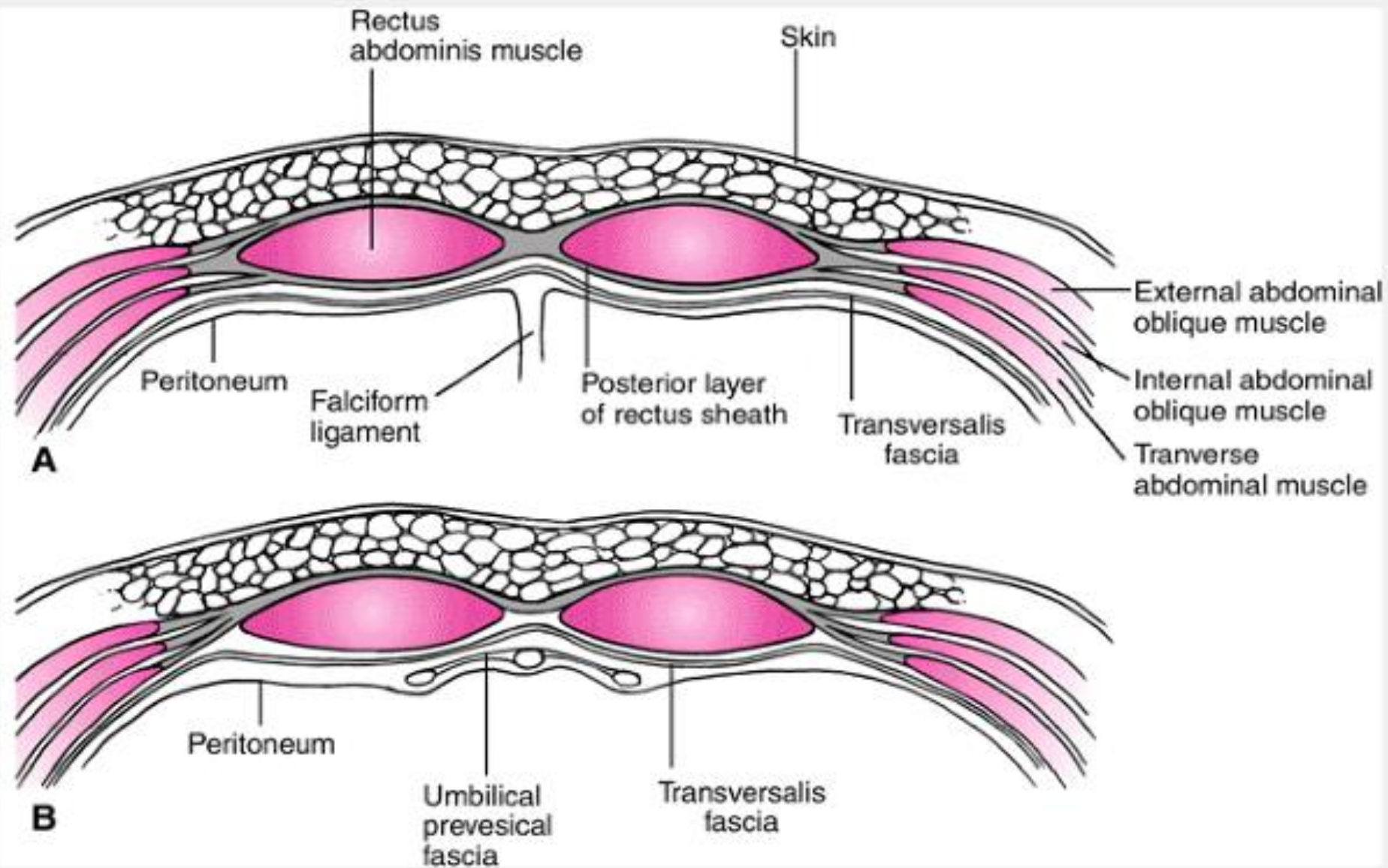
*Between the level of the anterosuperior iliac spine and the pubis*  
**the anterior wall** : the aponeurosis of all three muscles form.  
**The posterior wall** is absent, and the rectus muscle lies in contact with the fascia transversalis.



**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.

# Rectus sheath.....cont

- The posterior wall of the rectus sheath is not attached to the rectus abdominis muscle. The anterior wall is firmly attached to it by the muscle's tendinous intersections
- **Linea semicircularis** (arcuate line)
- Is a crescent-shaped line marking the inferior limit of the posterior layer of the rectus sheath just below the level of the iliac crest.



