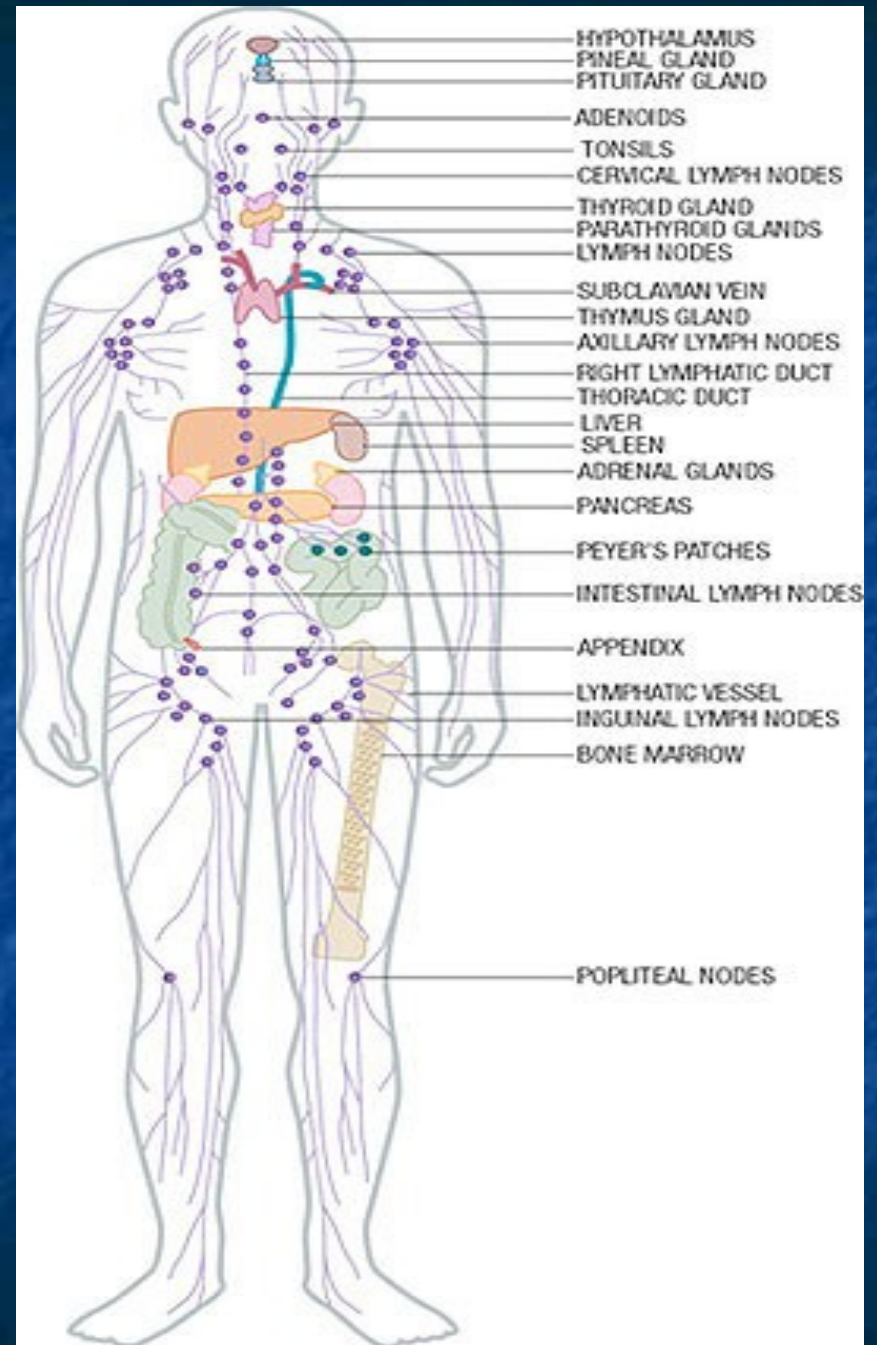


The Abdominal Region



Nine abdominal regions

- 2 horizontal planes

subcostal planes= thru inferior border of 10th costal cartilage

transtubercular planes= thru iliac tubercle & L5 vertebra

- 2 vertical planes

midclavicular planes= thru the midpoint of clavicle

- Four quadrants:

one horizontal plane

transumbilical plane= thru umbilicus , L3 L4 vertebra

Abdominal quadrants

Right upper quadrant	Left upper quadrant	
<p>Liver right lobe</p> <p>Gallbladder, stomach, pylorus, duodenum, Pancreas head, R suprarenal gland, R kidney, R colic flexure, Ascending colon superior part, Transverse colon</p>	<p>Liver left lobe</p> <p>Spleen, stomach, jejunum, prox ileum, pancreas body and tail, left kidney, L suprarenal, left colic flexure, Transverse colon left part,</p>	
<p>R half</p> <th data-bbox="98 933 962 1036">Right lower quadrant</th> <th data-bbox="967 933 1831 1036">Left lower quadrant</th>	Right lower quadrant	Left lower quadrant
<p>Cecum, Appendix, Ileum, Asc. Colon, R ovary, R uterine tube, R ureter, R spermatic cord, Uterus, Urinary bladder (full)</p>	<p>descending colon superior part.</p> <p>Sigmoid colon, Desc. Colon, L ovary, L uterine tube, L ureter, L spermatic cord, Uterus enlarge, Urinary bladder</p>	
	(full).	

Muscles of the Anterolateral Abdominal wall

Flat muscles of the abdominal wall, end as flat aponeurosis interlacing and converge at the **Linea Alba**, called **Rectus Sheath**.

