# HATAHET ANATOMY

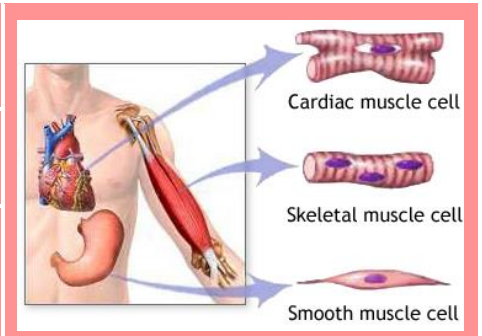
## The Muscular System

Lecture: 7,8,9

Pages: 21

# Lectures 7,8,9: The Muscular System

Muscles of the human body are classified according to their **microscopic anatomy**, **distribution**, and **factors control their contraction into** 3 types:

| Muscle | Location | Striation | Function | Type of control | Illustration |
|---|---|---|---|---|---|
| Skeletal muscles | Around the skeleton | Striated | Contracts to move the skeleton | Voluntary |  |
| Cardiac muscles | Heart myocardium | Striated | Pumps the blood out of the heart into the vessels | Involuntary | |
| Smooth muscles | Walls of hollow structures, like: (blood vessels, airways, GIT) | Non-striated | Controls different unconscious activities, like digestion, breathing, and glands secretion | Involuntary | |



❖ Skeletal muscles have the power of **pulling** (**muscles never push**) in different directions by contraction, and its main functions are:

❶ Production of movements; either total (as a group of muscles) or localized (as an individual muscle)
❷ Stabilizing body position and posture
❸ Storing and moving substances in body, like: (Calcium ions)
❹ Heat production "Thermogenesis"; as skeletal muscles are rich in mitochondria

❖ Properties of muscle tissue:

❶ Contractility, the ability to contract
❷ Excitability, the ability to respond to stimuli by producing action potential
❸ Extensibility, the ability to stretched without being damaged; each muscle fiber can stretch up to 50 cm in length
❹ Elasticity, the ability to return to original shape and length

# Introduction to Skeletal muscles

## Surface Anatomy

- **Belly (Body)**: the reddish bulky portion of the muscle that have the ability to produce contractions, and muscles can have 1 or more bellies
- **Tendon**: the white tough CT that attaches the muscle to bones of the skeleton, can be rope-like or flat (**Aponeurosis**)

## Histology

### Skeletal muscle tissue (Muscle → Fascicle → Muscle Fiber → Myofibrils → Filaments)

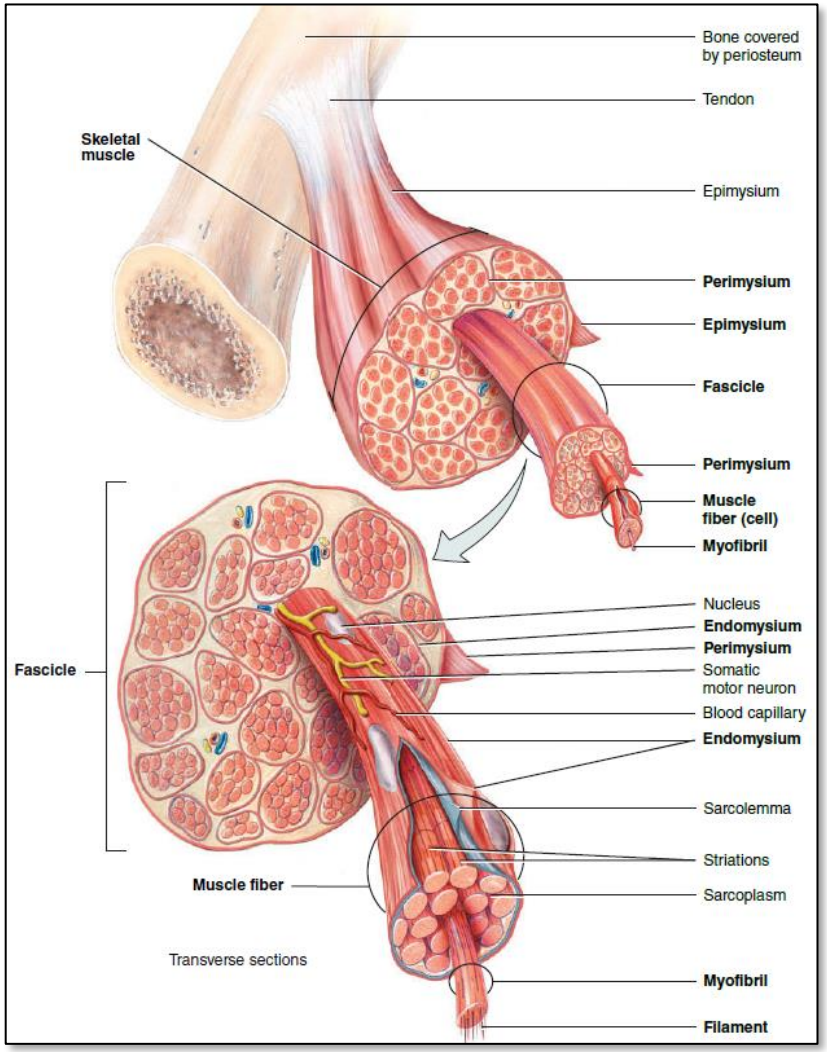
- Fascicle, a bundle of muscle fibers, and a bundle of fascicles make up the skeletal muscle
- Muscle fiber (Muscle cell), a bundle of myofibrils
- Myofibril, the functional unit of the skeletal muscles, made up of **Sarcomere** (القطعة العضلية)
- Filaments, the contractile protein filaments Myosin & Actin

### Connective tissue coverings

- Endomysium, wraps around each muscle fiber
- Perimysium, wraps around each muscle fascicle
- Epimysium, wraps around the surface of each skeletal muscle

***Notes:

- The collection of the 3 CT coverings of a skeletal muscle makes up the tendon of this muscle
- The summation of the contraction of all muscle fibers in the belly will be transmitted into the tendons by the connective tissue coverings, causing the skeleton to move