**Figure 5-2** Arrangement of the rectus sheath above the umbilicus (upper) and below the arcuate line (lower).

# Others fascia in the ant. abd.ominal wall

## ❖ Transversalis fascia

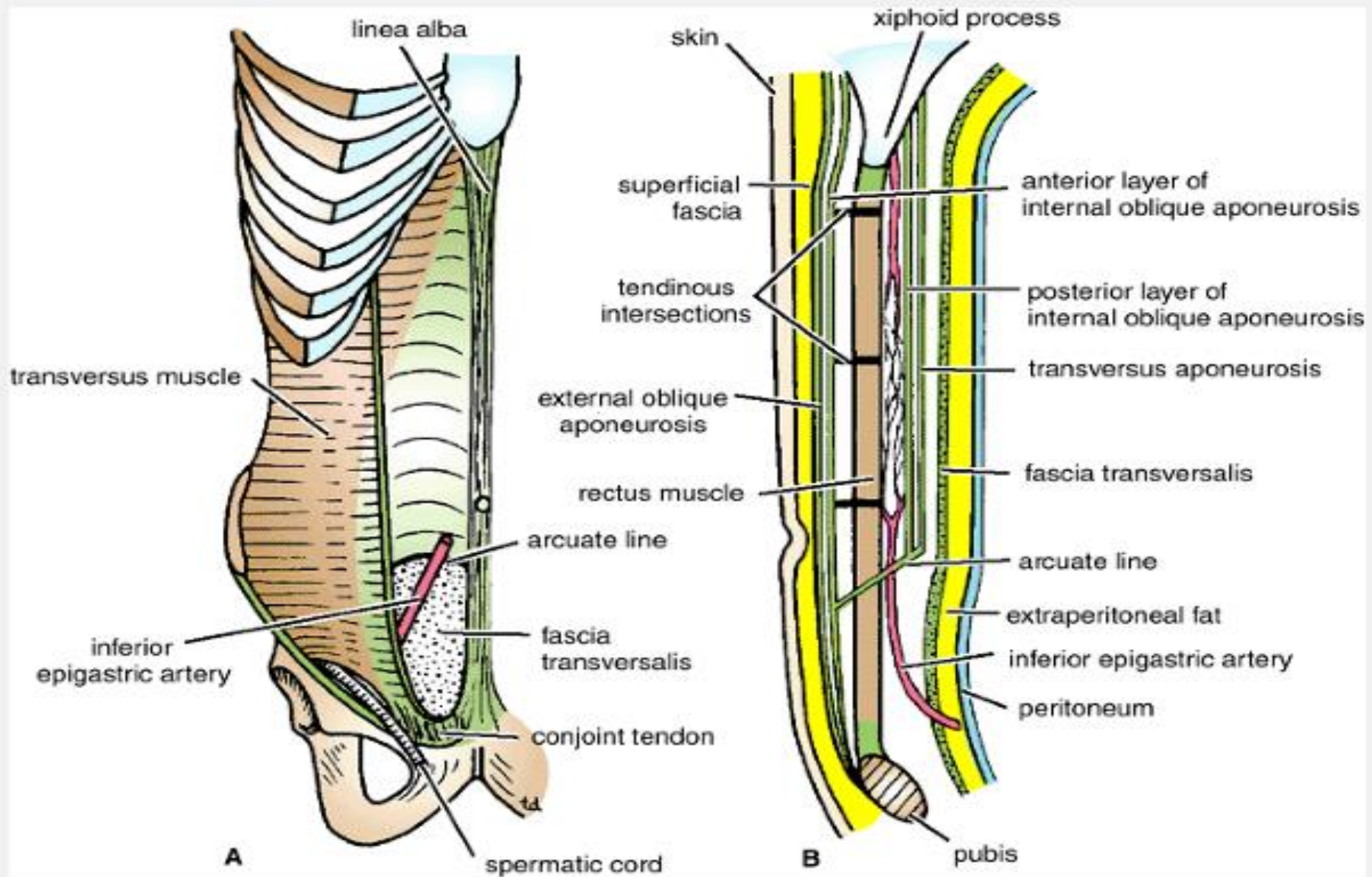
- a thin layer of fascia that lines the Transversus Abdominis muscle
- continue to diaphragm , iliac muscle & pelvis fascia
- contribute to femoral sheath

## ❖ Extraperitoneal Fascia

- ✓ The thin layer of C.T and adipose tissue between the peritoneum and fascia transversalis.

