The Abdominal Region

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Lec. 6

General Concepts

- Cylindrical chamber extending from inferior aspect of thorax to superior margin of pelvis.

- Abdominal and pelvic cavities are continuous.

- AP space is called the peritoneal cavity.

- Abdominal viscera are suspended within peritoneal cavity

Roles of abdominal wall

-Houses and protects major viscera Below sub-costal level
-Breathing

1.Relaxes in inspiration, facilitates expansion of thorax upon contraction of diaphragm.

2.Contracts in expiration to assist elevation of diaphragm.

-Alteration of intra-abdominal pressure

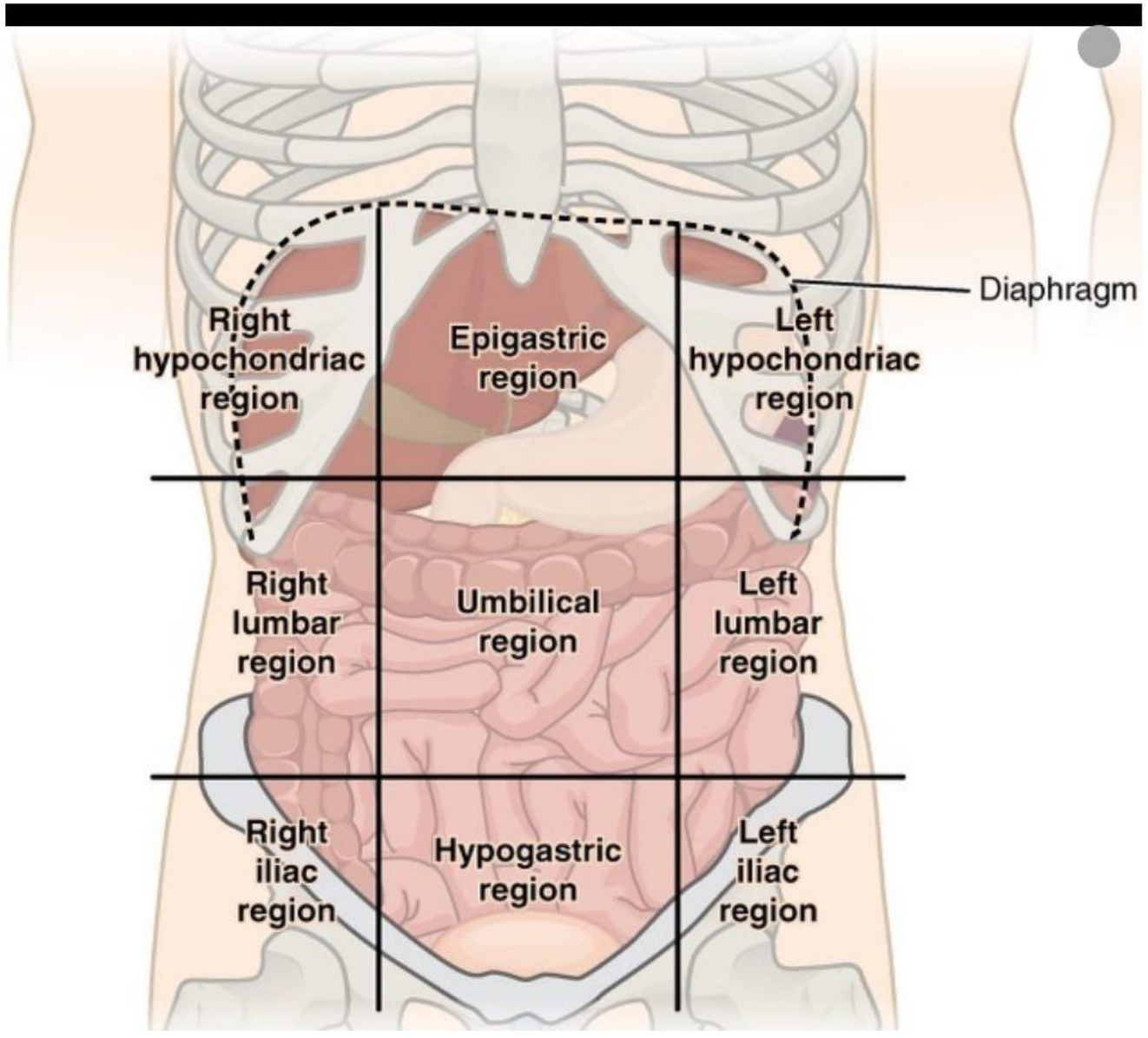
Contraction causes large increase in pressure if diaphragm is fixed: eg voiding, childbirth