## Properties of Skeletal muscles

- **Origin**, the attachment to the **FIXED** bone part, it is usually the proximal/superior attachment point
- **Insertion** the attachment to the **MOVABLE** bone part, it is usually the distal/inferior attachment point
- **Action**, muscles exert forces on tendons, and tendons pull on the skeleton or skin to cause the movements, these movements are described in relation to bone, joint, or region. There are 2 types of muscle actions:
  - Standard Muscle Action (SMA) → Origin is fixed & Insertion is movable
  - Reversed Muscle Action (RMA) → Origin and Insertion are switched; Origin is movable & Insertion is Fixed
- **Innervation**, composed of 1 nerve that controls the contractility of the muscle
- **Blood supply**, composed of 1 artery & 2 veins for each muscle

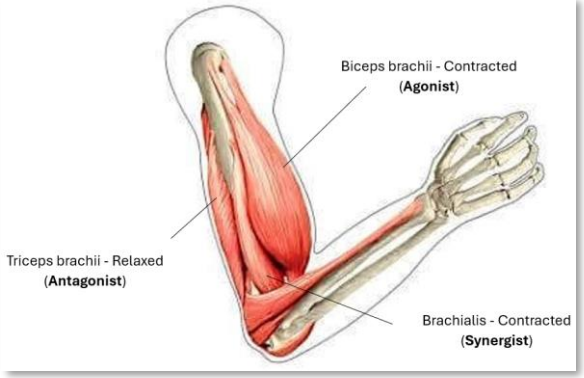
***Notes:

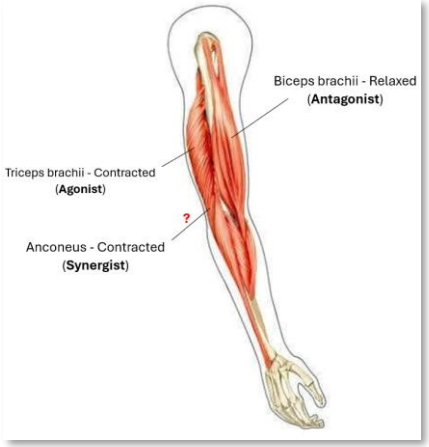
- Muscles that move a body part do NOT cover that part (discussed in the video)
- Articulating bones do NOT move equally in response to contraction, for example, when forearm is flexed at elbow joint, it is flexed anteriorly, but when leg is flexed at knee joint, it is flexed posteriorly, even though both joints had the same movement
- Muscles work in groups to maximize efficiency; small muscles contract first then larger muscles contract after "**small muscles initiate movement, large muscles terminate it**"

## Types of Skeletal muscles

- **Agonist (Prime mover)** → contracts to produce the desired movement
- **Antagonist** → contracts to produce the **OPPOSITE** of desired movement
- **Synergist** → smaller muscles that contract to initiate and assist the prime mover, or to stabilize the ORIGIN of the agonist

***Note: Antagonists for one movement can be an agonist for another



# Classification of Skeletal muscles

## Size

| | |
|---|---|
| Maximus | Largest |
| Minimus | Smallest |
| Longus | Long |
| Brevis | Short |
| Latissimus | Widest |
| Longissimus | Longest |
| Magnus | Large |
| Major | Larger |
| Minor | Smaller |
| Vastus | Huge |

## Shape

| *Term* | *English* | *Arabic* |
|---|---|---|
| Deltoid | Triangular | مثلث |
| Trapezius | Trapezoid | شبه منحرف |
| Serratus | Saw-toothed | أسنان المنشار |
| Rhomboid | Diamond-shaped | شبه الألماس ◆ |
| Orbicularis | Circular | دائري |
| Pectinate | Comb-shaped | شبه المشط |
| Piriformis | Pear-shaped | شبه حبة الإجاص |
| Platys | Flat | مسطّح |
| Quadratus | Square; 4-sided | رباعي الأضلاع |
| Gracilis | Slender | رفيع و نحيل |

## Action

| | |
|---|---|
| Flexor | Decreases the angle of a joint |
| Extensor | Increases the angle of a joint |
| Abductor | Moves a bone away from the midline |
| Adductor | Moves the bone towards the midline |
| Levator | Elevates a body part |
| Depressor | Depresses a body part |
| Supinator | Turns palm anteriorly |
| Pronator | Turns palm posteriorly |
| Tensor | Makes a body part rigid |
| Rotator | Rotates a bone around its axis |

## Number of Origins

| | |
|---|---|
| Biceps | Two origins |
| Triceps | Three origins |
| Quadriceps | Four origins |

## Direction of muscle fibers

| | |
|---|---|
| Rectus | Parallel to midline (Straight) |
| Transverse | Perpendicular to midline |
| Oblique | Diagonal to midline |

## Location of attachment (O/I)

Sites of origin & insertion, **ex: (Sternocleidomastoid)**, originating on the sternum and clavicle and inserting on mastoid process of temporal bone

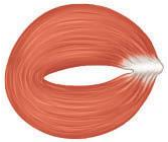
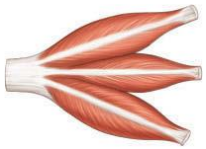
## Location of muscle

Structure near which a muscle is found, **ex: (Temporalis)**, a muscle near the temporal bone

## Relative position

| | |
|---|---|
| Externus (Superficialis) | Visible at body surface |
| Internus (Profundus) | Deep under the superficial muscles |
| Extrinsic muscles | Muscles located outside the organ |
| Intrinsic muscles | Muscles located inside/within the organs |

# Arrangement of fibers/fascicles

| Classification | Description | Illustrations |
|---|---|---|
| **Fusiform** | Muscle fibers/fascicles are arranged in a spindle shape to form a bulky portion at the center called (Belly) and terminate into flat tendons<br>**Ex: (Biceps brachii)** |  |
| **Parallel** | Muscle fibers/fascicles run parallel to the long axis of the muscle and terminate into flat tendons<br>**Ex: (Sartorius)** |  |
| **Convergent** | Muscle fibers/fascicles converge from a broad origin to a single thick tendon<br>**Ex: (Pectoralis major)** |  |
| **Circular** | Muscle fibers/fascicles are arranged in a circular way around an orifice (opening) to form a sphincter-like muscle<br>**Ex: (Orbicularis oris)** |  |
| **Unipennate** | Fascicles are arranged on only one side of tendon<br>**Ex: (Extensor digitorum longus)** |  |
| **Bipennate** | Fascicles are arranged on both sides of centrally positioned tendons<br>**Ex: (Rectus femoris)** |  |
| **Multipennate** | Fascicles attach obliquely from many directions to several tendons<br>**Ex: (Deltoid: anterior, lateral, posterior)** |  |