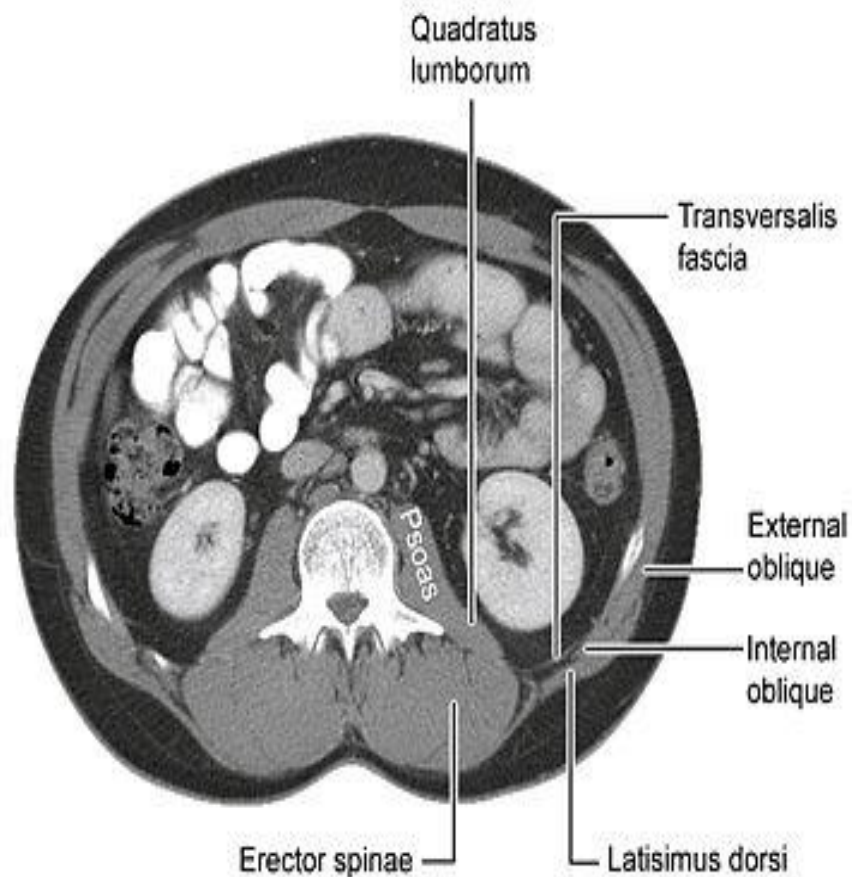