Why such different appearances?

Abdominal wall partly consists of hard bone

-5 lumbar vertebra and discs

-Superior part of pelvic bones


Diaphragm
Right hypochondriac region
Epigastric region
Left hypochondriac region
Right lumbar region
Umbilical region
Left lumbar region
Right iliac region
Hypogastric region
Left iliac region

-Bony components of the inferior thoracic wall- costal margin, 11th and 12 rib, xiphoid process.

-Majority of abdominal wall is made of more flexible tissue. Muscles, flat tendinous sheets and fascia.

Abdominal Region

The abdomen can be divided into 4 quadrants with the transverse and sagittal planes.

-Transverse (trans-umbilical) plane crosses the abdomen at the level of the umbilicus

-Sagittal (vertical) plane crosses the body at the level of the umbilicus

-The intersection of these 2 planes defines 4 quadrants:

- RUQ
- LUQ
- RLQ
- LLQ

The 9 regions of the abdomen created by the vertical midclavicular and horizontal subcostal and trans-tubercular planes.

Note: that the hypochondrium, lateral abdominal region, and inguinal region are present on both the left and right sides of the abdomen.

Abdominal surface landmarks

The following structures are helpful anatomic surface landmarks on the anterior abdominal wall

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-1- **Xiphoid process.** The xiphoid process is the inferior projection of the sternum.

-2- Umbilicus. The umbilicus lies at the L3–L4 vertebral level, within the T10 dermatome.

-A dermatome is **an area of skin that is mainly supplied by a single spinal nerve**. There are 8 cervical nerves (note C1 has with no dermatome),

12 thoracic nerves,

5 lumbar nerves and

5 sacral nerves.

Each of these spinal nerves relay sensation from a particular region of the skin to the brain.

3-Inguinal ligament. Formed by the inferior border of the external oblique muscle

-The inguinal ligament is revealed superficially as a crease on the inferior extent of the anterior abdominal wall.

-The inguinal ligament is the location of the dermatome level of L1

Layers of the abdomen

The layers of the anterior abdominal wall from superficial to deep are:

1-Skin

2-Superficial fascia:

3-External layer of adipose tissue contains superficial epigastric veins that drain the anterior abdominal wall (Superficial epigastric veins drain into the femoral and paraumbilical veins).

Lateral abdominal muscles:

-External oblique

-Internal oblique

-Transversus abdominis

Anterior abdominal muscles:

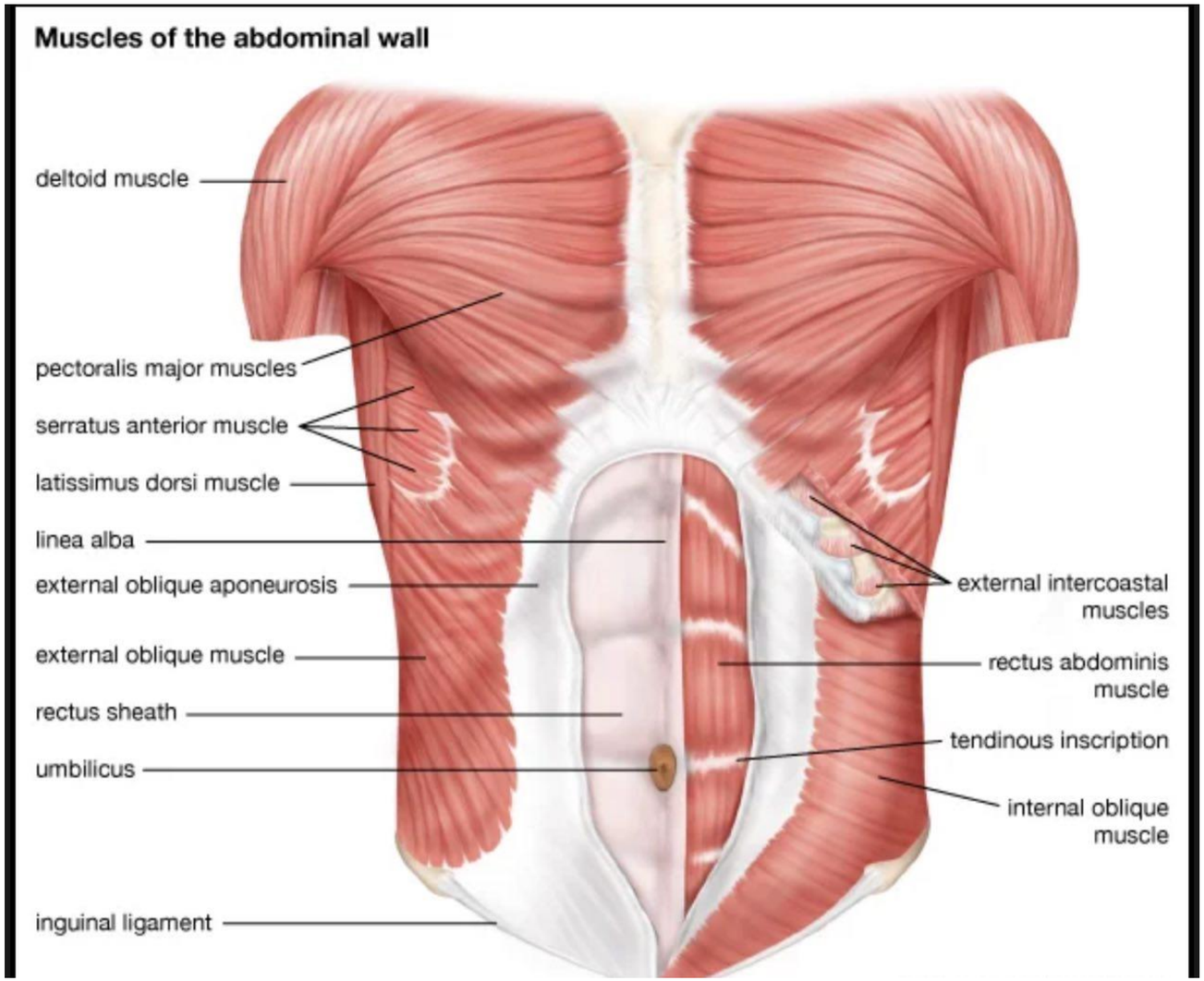
-Rectus abdominis

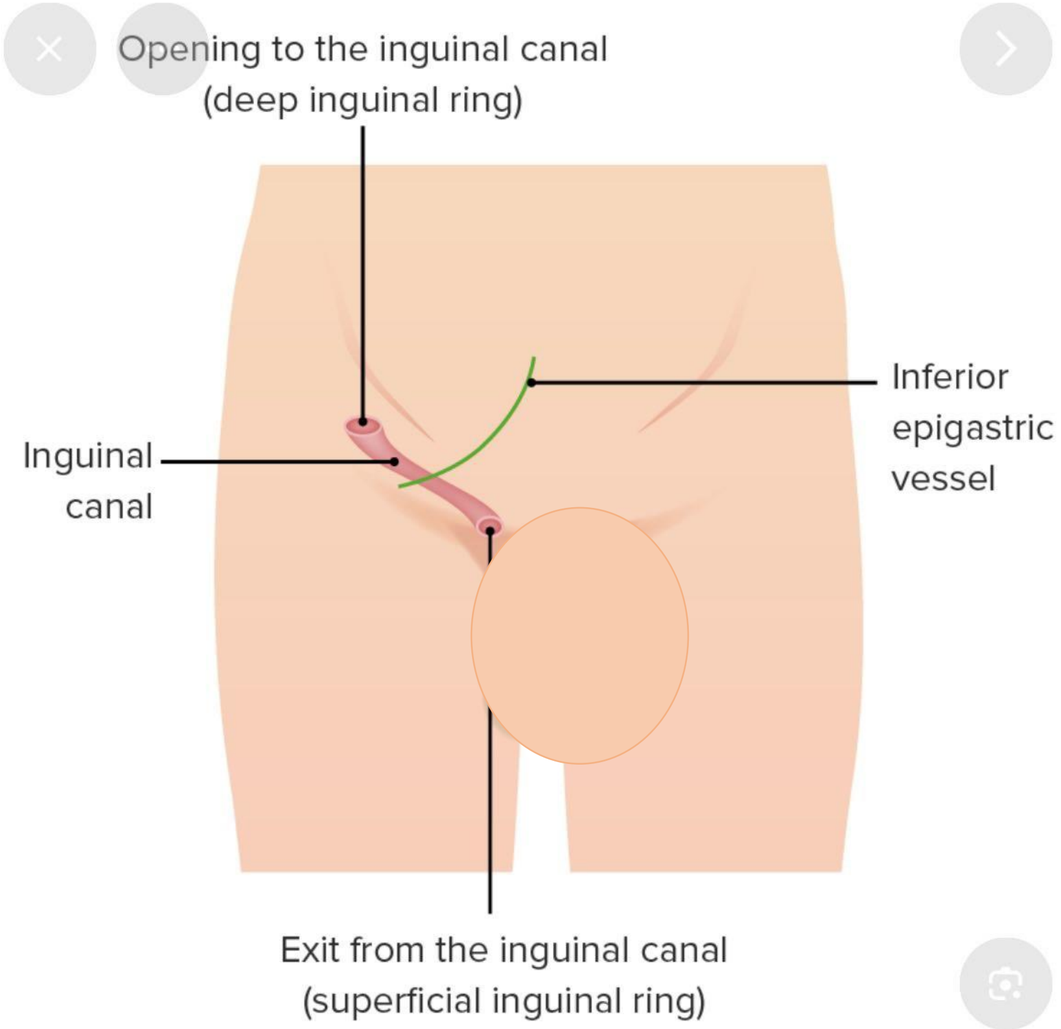
-Pyramidalis muscle

-Transversalis fascia

-Extraperitoneal fat

-Peritoneum




Opening to the inguinal canal
(deep inguinal ring)
Inferior
epigastric
vessel
Inguinal
canal
Exit from the inguinal canal
(superficial inguinal ring)

The inguinal canal

The inguinal Canal (IC)is a natural space created within the layers of the lower anterior abdominal wall just above the inguinal ligament.

-Each inguinal canal has 4 walls and 2 openings (inguinal rings)

-Deep inguinal ring is the origin of IC

-Superficial inguinal ring is the end of IC

-In the newborn period, the inguinal canal is short and lengthens over time to its final oblique position

-In an adult, the canal measures approximately 3-5 cm and extends from the deep or internal inguinal ring to the superficial or external inguinal ring.