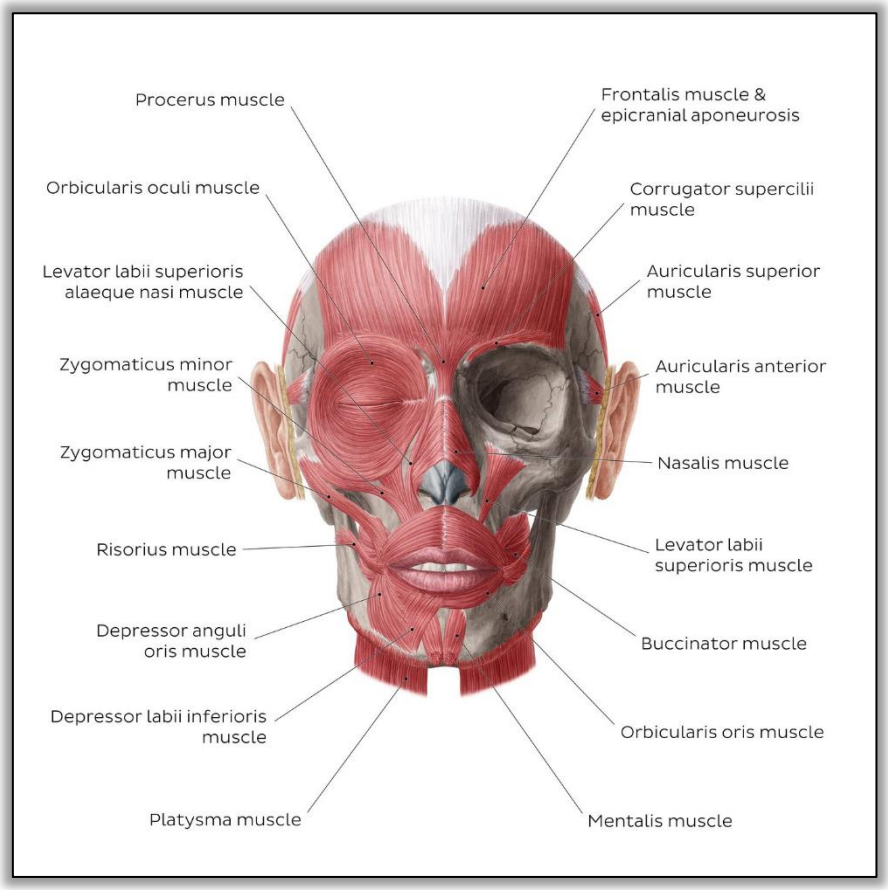
***Note: All the muscles in the body are named according to the previous categories, EXCEPT: **Platysma** & **Diaphragm**

# Muscles of Axial Skeleton

## Muscles of the Head

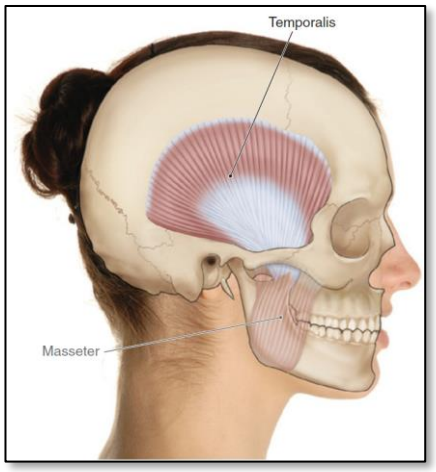
**[1] Muscles of Facial expression**, the muscles that express human's facial expressions & open the mouth and eyes

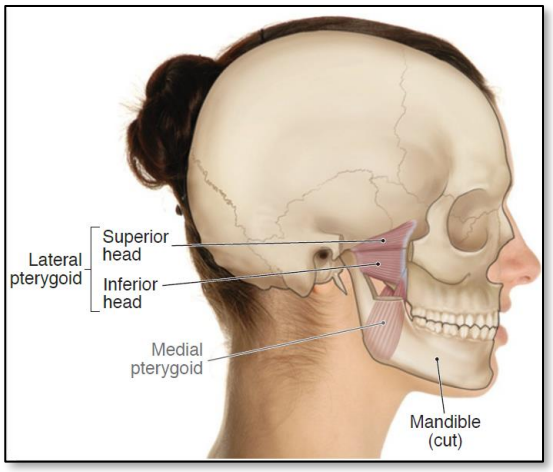
| Muscles of Facial expression | | | |
|---|---|---|---|
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Occipitofrontalis** | **Frontal belly**: Frontal bone<br>**Occipital belly**: Occipital bone | Epicranial aponeurosis | Draws scalp anteriorly & posteriorly |
| **Corrugator supercilii** | Superciliary arch | Skin of eyebrow | Draw eyebrows inferiorly |
| **Orbicularis oculi** | Medial wall of orbit | Circular path around the orbit | Closes eyes |
| **Zygomaticus major** | Zygomatic bone | Skin at angles of the mouth | Draws angles of mouth laterally |
| **Zygomaticus minor** | Zygomatic bone | Upper lip | Elevates upper lip |
| **Buccinator** | Alveolar processes | Fibers of orbicularis oris | Presses cheeks against teeth |
| **Risorius** | Parotid gland fascia | Skin at angles of the mouth | Draws mouth laterally, as in 😬 |
| **Orbicularis oris** | Muscles around the mouth | Skin at corner of the mouth | Constricts mouth opening |
| **Levator labii superioris** | Maxilla | Skin at angles of the mouth | Elevates upper lip |
| **Levator anguli oris** | Maxilla | Skin of lower lip | Draws angles of mouth superiorly |
| **Depressor labii inferioris** | Mandible | Skin of lower lip | Depresses lower lips |
| **Depressor anguli oris** | Mandible | Angle of mouth | Draws angle of mouth inferiorly |
| **Mentalis** | Mandible | Skin of chin | Elevates skin of chin up, as in ☹ |
| **Platysma** | Deltoid & Pectoralis major fascia | Mandible | Depresses the mandible |