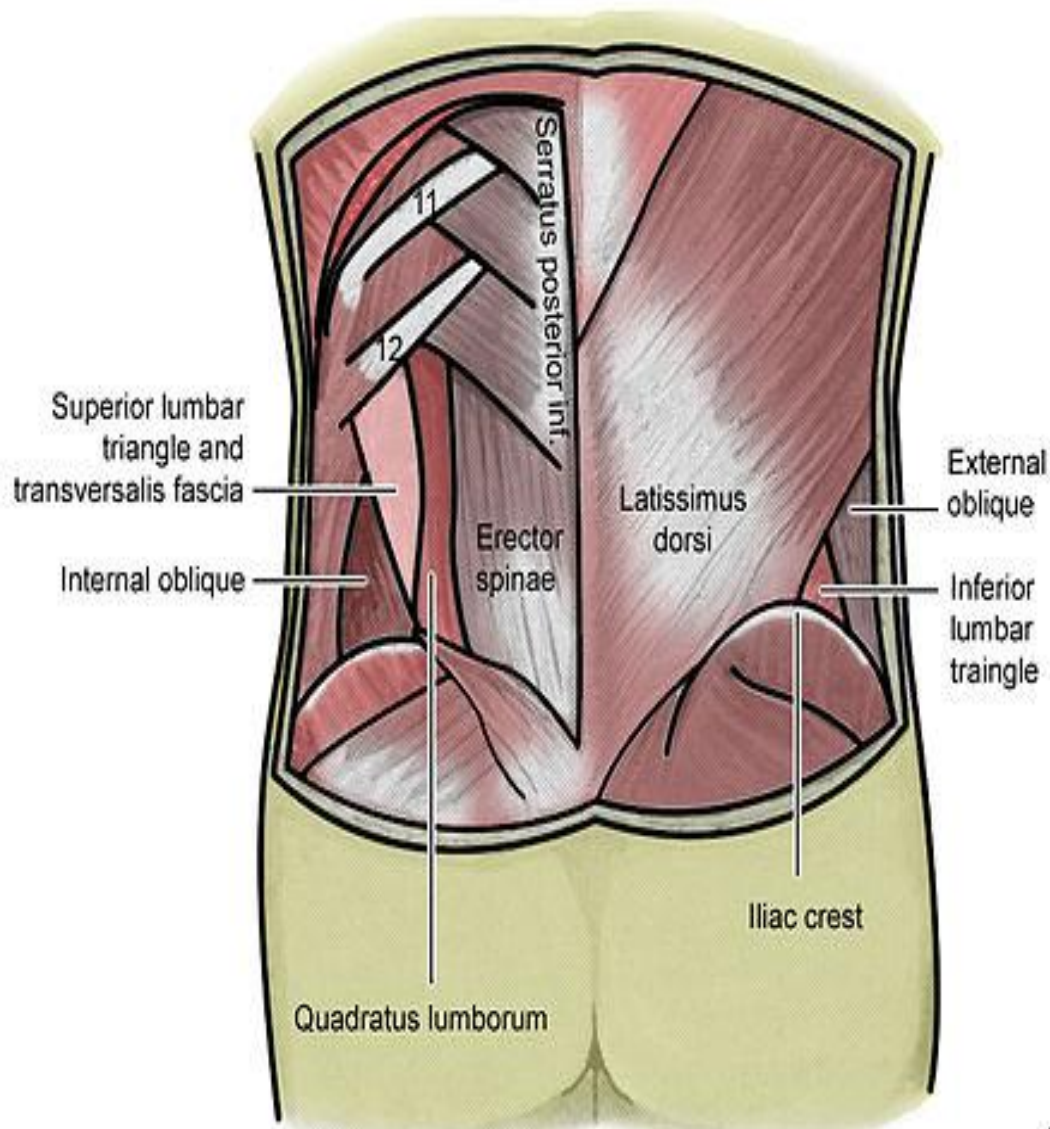
## ❖ Parietal peritoneum