- External oblique
- Internal oblique
- Transverse abdominis

Vertical muscles of the abdominal wall

- Rectus abdominis
- Pyramidalis, present in 28%, triangular shape

Contents of Rectus sheath

- Superior epigastric artery
- Inferior epigastric artery
- Epigastric Veins
- Lymphatic vessels
- Ventral primary rami of T7-T12

Case # 1

- “A 75-year-old man receiving long-term warfarin therapy developed a lower respiratory tract infection with paroxysmal coughing that was treated with oral amoxicillin 250 mg/clavulanate potassium 125 mg TID for 7 days. In the 3 days after completing antibiotic treatment, he developed increasingly severe lower abdominal pain that was clinically diagnosed as RSH”.
- This case is reported to highlight the potential interaction between warfarin and amoxicillin/clavulanate potassium and subsequent RSH formation via Pharmacokinetic or Pharmacodynamic.

Case # 2

- **A 26-year-old male presented with the history of lower abdominal pain, fever, vomiting and increasing swelling over the lower abdomen for the last one week. He had laparoscopic appendectomy elsewhere three weeks ago and was discharged home on the third postoperative day. He had been feeling unwell with lower abdominal pain since his discharge from the hospital and was given a week's course of antibiotics and analgesic in a private clinic. His abdominal examination revealed: the laparoscopic port site scar noticed at the umbilicus, left iliac fossa and the suprapubic area, generalized abdominal tenderness and guarding, visible and palpable spherical mass in the left side of abdomen occupying the left paraumbilical and suprapubic area with signs of inflammation. Laboratory tests showed leukocytosis and neutrophilia. Coagulation profile was within the normal range. An abdominal ultrasound revealed air fluid level in the left anterior abdominal wall with a cavity 9 x 5 cm in size suggestive of an abscess. The CT scan of the abdomen showed extraperitoneal collection, inoculation with air pockets in the left lower rectus sheath, rectus muscle was infiltrated. The collection was displacing the urinary bladder with no intraperitoneal communication and no intraperitoneal fluid collection. A diagnosis of rectus sheath abscess was made.**
- **The wound was debrided and left open with secondary**

Nerves of the anterolateral abdominal wall

Nerve	Origin	Course	Distribution
Thoracoabdominal T7 – T11	Lower intercostal	Bet. Layers of 3 & 4 abdominal muscles	Ant. Abd. Wall and periphery of diaphragm
Subcostal T12	Ventral ramus of 12 th thoracic n.	Along inferior border of 12 th rib	Lowest slip of internal oblique
Iliohypogastric nerve L1	Ventral ramus of lumbar nerve	Pierce transv abd. & ext. obliq apo.	Skin of hypogastric, iliac crest, int oblique transv. abdominis
Ilioinguinal L1	Ventral ramus of 1 st lumbar nerve	Bet. 2 & 3 layers of abdo. Muscle to inguinal canal.	Skin of scrotum of labiu majus, mons pubis, thigh, Int

Obliq Trnsvrs

Layers of the anterior abdominal wall, spermatic cord and scrotum

Layers & muscles	Scrotum and testis	Cover of spermatic cord
Skin	skin	Scrotum & septum
Subcut. tss, superficial fascia	Dartos fascia and muscle	Scrotum & septum
Ext. oblique apon.	Ext. spermatic fas.	Ext.spermatic fas.
Int. oblique apon.	Cremaster fascia	Cremaster fascia
Fascia of int. oblique muscle	Cremaster fascia	Cremaster fascia
Transverse abd.m		
Transverse abd.M	Int. spermatic fasc.	Int. spermatic fasc.
Extraperitoneal fat		
Peritoneum	Tunica vaginalis	Proces. vaginalis

Arteries of the anterolateral abdominal wall

Artery	Origin	Course	Distribution
Superior epigastric	Int. thoracic art.	Rectus sheath to rectus abdominis	Rectus abd. Anterolateral abd.
Inferior epigastric	Ext, iliac artery	Rectus sheath to Rectus abdominis	same
Deep circumflex iliac	Ex. Iliac artery	Abd wall to inguinal ligament	same
Superficial Circumflex iliac	Femoral artery	Superficial fascia along inguinal ligament	Subcu tss and abd wall
Superficial epigastric	Femoral artery		Subcu tss and suprapubic