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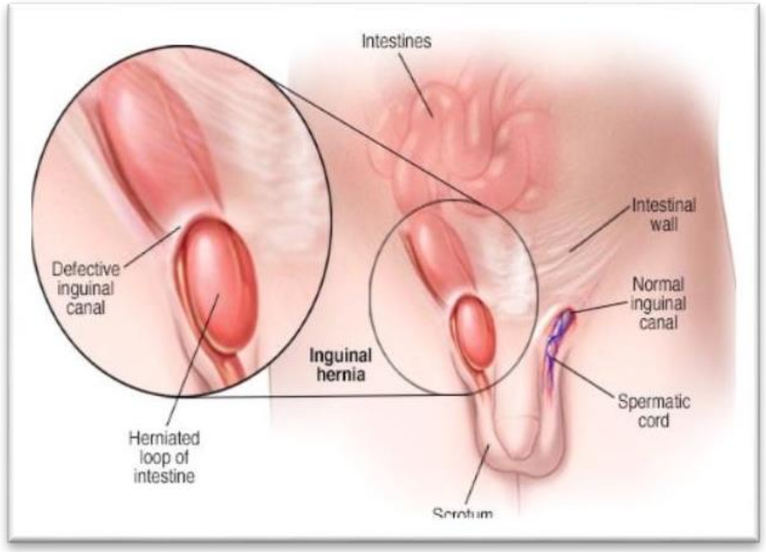
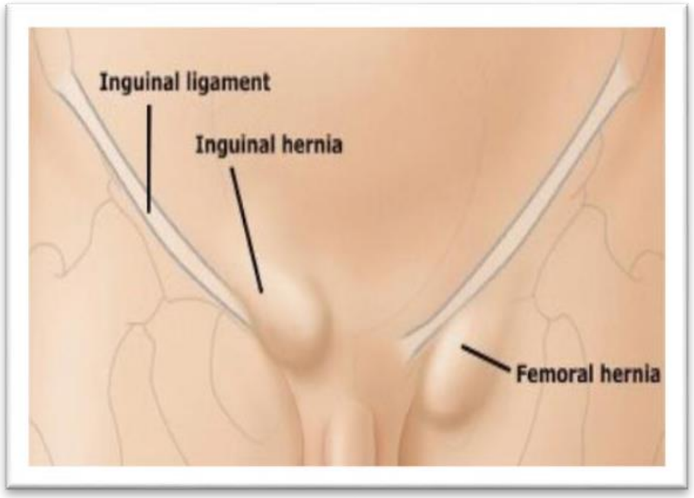
Weakness or defects in the posterior wall may lead to formation of inguinal hernias
-In males, the inguinal canal tends to be more developed, containing the spermatic cord and ilioinguinal nerve
-whereas in females, it remains less developed and contains the round ligament of the uterus, in addition to the ilioinguinal nerve





Inguinal Hernias

-Inguinal hernias: The superficial and deep inguinal rings represent 2 weak points in the abdominal wall and create a pathway for inguinal hernias.

-Several risk factors have been implicated in the development of inguinal hernias, including obesity, pregnancy, and aging.

-Affected individuals will present with a burning sensation or dull ache at the groin, and a mass that may fluctuate in size based on time of the day and preceding activity.

-Classically, coughing or straining leads to the appearance of the hernia.

-Treatment is surgical and usually performed on an outpatient basis with excellent results.

Neurovasculature of Abdominal wall

Arterial supply

The arteries of the anterior abdominal wall are divided into superficial and deep layers:

A- Superficial layer:

1-Musculophrenic artery: Branch of the internal thoracic artery
Supplies the superior anterolateral abdominal wall.

2-Superficial epigastric artery: Branch of the femoral artery
Supplies the inferior anterolateral abdominal wall

3-Superficial circumflex iliac artery: Branch of the femoral artery

- Supplies the inferior anterolateral abdominal wall

B -Deep layer:

1-Superior epigastric artery: Direct continuation of the internal thoracic artery