- ✓ It is a thin serous membrane
- ✓ Continuous below with the parietal peritoneum lining the pelvis.



**Figure 4-10** Rectus sheath in anterior view (A) and in sagittal section (B). Note the arrangement of the aponeuroses forming the rectus sheath.

# Lumbar triangle





## lumbar triangle

- 1- the inferior lumbar (Petit) triangle, which lies superficially
  - 2- the superior lumbar (Grynfeltt) triangle, which is deep and superior to the inferior triangle.
- Of the two, the superior triangle is the more consistently found in cadavers, and is more commonly the site of herniation
  - however, the inferior lumbar triangle is often simply called the lumbar triangle, perhaps owing to its more superficial location and ease in demonstration.

# Lumber triangle(petitis)

- The inferior lumbar (Petit) triangle is formed
  - **Medially** by the latissimus dorsi muscle
  - **laterally** by the external abdominal oblique muscle
  - **Inferiorly** by the iliac crest
  - **The floor** internal abdominal oblique muscle.
- The fact that herniation occasionally occur here is of clinical importance.

# Superior lumbar (Grynfeltt-Lesshaft) triangle

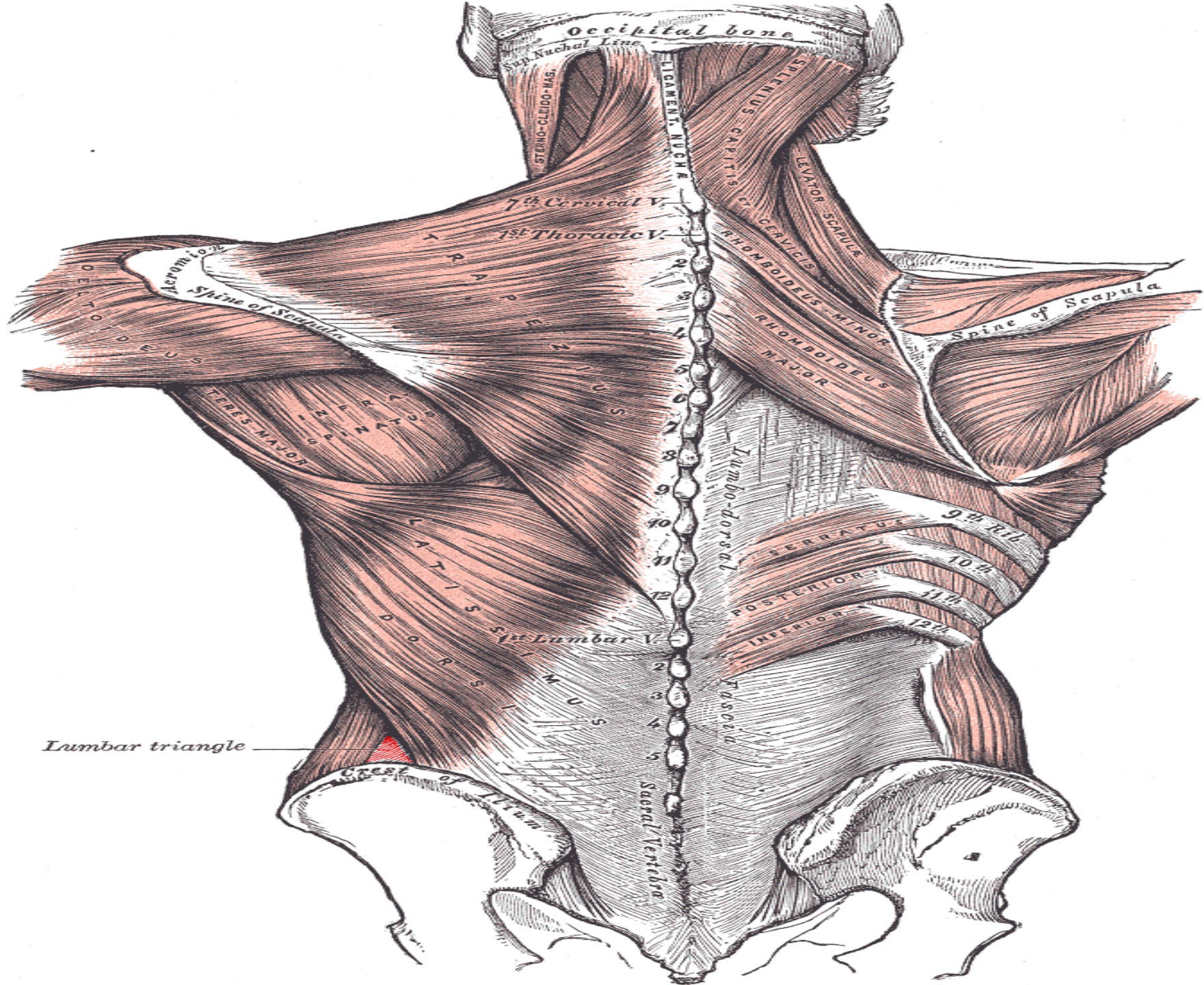
**Medially:** by the quadratus lumborum muscle

**laterally :**by the internal abdominal oblique muscle

**Superiorly:** by the 12th rib.

**The floor :** transversalis fascia

**Roof:** is the external abdominal oblique muscle



Lumbar triangle

Occipital bone

Sup. Nuchal Line

STERNO-CLAVICULO-THORACIC

LIGAMENT. NUCAE

7th Cervical V.

1st Thoracic V.

SPLIENIUS CAPITIS

LEVATOR SCAPULAE

CERVICIS

RHOMBOIDEUS MINOR

RHOMBOIDEUS MAJOR

Spine of Scapula

Acromion

Spine of Scapula

DELTOIDEUS

TRAP. MAJOR

Lumbodorsal

SERRATUS POSTERIOR SUPERIOR

SERRATUS POSTERIOR INFERIOR

SERRATUS ANTERIOR

9th RIB

10th RIB

11th RIB

12th RIB

5th Lumbar V.

