

Abdominal wall - Function, Muscles, fascias

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The abdominal wall encloses the abdominal cavity.

It can be divided into the anterolateral section and the posterior section.

Function of the abdominal wall

The abdominal wall functions to:

1. protect the internal abdominal organs (abdominal viscera)
2. Stabilization and rotation of the trunk
3. Increase of intra-abdominal pressure (forceful expiration, coughing, vomiting).

Anterolateral abdominal wall

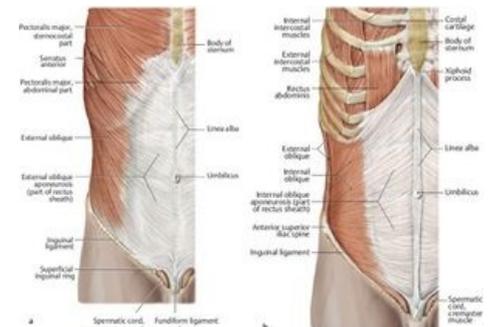
The Anterolateral abdominal wall consists of four main layers:

1. Skin
2. Superficial fascia
3. Muscles (and associated fascia)
4. Parietal peritoneum

Muscles of the Anterolateral abdominal wall

The muscles in the Anterolateral abdominal wall can be divided into 2 groups:

1. Flat muscles-
 1. The fibers of the flat muscles run in different directions and cross each other, decreasing the likelihood of the abdominal viscera herniating through them.
 2. In the medial aspect (anteromedial area), each flat muscle creates an aponeurosis (a broad, flat tendon), covering the rectus muscle. The aponeurosis of all of the flat muscles is the Linea alba (a fibrous structure extending from the xiphoid process of the sternum to the pubic symphysis).
2. Vertical muscles



Muscles of the abdominal wall. Right side, anterior view. Superficial abdominal wall muscles. Removed: external oblique, pectoralis major, and serratus anterior.

Flat muscles:

Name	Origin	Insertion	Innervation	Function
External oblique (Fibers run inferomedially)	Ribs 5-12	Iliac crest and pubic tubercle	Thoraco-abdominal nerves (T7-T11) and subcostal nerve	Contralateral rotation of torso
Internal oblique (Fibers run superomedially)	Inguinal ligament, iliac crest, lumbodorsal fascia	Ribs 10-12	Thoraco-abdominal nerves (T7-T11) and subcostal nerve	Bilateral contraction compresses the abdomen Unilateral contraction causes ipsilateral rotation of torso
Transversus abdominis (Fibres run transversely)	Inguinal ligament, costal cartilages 7-12, iliac crest, thoracolumbar fascia	Xiphoid process, pubic crest and linea alba	Thoraco-abdominal nerves (T7-T11) and subcostal nerve	Compression of abdomen

Vertical muscles:

Name	Origin	Insertion	Innervation	Function
Rectus abdominis	Pubic crest	Xiphoid process and costal cartilages 5-7	Thoraco-abdominal nerves (T7-T11)	Compresses abdominal viscera and stabilises pelvis during walking
Pyramidalis	Pubic crest and pubic symphysis	Linea alba	Subcostal nerve	Tenses the linea alba

Mnemonic to remember the anterolateral abdominal wall muscles:

TIRE Pump

Transversus abdominis, **I**nternal oblique, **R**ectus abdominis, **E**xternal oblique, **P**yramidalis

Fascias of the Anterolateral abdominal wall

The skin is the most superficial layer of the anterolateral abdominal wall.

The superficial fascia is located just below the skin, and consists of connective tissue.

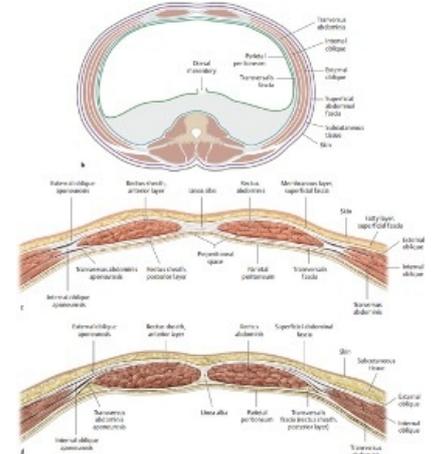
Superficial fascia

The superficial fascia can be seen both superiorly and anteriorly to the umbilicus, and has different composition in each part.

Above the umbilicus- The superficial fascia is continuous and is made of one layer.

Below the umbilicus- The superficial fascia divides into 2 layers:

1. Superficial Camper's fascia- A thick fatty layer. Its thickness varies.
2. Deep Scarpa's fascia- A thinner and more dense membranous layer. It overlies the muscle layer of the abdominal wall and attaches to the Linea alba and Pubic symphysis. It fuses with the Fascia lata (deep fascia of the thigh) below the inguinal ligament.



Relationship between rectus sheath and the parietal peritoneum and transversalis fascia. Section through the abdominal wall superior to the arcuate line. Section through the abdominal wall inferior to the arcuate line.

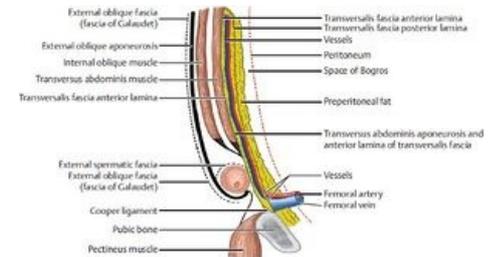
Posterior abdominal wall

Muscles of the posterior abdominal wall

The posterior abdominal wall is supported by the 12th thoracic vertebrae as well as all 5 lumbar vertebrae.

There are between 3 to 4 muscles in the posterior abdominal wall, depending on the individual: Quadratus lumborum, Psoas major, Iliacus, Psoas minor (Psoas minor muscle is only present in 40% of the population).

Only the quadratus lumborum is a 'true' posterior abdominal muscle, as all other muscles extend into the lower limb.



Sagittal cross section of the lower abdominal wall

Name	Origin	Insertion	Innervation	Function
Quadratus lumborum	Iliac crest and iliolumbar ligament	Transverse process of L1-L4 and inferior border of rib 12	Anterior rami of T12-L4	Extension and lateral flexion of vertebral column.
Psoas major	Transverse processes and vertebral bodies of T12-L4	Lesser trochanter of femur	Anterior rami of L1-L3	Flexion of thigh. Lateral flexion of vertebral column.
Iliacus	Iliac fossa	Lesser trochanter of femur	Femoral nerve L2-L4	Thigh flexion and external rotation. Trunk flexion.
Psoas minor	Originates from the vertebral bodies of T12 and L1	Pectineal line of pubis	Anterior rami of L1	Flexion of vertebral column.

Fascias of the posterior abdominal wall

The fascias of the posterior abdominal wall lie immediately below the skin and subcutaneous tissue.

Thoracolumbar fascia

A large, diamond shaped area of connective tissue. It is formed by the thoracic and lumbar parts of the deep fascia.

It is divided into 3 layers: Anterior, Middle, posterior.

- The Quadratus femoris muscle is enclosed between the anterior and middle layers.
- The deep back muscles are enclosed between the middle and posterior layers.

Psoas fascia

The psoas fascia is more profound to the anterior layer of the thoracolumbar fascia, and it covers the Psoas major muscle.

It is continuous with the thoracolumbar fascia laterally and with the iliac fascia inferiorly.

Sources

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