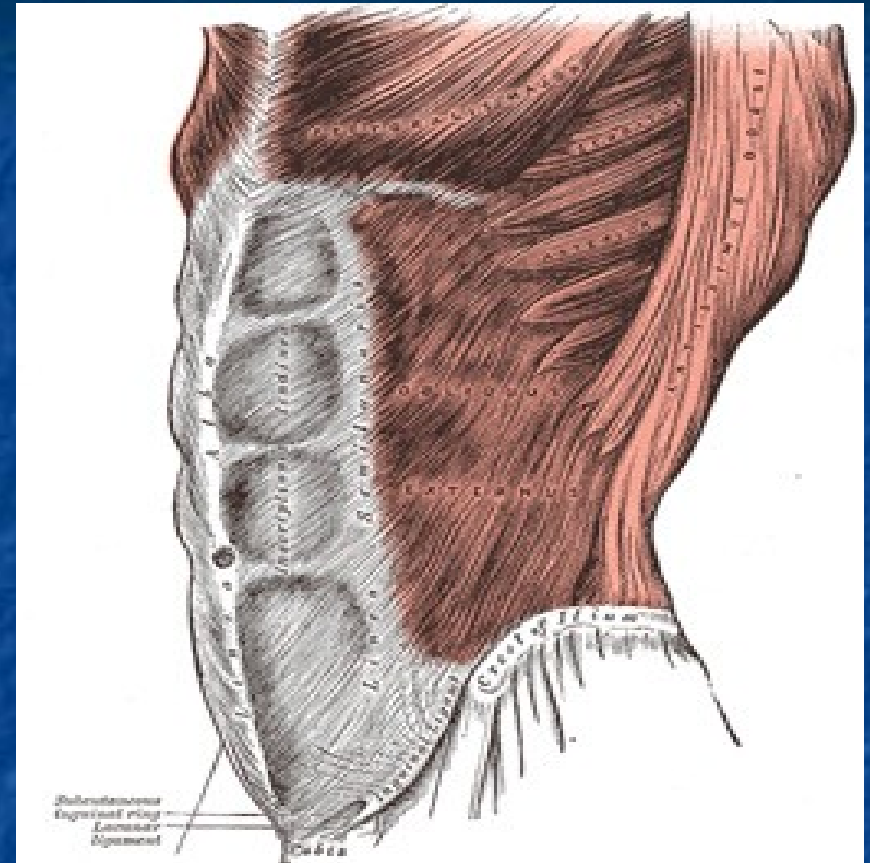
The Superficial Fascia

- The superficial fascia of the abdomen consists, over the greater part of the abdominal wall, of a single layer containing a variable amount of fat; but near the groin it is easily divisible into two layers, between which are found the superficial vessels and nerves and the superficial inguinal lymph glands.
- The **superficial layer** (*fascia of Camper*) is thick, areolar in texture, and contains in its meshes a varying quantity of adipose tissue. Below, it passes over the inguinal ligament, and is continuous with the superficial fascia of the thigh.
- In the male, Camper's fascia is continued over the penis and outer surface of the spermatic cord to the scrotum, where it helps to form the dartos. As it passes to the scrotum it changes its characteristics, becoming thin, destitute of adipose tissue, and of a pale reddish color, and in the scrotum it acquires some involuntary muscular fibers. From the scrotum it may be traced backward into continuity with the superficial fascia of the perineum. In the female, Camper's fascia is continued from the abdomen into the labia majora.

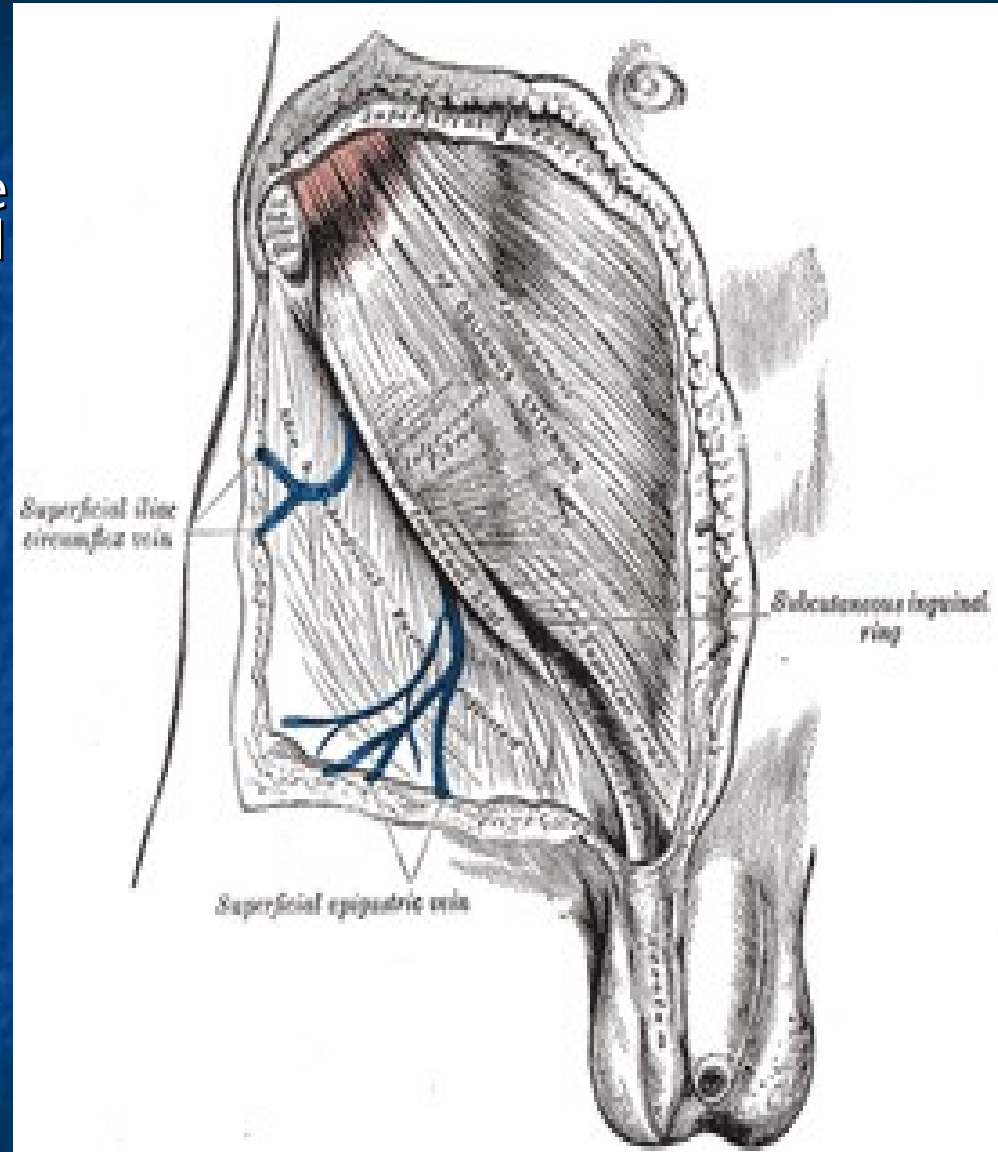
The deep layer

- (*fascia of Scarpa*) is thinner and more membranous in character than the superficial, and contains a considerable quantity of yellow elastic fibers.
- It is loosely connected by areolar tissue to the aponeurosis of the *Oblíquus externus abdominis*, but in the middle line it is more intimately adherent to the *linea alba* and to the *symphysis pubis*, and is prolonged on to the *dorsum* of the penis, forming the *fundiform ligament*; above, it is continuous with the superficial fascia over the rest of the trunk; below and laterally, it blends with the *fascia lata* of the thigh a little below the *inguinal ligament*; medially and below, it is continued over the penis and spermatic cord to the scrotum, where it helps to form the *dartos*.
- From the scrotum it may be traced backward into continuity with the deep layer of the superficial fascia of the perineum (*fascia of Colles*). In the female, it is continued into the *labia majora* and thence to the *fascia of Colles*.