DORSAL MUSCLES

Fascia

Crest of Ilium

Sacral Vertebrae

# Action of the Ant. Abdominal muscle

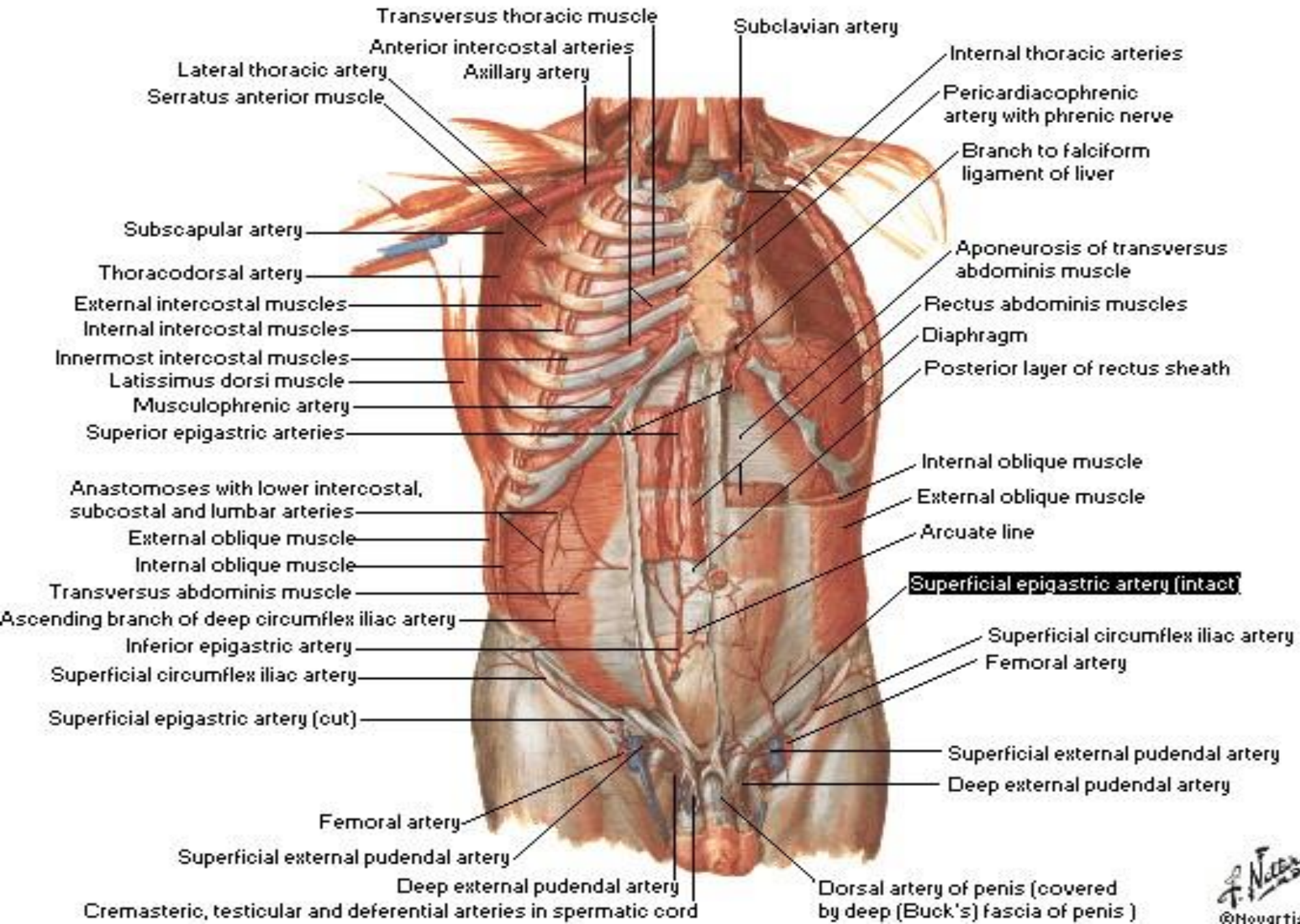
- Deep expiration
- Increase the intra abdominal pressure in
  - Vomiting
  - Cough
  - Defecation
  - Labour
- Protect viscera
- keep viscera in position
- Rectus abdominis → bends trunk forward

# Blood supply of the ant. Abdominal wall

## Arteries

- Sup. Epigastric artery
- Inf. Epigastric artery
- Intercostal arteries
- Lumbar arteries
- Deep circumflex artery