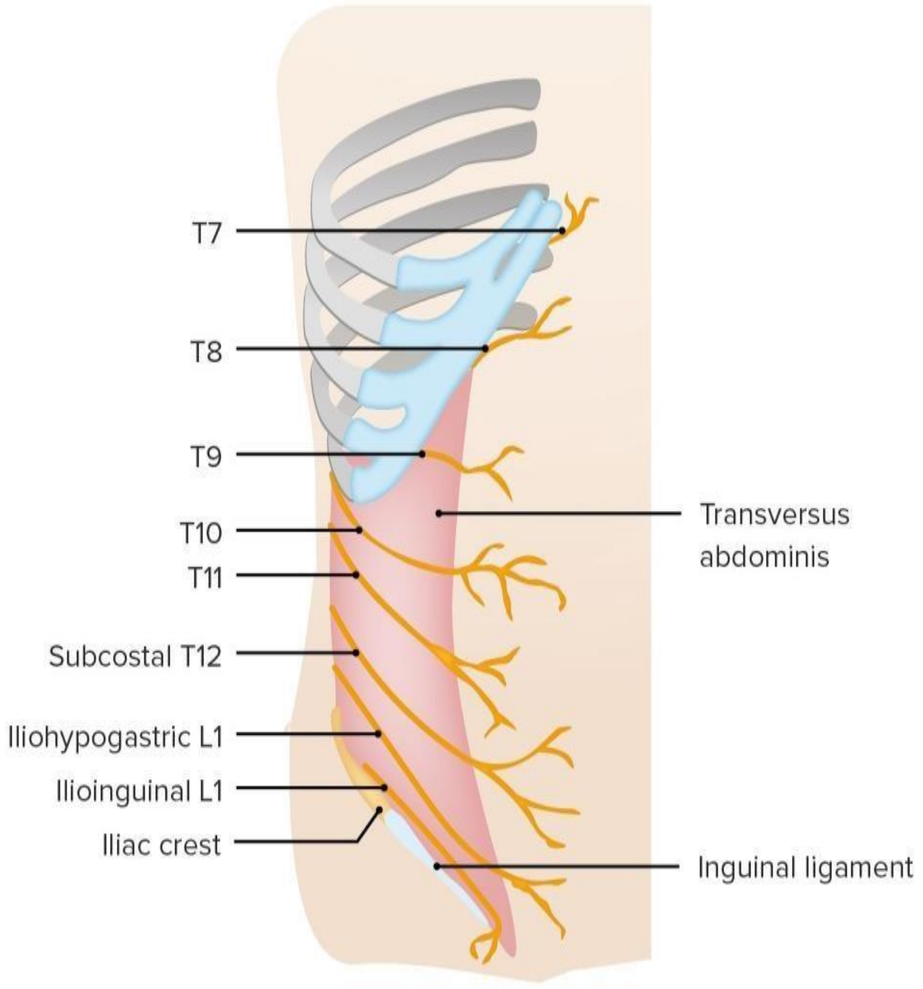
Supplies the superior part of the abdominal wall