- The **Obliquus externus abdominis** (*External or descending oblique muscle*), situated on the lateral and anterior parts of the abdomen, is the largest and the most superficial of the three flat muscles in this region. It is broad, thin, and irregularly quadrilateral, its muscular portion occupying the side, its aponeurosis the anterior wall of the abdomen. It *arises*, by eight fleshy digitations, from the external surfaces and inferior borders of the lower eight ribs being attached close to the cartilages of the corresponding ribs, the lowest to the apex of the cartilage of the last rib, the intermediate ones to the ribs at some distance from their cartilages.
- The five superior serrations increase in size from above downward, and are received between corresponding processes of the Serratus anterior; the three lower ones diminish in size from above downward and receive between them corresponding processes from the Latissimus dorsi. From these attachments the fleshy fibers proceed in various directions. Those from the lowest ribs pass nearly vertically downward, and are inserted into the anterior half of the outer lip of the iliac crest; the middle and upper fibers, directed downward and forward, end in an aponeurosis, opposite a line drawn from the prominence of the

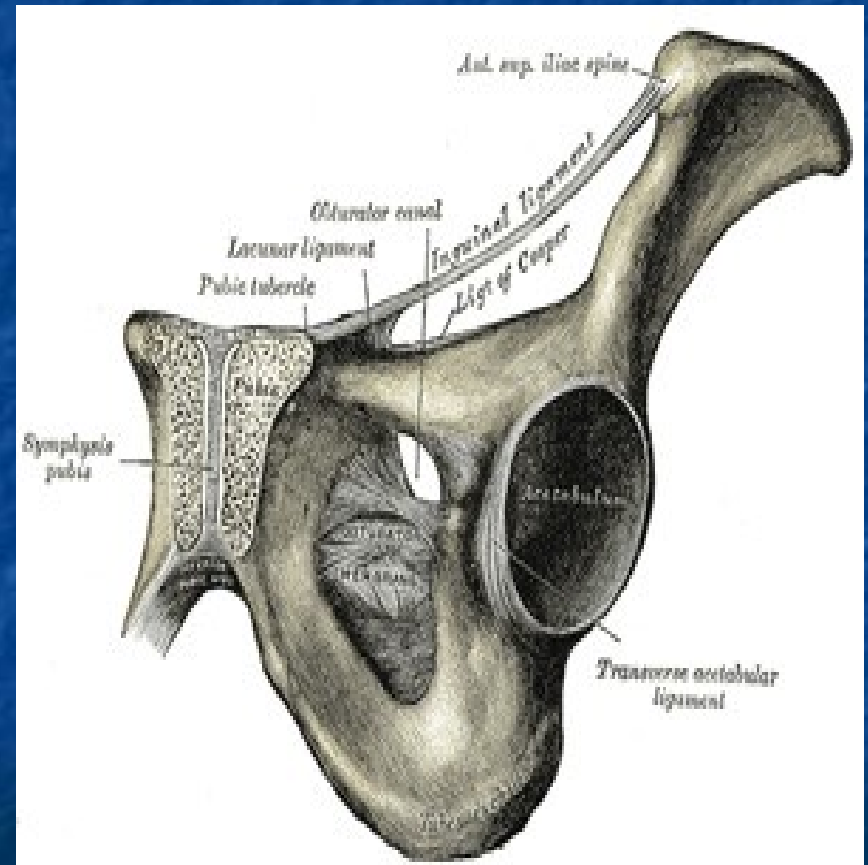


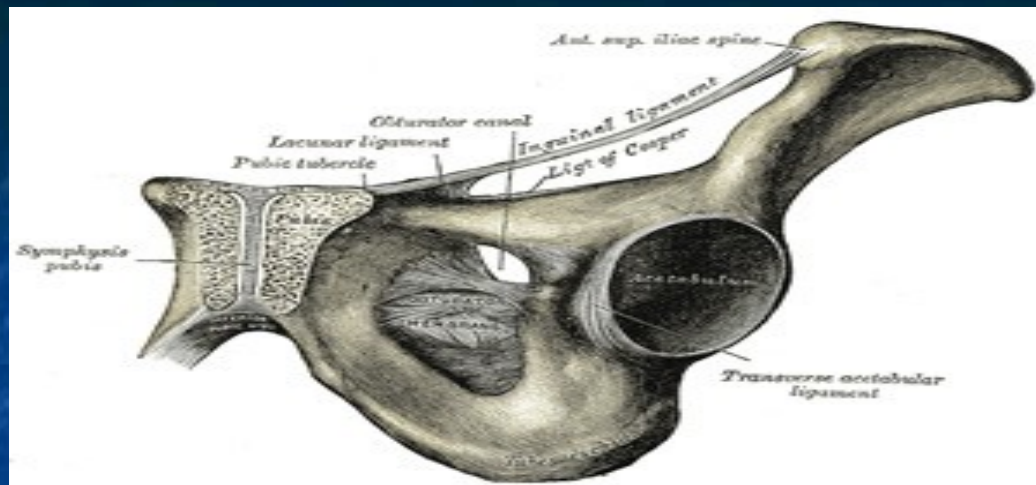
- **inguinal ligament.**
- The **aponeurosis of the Obliquus externus abdominis** is a thin strong membranous structure, the fibers of which are directed downward and medialward.
- In the middle line, it interlaces with the aponeurosis of the opposite muscle, forming the **linea alba**
- The portion which is reflected from the inguinal ligament at the pubic tubercle is attached to the pectineal line and is called the **lacunar ligament.**
- In the aponeurosis of the Obliquus externus, immediately above the crest of the pubis, is a triangular opening, the **subcutaneous inguinal ring.**