# Arteries of Anterior Abdominal Wall



# Blood supply.....cont

## Veins

### **1- Above the umbilicus**

- Lat. Thoracic. vein. → Axillary vein

### **2- Below the umbilicus**

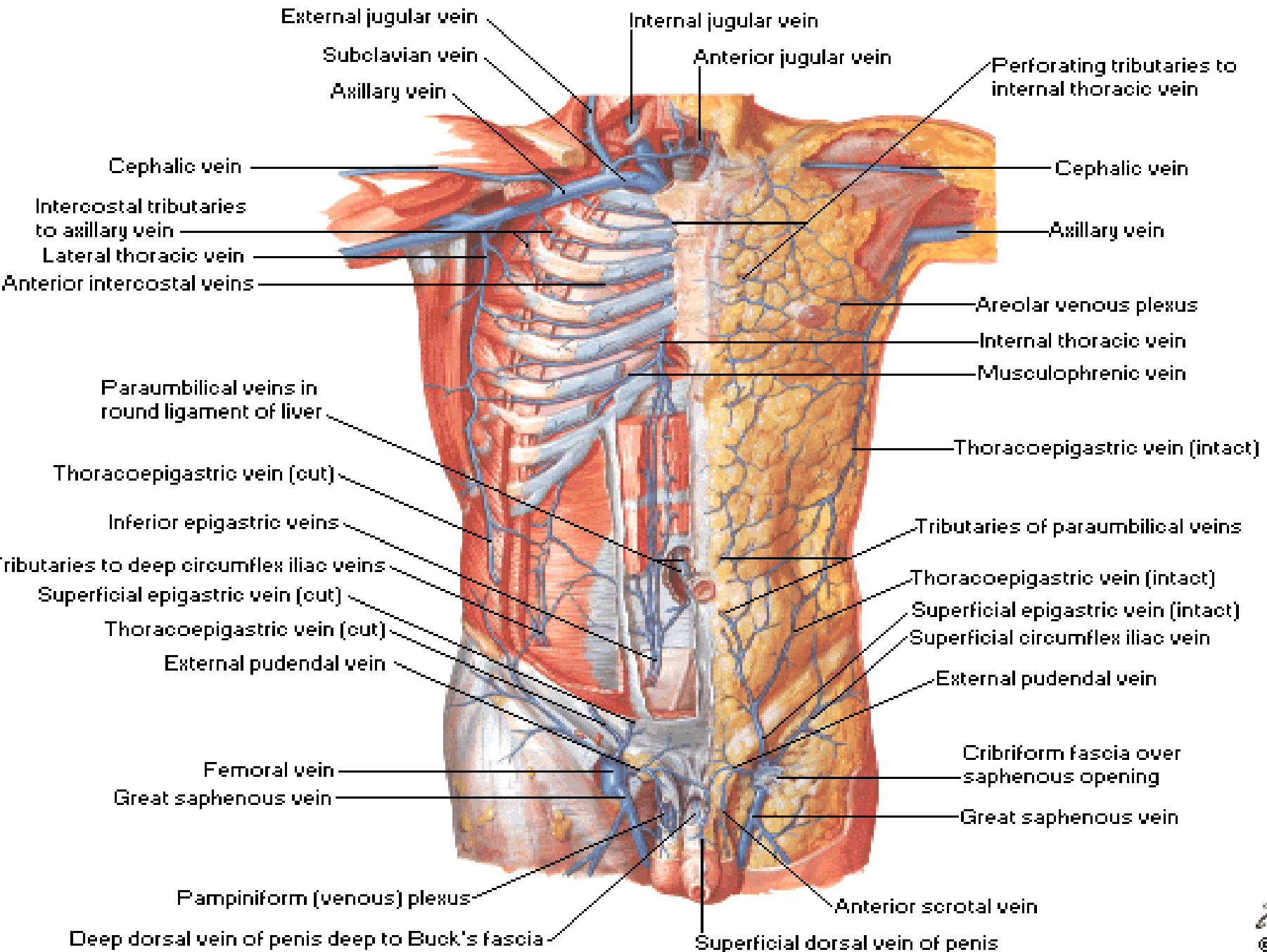
- Inf. Epigastric → Femoral vein

### **3- Paraumbilical veins**

- Ligamentum teres → portal vein( Porto- systemic anastomosis)