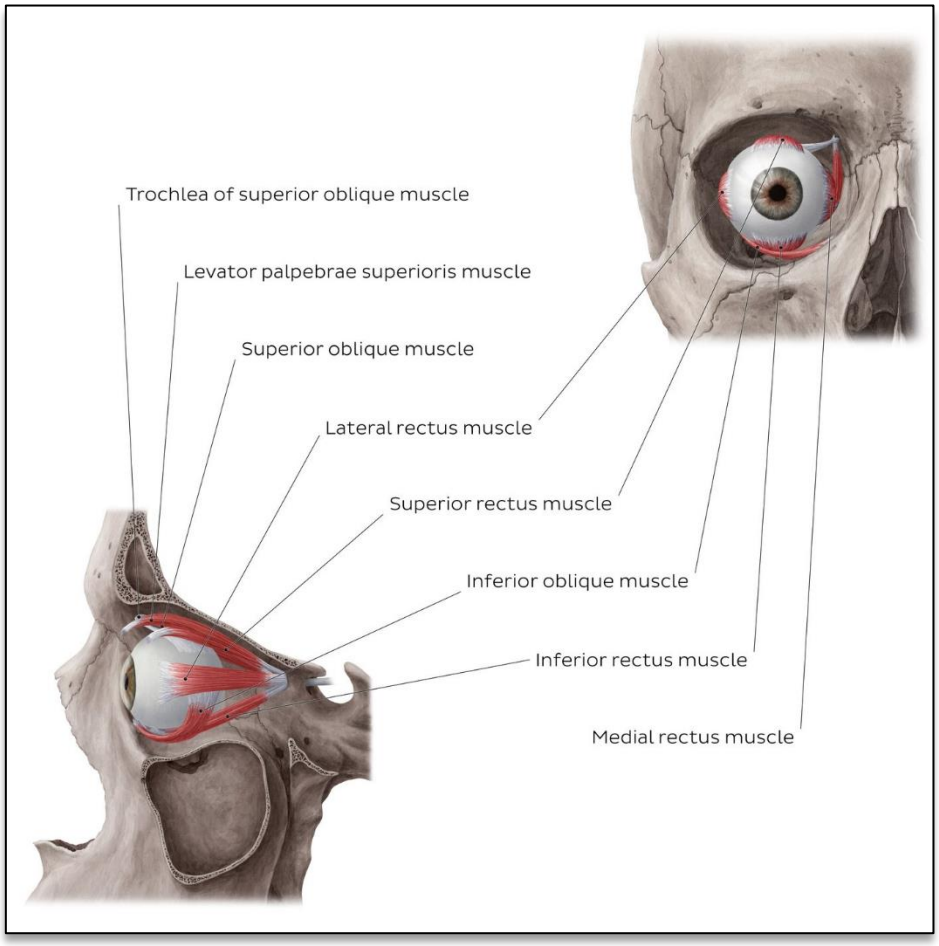
**[2] Muscles of Mastication**, the muscles that aid in mastication by moving the mandible

| Muscles of Mastication | | | |
|---|---|---|---|
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Temporalis** | Temporal bone | Mandible | Elevates & Retracts mandible |
| **Masseter** | Zygomatic arch | | Elevates mandible |
| **Medial pterygoid** | Pterygoid process | | Elevates & Protracts mandible |
| **Lateral pterygoid** | Pterygoid process | | Depresses & Protracts mandible |




**[3] Muscles of the Eye**, muscles that move the eyeball and the eyelids, these 7 muscles are in the image here:



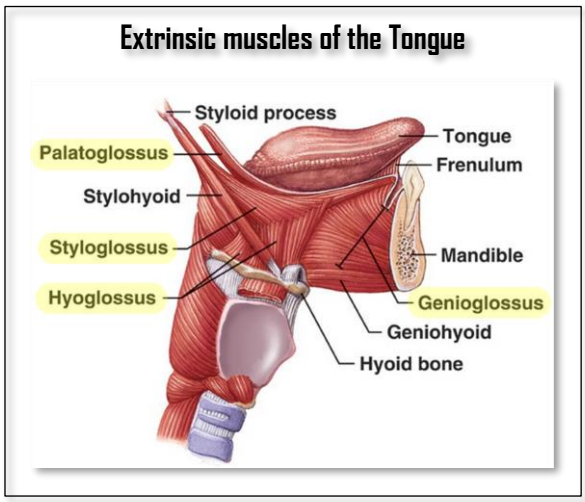
**[4] Muscles of the Tongue**, muscles that manipulate the shape of the muscle and aid in speech, divided into:

**A. Intrinsic muscles** (مش مطلوب بس عشان تكمل الصورة), muscles that originate & insert into the tongue itself, those are 3:

- Longitudinal muscles
- Vertical muscles
- Transverse muscles

**B. Extrinsic muscles**, muscles that originate outside the tongue & insert within the tongue itself, those are 4:

- Genioglossus
- Styloglossus
- Hyoglossus
- Palatoglossus




## ❖ Innervation of muscles of the Head ❖

- **Muscles of Facial expressions** → Facial nerve (**CN VII**)
- **Muscles of Mastication** → Trigeminal nerve (**CN V**)
- **Muscles of the Eye** → Oculomotor nerve (**CN III**), Trochlear nerve (**CN IV**), Abducent nerve (**CN VI**)
- **Muscles of Tongue** → Vagus nerve (**CN X**), Hypoglossal nerve (**CN XII**)

## Muscles of the Neck

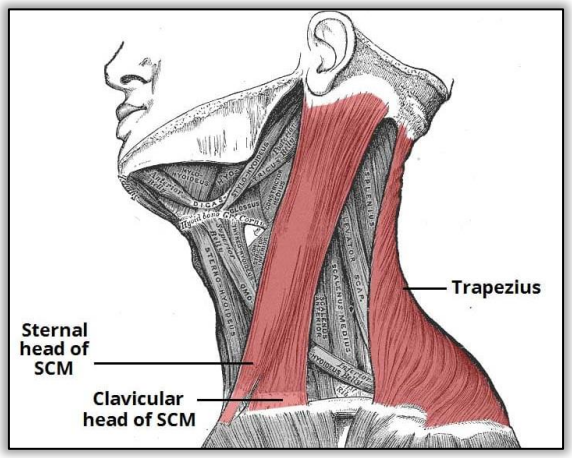
### Important landmarks of the Neck

#### Sternocleidomastoid (SCM)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Sternal head** | Manubrium sterni | Mastoid process of temporal bone | **Unilateral**: rotates the head<br>**Bilateral**: flexes the head |
| **Clavicular head** | Clavicle | | |

#### Trapezius

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Superior fibers** | Occipital bone<br>Vertebra C7 | Clavicle<br>Acromion process of scapula<br>Spine of scapula | **Unilateral**: laterally flex head<br>**Bilateral**: extends the head |