Inguinal ligaments

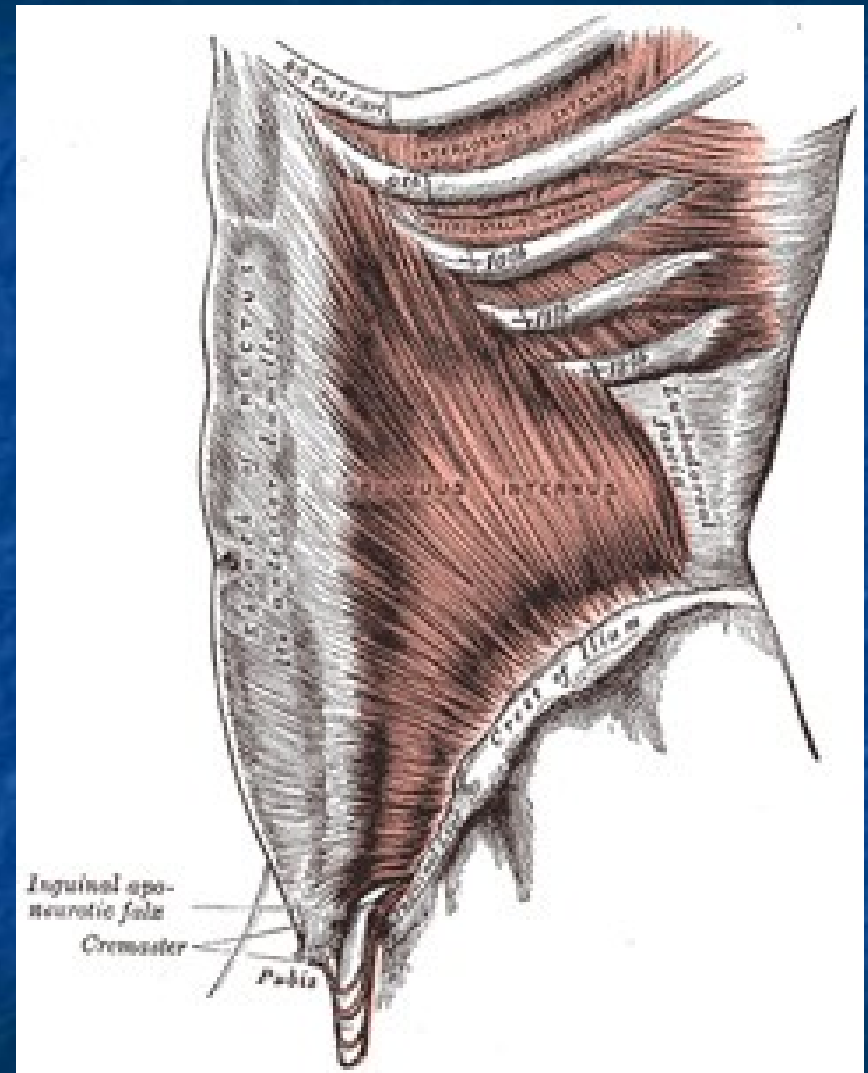
- **The Inguinal Ligament (*ligamentum inguinale* [Poupart]; **Poupart's ligament**)** The inguinal ligament is the lower border of the aponeurosis of the Obliquus externus,
- **The Lacunar Ligament (*ligamentum lacunare* [Gimbernati]; **Gimbernati's ligament**)** The lacunar ligament is that part of the aponeurosis of the Obliquus externus which is reflected backward and lateralward, and is attached to the pectineal line.
It is about 1.25 cm. long, larger in the male than in the female, almost horizontal in direction in the erect posture, and of a triangular form with the base directed lateralward.