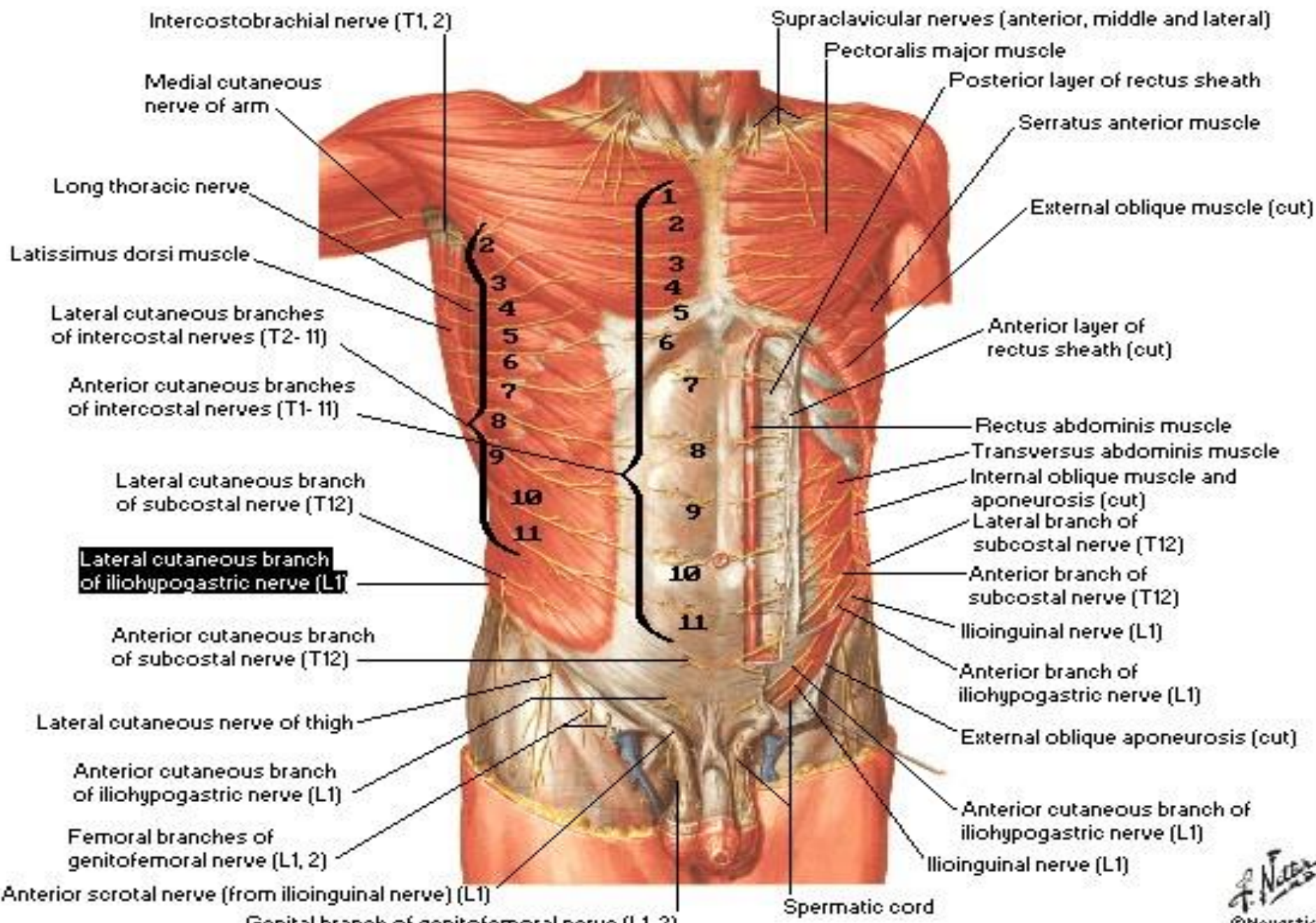
# Veins of Anterior Abdominal Wall



# Nerve supply of the ant. Abdominal wall

- **Thoracoabdominal nerve:** Lower 6<sup>th</sup> thoracic nerves & 12<sup>th</sup> subcostal nerve
- **Dermatomes** (Anterior, lateral cutaneous nerve terminal branches of Thoracoabdominal nerve)
  - T7 to skin superior to umbilicus below xiphoid process
  - T10 to skin surrounding umbilicus
  - L1 to skin inferior to umbilicus above sym.pubis
- **L1 nerve**
  - Iliohypogastric nerve
  - Ilioinguinal nerve

# Nerves of Anterior Abdominal Wall



# Lymphatic drainage of ant. Abdominal wall

- Above the umbilicus → Ant.axillary L.N
- Below the umbilicus → Sup. Inguinal L.N
- Above the iliac crest → Post.axillary.L.N
- Below the iliac crest → Sup.inguinal L.N

# Clinical notes

Abdominal stab wounds

Surgical incision

# Abdominal stab wounds

- Lateral to rectus sheath
- Ant. To rectus sheath
- In the midline= Linea alba
- Structures in the various layers through which an abdominal stab wound depend on the anatomical location

# Surgical incision

- The length and direction of surgical incision through the ant. Abdominal wall to expose the underlying viscera are largely controlled by
  - 1- position & direction of nerves
  - 2- direction of muscle fibers
  - 3- arrangement of the apponeurosis forming the rectus sheath
- The incision should be made in the direction of the line of cleavage in the skin so that the hairline scar is produced

# Incision through the rectus sheath

- Widely used
- The rectus abdominis muscle and its nerve supply are kept intact
- On closure the ant & post wall of the sheath are sutured separately and the rectus muscle back into position between the suture lines



# Common types of incisions

- Paramedian incision
- Pararectus incision
- Midline incision
- Transrectus incision
- Transverse incision
- Muscle splitting
- Abdominothoracic incision