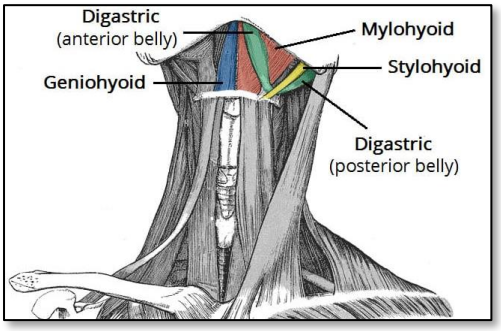
# Anterior muscles of the neck

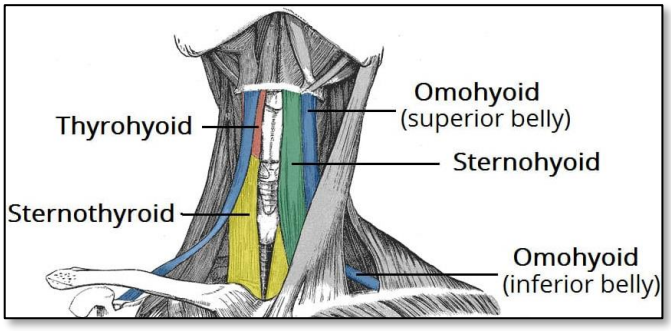
## Suprahyoid muscles

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Digastric muscle** | **Anterior belly**: Mandible<br>**Posterior belly**: Temporal bone | Hyoid bone | Elevates hyoid bone |
| **Stylohyoid** | Styloid process of temporal bone | | |
| **Mylohyoid** | Mandible | | |
| **Geniohyoid** | Mandible | | |

## Infrahyoid muscles

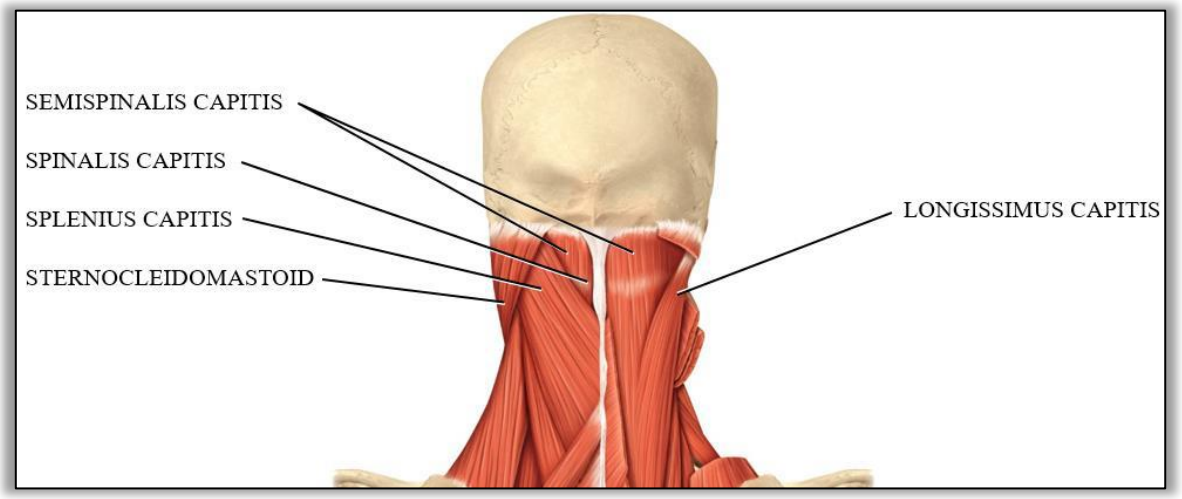
| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Sternohyoid** | Manubrium sterni | Hyoid bone | Depresses hyoid bone |
| **Omohyoid** | Scapula | | |
| **Sternothyroid** | Manubrium sterni | Thyroid cartilage | Depresses thyroid cartilage |
| **Thyrohyoid** | Thyroid cartilage | | Elevates thyroid cartilage |



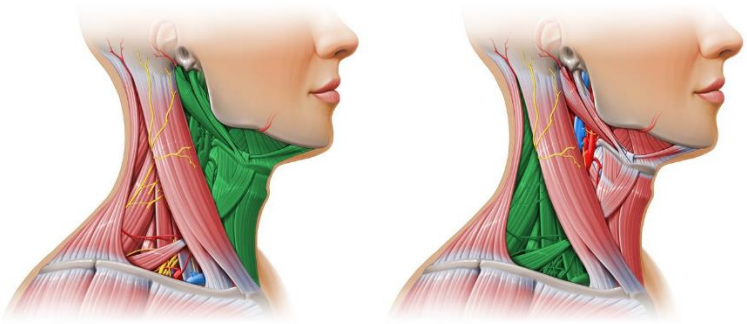

# Posterior muscles of the neck

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Semispinalis** | Cervical & Thoracic vertebrae | Occipital bone | Extends the head |
| **Spinalis capitis** | | | |
| **Splenius capitis** | | | |
| **Longissimus capitis** | | | |



❖ **Triangles of the Neck**: the neck is divided by the **Sternocleidomastoid** into 2 main triangles:

- **Anterolateral triangle** → further divided into 2 triangles
- **Posterior triangle** → covered by Trapezius



Anterolateral Triangle | Posterior Triangle

## Muscles of Respiration

▪ **Respiration**: the process of exchanging the air between the internal and external environment by the mechanism of inhalation & exhalation

• For the respiration to happen, the thorax must change in size:

- **during inspiration**, the diaphragm will contract and move downward, and external intercostal muscles contract to lift the ribs; the thorax increases in size
- **during expiration**, the diaphragm will relax and move upward, and external intercostal muscles relax to depress the ribs; the thorax decreases in size back to normal

• The muscles of respiration are the muscles that produce the contractions needed for inspiration & expiration, these are:

- **Primary respiratory muscles**, the muscles that act directly in respiration, including: (Diaphragm / Intercostal muscles)
- **Secondary respiratory muscles**, are the muscles that help in respiration process indirectly as a secondary function

## [1] Diaphragm (الحجاب الحاجز)

- a dome-shaped muscle that separates the thoracic cavity and the abdominal cavity
- consists of a flat central tendon (aponeurosis) and peripheral muscular portion; a **musculotendinous muscle**
- it is the main agonist respiratory pump and the most important muscle of respiration
- its superior surface blends with the **pericardium** (covering of the heart) and **parietal pleura** (covering of the lungs)
- originates during embryonic life in the neck and descends downward as human develops
- innervated by the Phrenic nerve (C 3,4,5 nerves)
- has 3 openings:

**1) Median opening (Aortic hiatus - T12)**

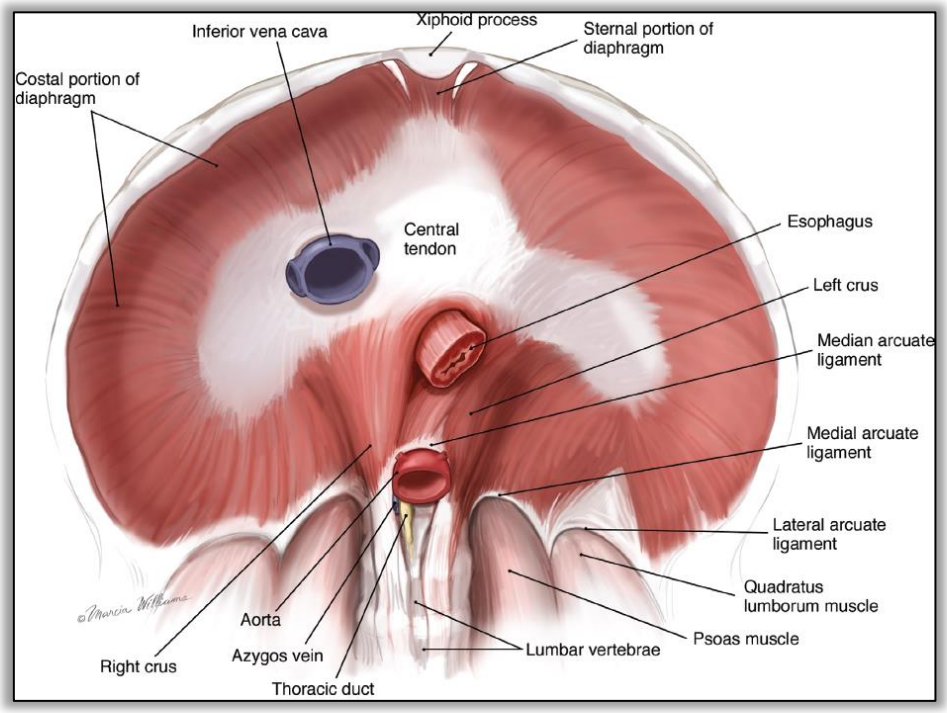
- passes: (Aorta / Azygos vein / Thoracic duct)
- made by the median arcuate ligament of the right and left crura

**2) Medial opening (Esophageal hiatus - T10)**

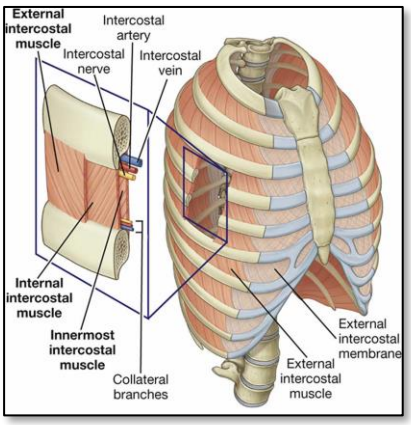
- passes: (Esophagus / Vagus nerve - CN X)
- made by the right crus only

**3) Lateral opening (Caval opening - T8)**

- passes: (Inferior vena cava) as it ascends to empty in the heart




## [2] Intercostal muscles




- 3 pairs of oblique muscles located at the intercostal spaces
- their function is to promote the movement of ribs during breathing
- innervated by the Intercostal neurovascular junction (VAN - NAV)
- these muscles are:

A. **External intercostal**, (anterior + inferior) "as if you put your hands on your pockets"
B. **Internal intercostal**, (posterior + inferior)
C. **Innermost intercostal**, (posterior + inferior)

| Primary muscles of Respiration | | | |
|---|---|---|---|
| **Diaphragm** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Diaphragm** | **Vertebral origin**: lumbar vertebrae<br>**Costal origin**: 7th - 12th ribs<br>**Sternal origin**: xyphoid process | Central aponeurosis | **Contraction**: increases the vertical length of thoracic cavity<br>**Relaxation**: decreases the vertical length of thoracic cavity |
| **Intercostal muscles** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **External intercostal** | Inferior border or rib above | Superior border of rib below | Elevates ribs during inhalation |
| **Internal intercostal** | Superior border of rib below | Inferior border or rib above | Draws adjacent ribs together to further decrease the size of thoracic cavity during **forced exhalation** |
| **Innermost intercostal** | | | |

# Muscles of Abdominal wall

## [1] Muscles of Anterolateral abdominal wall

### A. Rectus abdominis (six-packs)

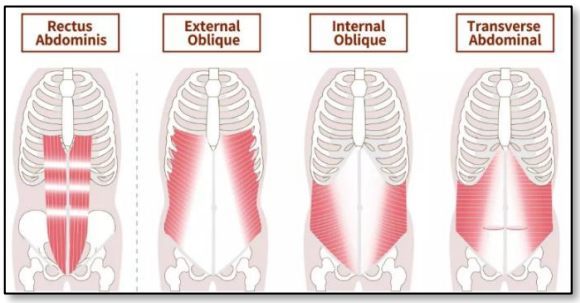
- the most anterior muscle of the abdomen
- covered from both sides by a flat CT sheet called (**Rectus sheath**), composed of 2 parts:

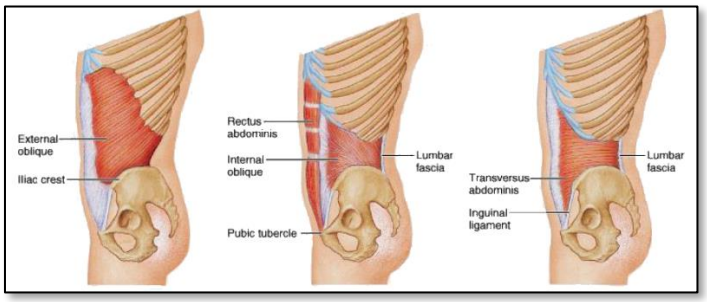
  - Anterior sheath → made of: (External aponeurosis & anterior ½ Internal aponeurosis)
  - Posterior sheath → made of: (Transverse aponeurosis & posterior ½ Internal aponeurosis)

- this muscle is crossed by 3 horizontal fibrous bands called (**Tendinous intersections**):

  - One at the level of umbilicus
  - One at the level of xiphoid process
  - One is located midway between the other two