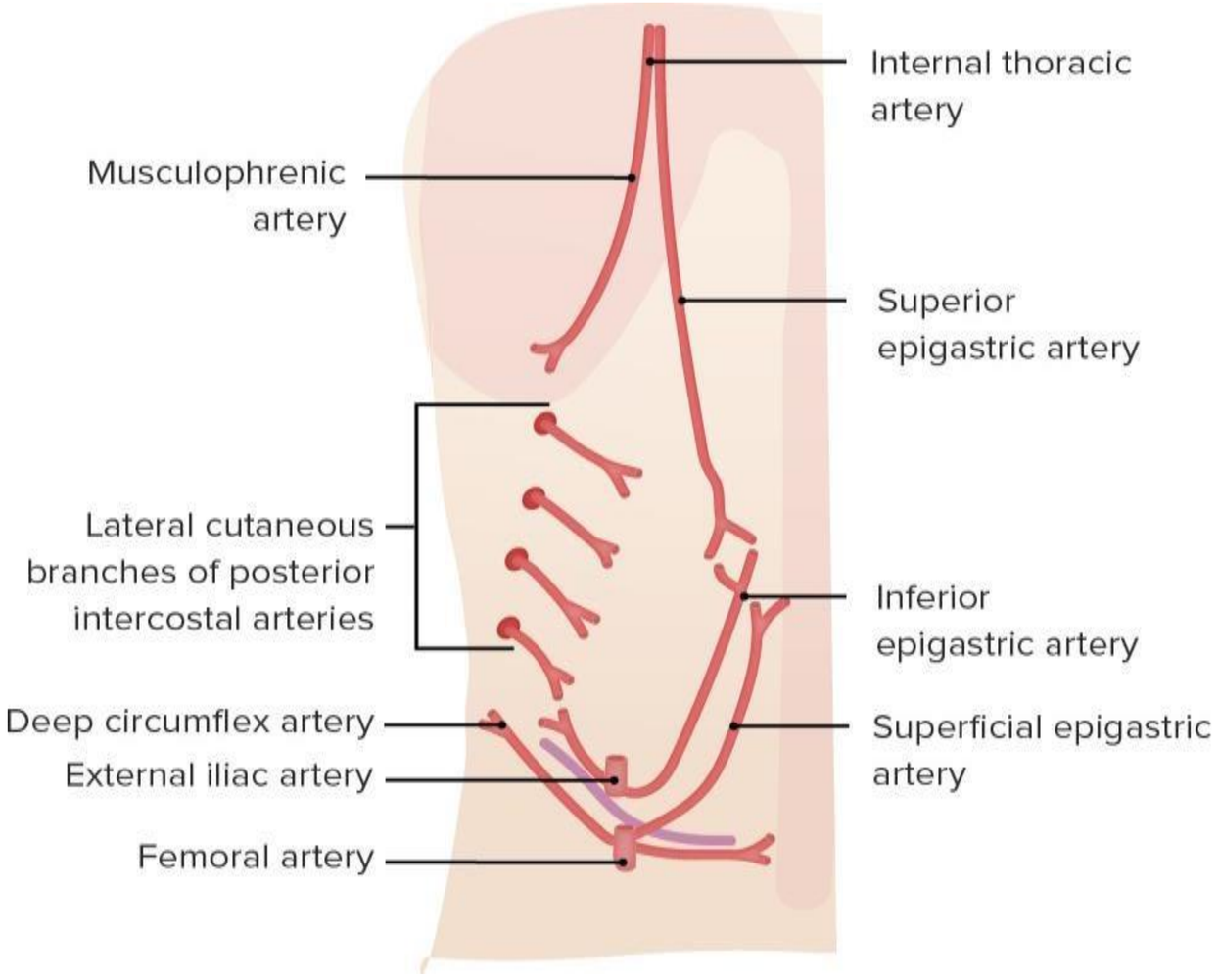
2-Inferior epigastric artery: Branch of the external iliac artery

Supplies the inferior part of the abdominal wall

The 10th and 11th intercostal arteries and the subcostal artery supply the lateral abdominal wall.

Arteries of the anterior and lateral abdominal wall


T7
T8
T9
T10
T11
Subcostal T12
Iliohypogastric L1
Ilioinguinal L1
Iliac crest
Transversus abdominis
Inguinal ligament


Internal thoracic artery
Musculophrenic artery
Superior epigastric artery
Lateral cutaneous branches of posterior intercostal arteries
Inferior epigastric artery
Deep circumflex artery
Superficial epigastric artery
External iliac artery
Femoral artery

Venous drainage of Abdominal wall

Venous drainage follows the arteries of the same name.

The superficial veins around the umbilicus anastomose with the deep veins through the paraumbilical veins.

Innervation

The skin, abdominal muscles, and peritoneum are innervated by:

- Thoracoabdominal nerves (T7–T11)
- Subcostal nerve (T12)
- Iliohypogastric nerve (L1)
- Ilioinguinal nerve (L1)

Sensory distribution:

Series of transverse dermatomal bands from T7 to L1 Skin around the umbilicus is innervated by T10.