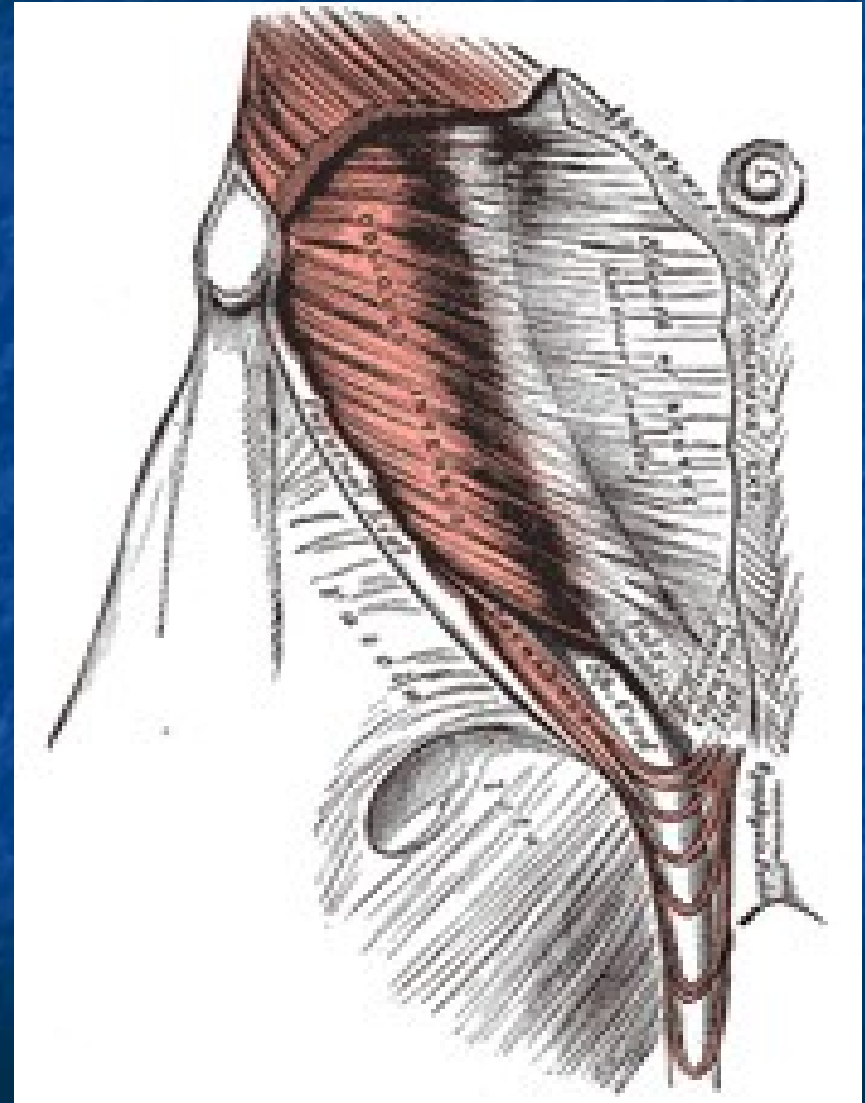


- **(*ligamentum inguinale reflexum [Collesi]*; *triangular fascia*).**—The reflected inguinal ligament is a layer of tendinous fibers of a triangular shape, formed by an expansion from the lacunar ligament and the inferior crus of the subcutaneous inguinal ring.
- interlaces with the ligament of the other side of the linea alba
- **Ligament of Cooper.**—
It extends lateralward from the base of the lacunar ligament along the pectineal line, to which it is attached. It is strengthened by the pectineal fascia, and by a lateral expansion from the lower attachment of the linea alba (*adminiculum lineæ albæ*).
- **Variations.**—The Obliquus externus may show decrease or doubling of its attachments to the ribs; addition slips from lumbar aponeurosis: doubling between lower ribs and ilium

- The **Obliquus internus abdominis**
- (*Internal or ascending oblique muscle*) thinner and smaller than the Obliquus externus, beneath which it lies, is of an irregularly quadrilateral form, and situated at the lateral and anterior parts of the abdomen.
- It *arises*, by fleshy fibers, from the lateral half of the grooved upper surface of the inguinal ligament, iliac crest, lumbo dorsal fascia.
- *inserted*, conjointly with those of the Transversus, into the crest of the pubis and medial part of the pectineal line behind the lacunar ligament, forming what is known as the



- The **Cremaster**
- is a thin muscular layer, *arise* from the middle of the inguinal ligament where its fibers are continuous with those of the Obliquus internus and also occasionally with the Transversus.
- **cremasteric fascia.** The fibers ascend along the medial side of the spermatic cord, and are inserted by a small pointed tendon into the tubercle and crest of the pubis and into the front of the sheath of the Rectus