### B. Oblique abdominal muscles




## Muscles of Abdominal walls

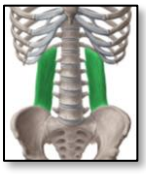
### Muscles of Anterolateral wall

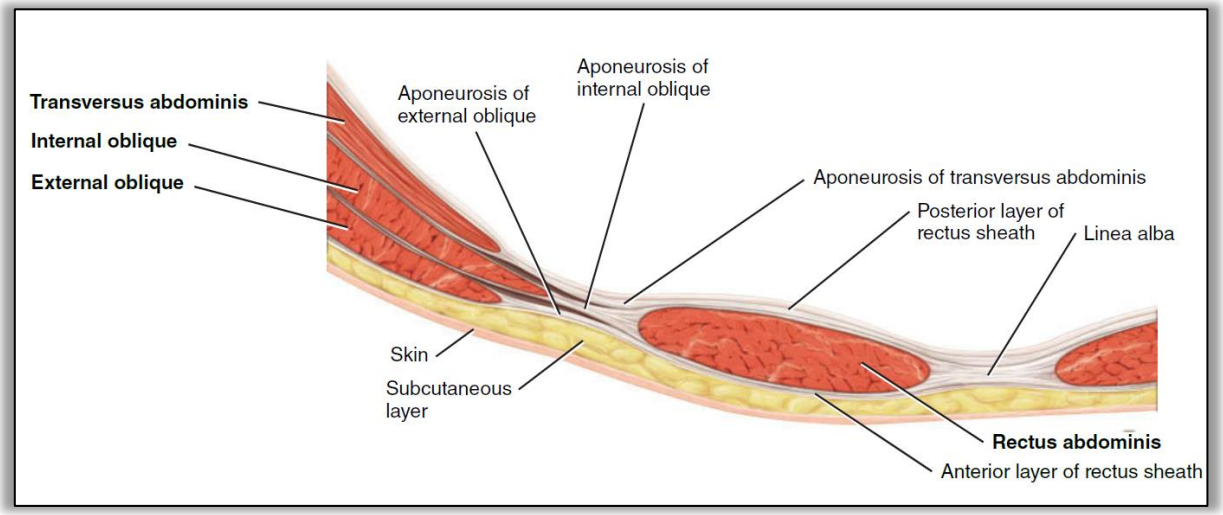
| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Rectus abdominis** | Pubic crest<br>Pubic symphysis | Lower costal cartilages<br>Xiphoid process | Compress abdomen during urination, defecation, forced exhalation, and childbirth<br><br>**All except Rectus abdominis**: Flex vertebral column |
| **External oblique** | Lower ribs | Iliac crest<br>Linea alba | |
| **Internal oblique** | Iliac crest<br>Inguinal ligament | Lower costal cartilages<br>Linea alba | |
| **Transversus abdominis** | Iliac crest<br>Inguinal ligament<br>Lower costal cartilages | Xiphoid process<br>Linea alba | |

### Muscles of Posterior wall

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Quadratus lumborum** | Iliac crest | Inferior border or the 12$^{th}$ rib<br>Lumbar vertebrae | Laterally flexes the vertebral column at lumbar region |

## [2] Muscles of Posterior abdominal wall → Quadratus lumborum






## ❖ Structures of the abdominal wall ❖

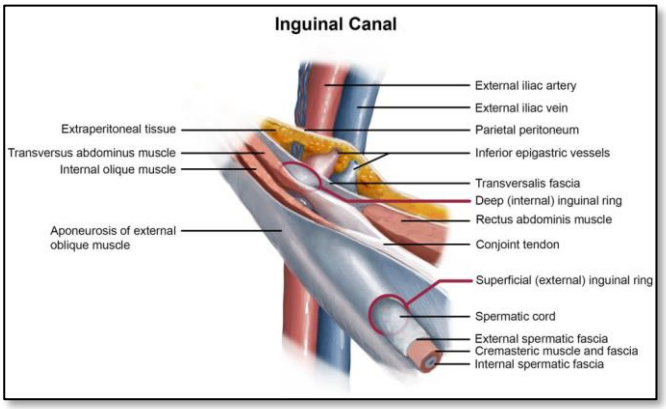
### ➢ Linea alba

- a fibrous connective tissue band, located at the midline
- extends from the xiphoid process to pubic symphysis
- formed by the R&L rectus sheaths when they meet medially

### ➢ Inguinal ligament

- long ligament that runs obliquely at each hip bone
- extends from the ASIS (Anterior Superior Iliac Spine) to pubic tubercle
- formed by the thickening of the lower free border of the aponeurosis of **external oblique muscle**

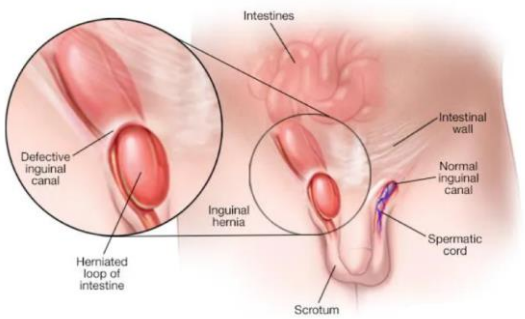
### ➢ Inguinal canal




- a passage in the lower anterior abdominal wall, just above the inguinal ligament
- allows some structures to pass through:
  - Males → Cremasteric muscle, Spermatic cord
  - Females → Round ligament of uterus
  - Both genders → Ilioinguinal nerve
- has 2 openings/rings
  - Superficial inguinal ring, the outer opening, made by the external oblique aponeurosis
  - Deep inguinal ring, the inner opening, made by the transversalis fascia

## ❖ Clinical correlation: Inguinal hernia ❖

- it is the protrusion of a part of the small intestine due to rupture or trauma in the inguinal area
- more common in males; as they have larger inguinal canal which is a weak area in the abdominal wall
- Treatment → Surgical repair