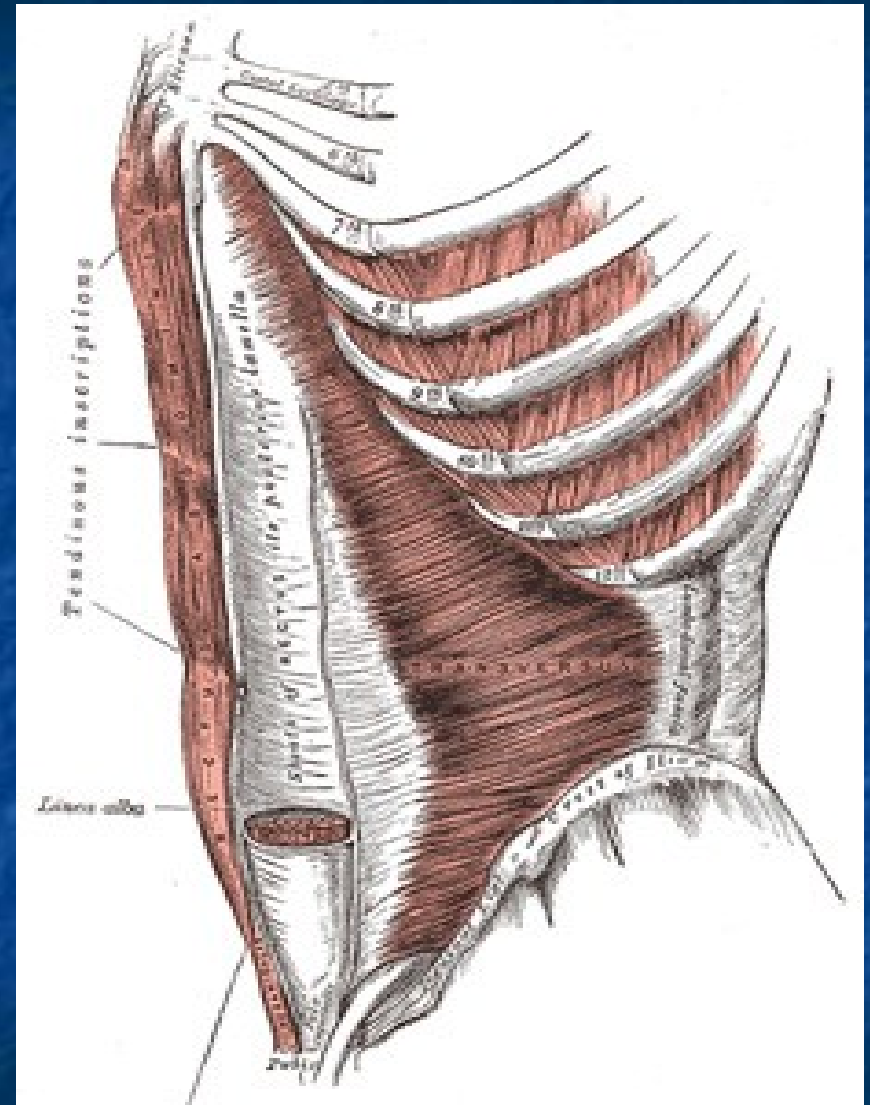


Transversus abdominis

(*Transversalis muscle*)

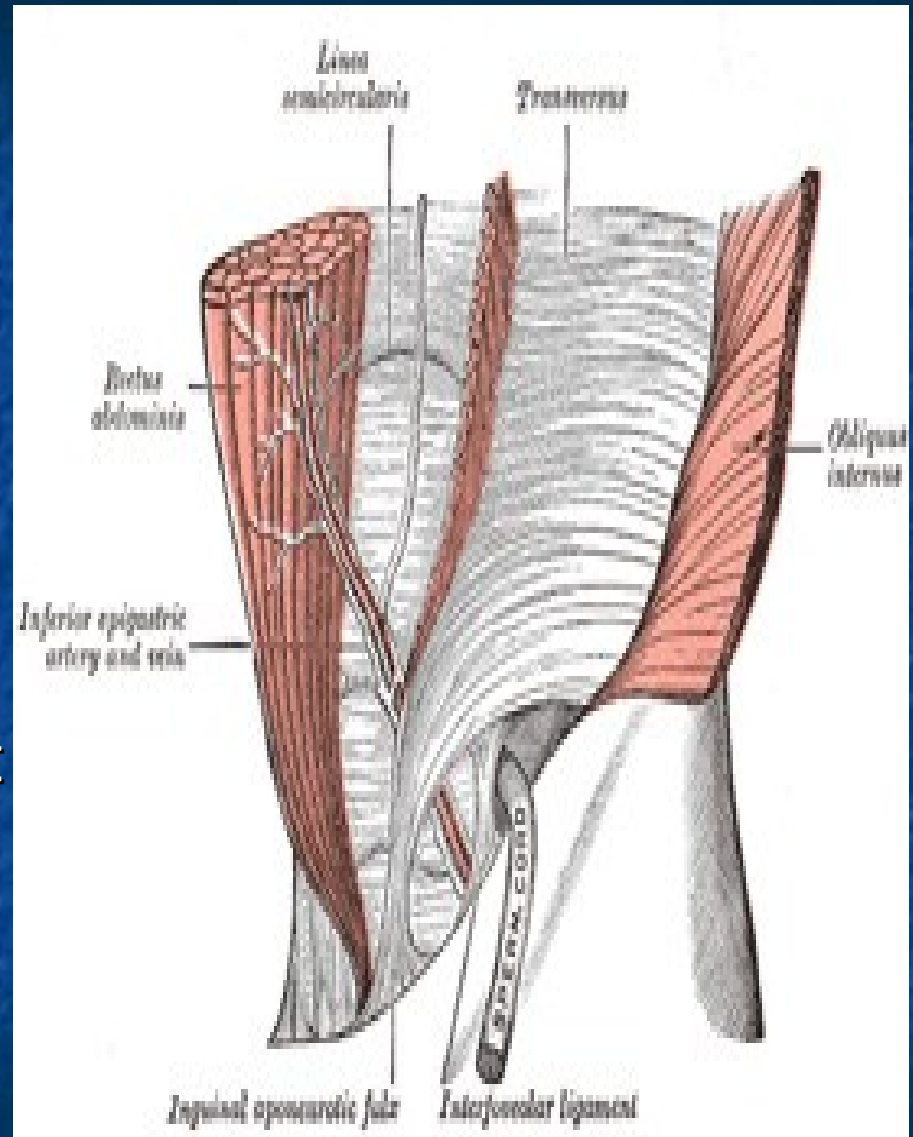
so called from the direction of its fibers, is the most internal of the flat muscles of the abdomen, being placed immediately beneath the Obliquus internus.

- It *arises*, from the lateral third of the inguinal ligament, the iliac crest, from the inner surfaces of the cartilages of the lower six ribs
- *Inserted*, into the crest of the pubis and pectineal line, forming the inguinal



- **inguinal aponeurotic falx** (*falx aponeurotica inguinalis*; conjoined tendon of Internal oblique and Transversalis muscle) of the Obliquus internus and Transversus is mainly formed by the lower part of the tendon of the Transversus,
- inserted into the crest of the pubis and pectineal line
- **interfoveolar ligament of Hesselbach**

Lateral to the falx is a ligamentous band extending down in



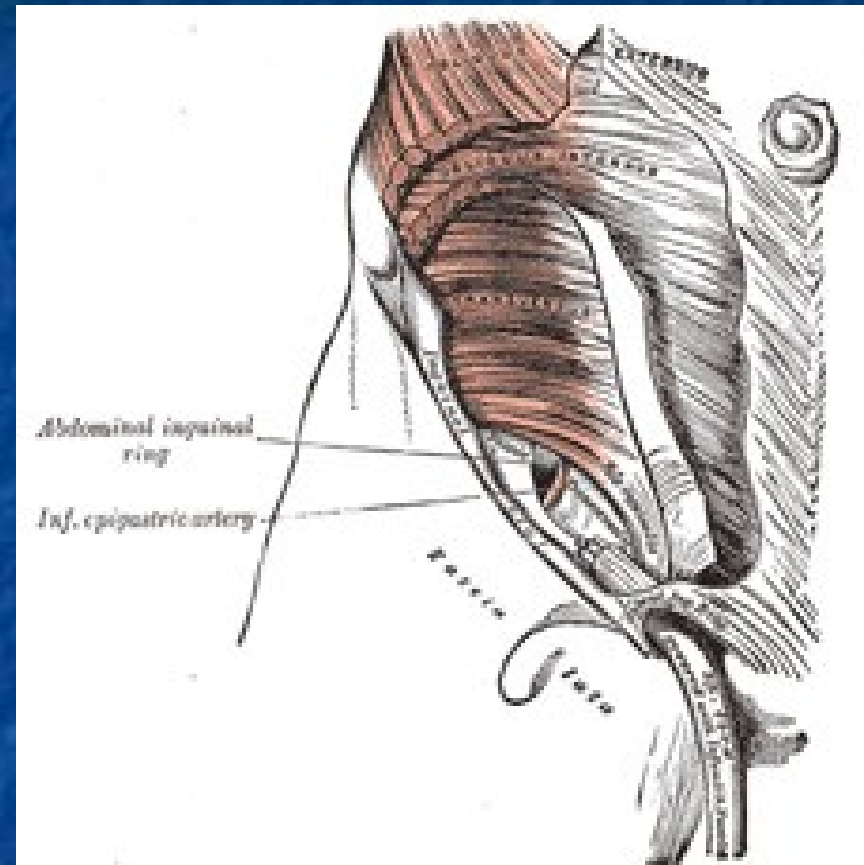
Abdominal muscle

- The **Rectus abdominis** is a long flat muscle, which extends along the whole length of the front of the abdomen, and is separated from its fellow of the opposite side by the linea alba. It is much broader, but thinner, above than below, and *arises* by two tendons; the lateral or larger is attached to the crest of the pubis, the medial interlaces with its fellow of the opposite side, and is connected with the ligaments covering the front of the symphysis pubis.
- The Rectus is crossed by fibrous bands, three in number, which are named the **tendinous inscriptions**.
- the costal margin midway between the umbilicus and symphysis pubis, where the posterior wall of the sheath ends in a thin curved margin, the **linea semicircularis**,
- The **Pyramidalis** is a small triangular muscle, placed at the lower part of the abdomen, in front of the Rectus, and contained in the sheath of that muscle.

Nerves of the abdominal wall

- **Nerves.**—The abdominal muscles are supplied by the lower intercostal nerves. The Obliquus internus and Transversus also receive filaments from the anterior branch of the iliohypogastric and sometimes from the ilioinguinal. The Cremaster is supplied by the external spermatic branch of the genitofemoral and the Pyramidalis usually by the twelfth thoracic.
- **The Linea Alba.**—The linea alba is a tendinous raphé in the middle line of the abdomen, stretching between the xiphoid process and the symphysis pubis. It is placed between the medial borders of the Recti, and is formed by the blending of the aponeuroses of the Obliqui and Transversi.
- **The Lineæ Semilunares.**—The lineæ semilunares are two curved tendinous lines placed one on either side of the linea alba. Each corresponds with the lateral border of the Rectus.
- **The Transversalis Fascia.**—The transversalis fascia is a thin aponeurotic membrane which lies between the inner

- **The Abdominal Inguinal Ring (*annulus inguinalis abdominis; internal or deep abdominal ring*).**—The abdominal inguinal ring is situated in the transversalis fascia, midway between the anterior superior iliac spine and the symphysis pubis, and about 1.25 cm. above the inguinal ligament
- **The Inguinal Canal (*canalis inguinalis; spermatic canal*).**—The inguinal canal contains the spermatic cord and the ilioinguinal nerve in the male, and the round ligament of the uterus and the ilioinguinal nerve in the female.
- **The Deep Crural Arch.**—Curving over the external iliac vessels, at the spot where they become femoral, on the abdominal side of the inguinal ligaments and loosely connected with it, is a thickened band of fibers



Peritonium

- **Extraperitoneal Connective Tissue.**—Between the inner surface of the general layer of the fascia which lines the interior of the abdominal and pelvic cavities, and the peritoneum, there is a considerable amount of connective tissue, termed the **extraperitoneal** or **subperitoneal connective tissue**.
- The **parietal portion** lines the cavity in varying quantities in different situations. It is especially abundant on the posterior wall of the abdomen, and particularly around the kidneys, where it contains much fat. On the anterior wall of the abdomen, except in the pubic region, and on the lateral wall above the iliac crest, it is scanty, and here the transversalis fascia is more closely connected with the peritoneum. There is a considerable amount of extraperitoneal connective tissue in the pelvis.
- The **visceral portion** follows the course of the branches of the abdominal aorta between the layers of the mesenterics and other folds of peritoneum which connect the various viscera to the abdominal wall. The two portions are directly continuous with each other.

The Posterior Muscles of the Abdomen

- Psoas major.
Iliacus. Psoas minor.
Quadratus lumborum. The Psoas major, the Psoas minor, and the Iliacus, with the fasciæ covering them, will be described with the muscles of the lower extremity.
- The **Quadratus lumborum** is irregularly quadrilateral in shape, and broader below than above. It *arises* by aponeurotic fibers from the iliolumbar ligament and the adjacent portion of the iliac crest for about 5 cm., and is *inserted* into the lower border of the last rib
- **Nerve Supply.**—The twelfth thoracic and first and second lumbar nerves supply this muscle.
- **Actions.**—The Quadratus lumborum draws down the last rib, and acts as a muscle of inspiration by helping to fix the origin of the diaphragm.