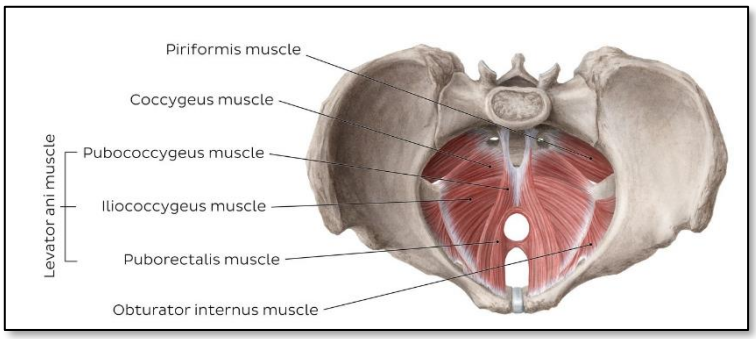
## Muscles of Pelvis

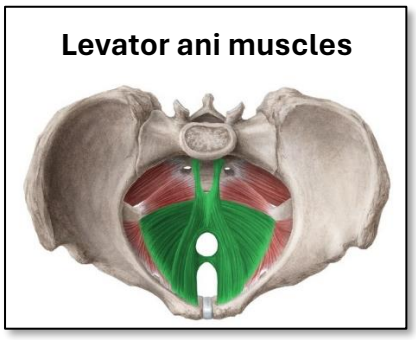
### [1] Muscles of Pelvic floor

- made mainly of the **Levator ani muscles** & assisted by the **Coccygeus muscle**
- with the surrounding connective tissue, muscles of the pelvic floor are called the (**Pelvic diaphragm**)

### [2] Muscles of Perineum

- perineum is the region of the trunk below the pelvic diaphragm
- has a diamond shape ◆
- has 2 layers of muscles: (**Superficial group** & **Deep group**)



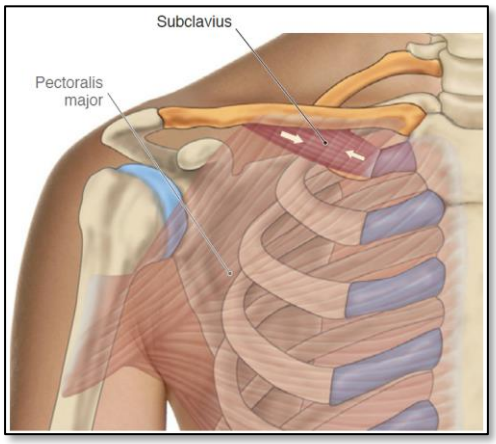

# Muscles of Appendicular Skeleton

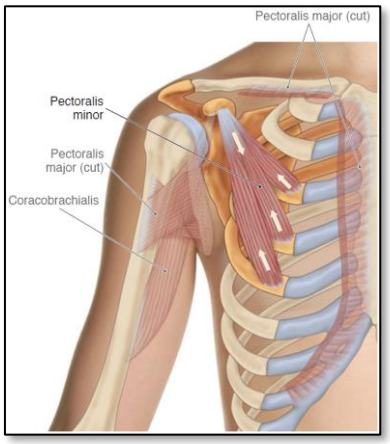
## Muscles of Upper lumbs

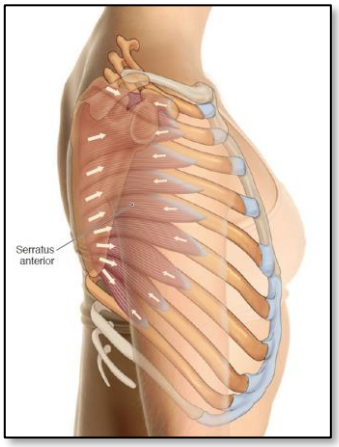
### [1] Muscles of Pectoral girdle

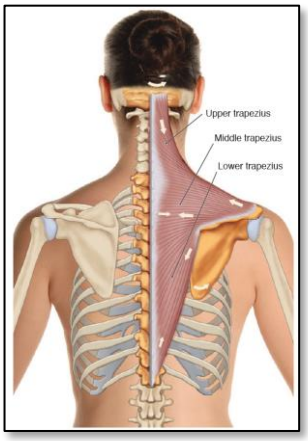
- these muscles move the pectoral girdle and stabilize it
- movements of the scapula follows that of the humerus; as they are attached to each other at the shoulder joint, ex: "Lateral rotation of scapula causes the abduction of humerus at the glenohumeral joint"

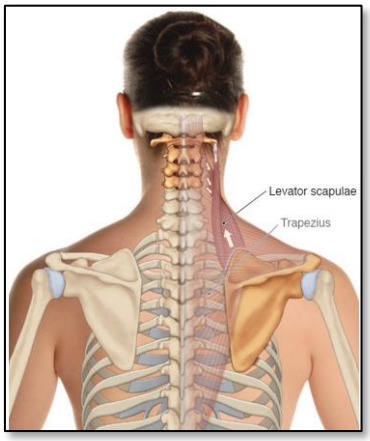
| Muscles of Pectoral girdle | | | |
|---|---|---|---|
| **Anterior muscles** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Subclavius** | Rib 1 | Clavicle | Depresses, abducts, and laterally rotates the scapula (Stabilizing the scapula) |
| **Pectoralis minor** | Ribs 2-5 | Scapula | |
| **Serratus anterior** | Ribs 2-9 | Scapula | |
| **Posterior muscles** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Trapezius** | Occipital bone & Vertebrae | Clavicle & Scapula | Elevates, adducts, and medially rotates the scapula (Stabilizing the scapula) |
| **Levator scapulae** | Vertebrae | Scapula | |
| **Rhomboid major** | Vertebrae | Scapula | |
| **Rhomboid minor** | Vertebrae | Scapula | |

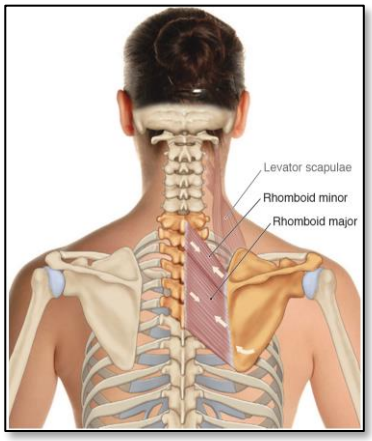


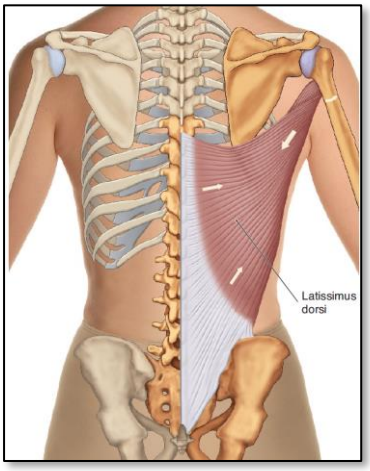



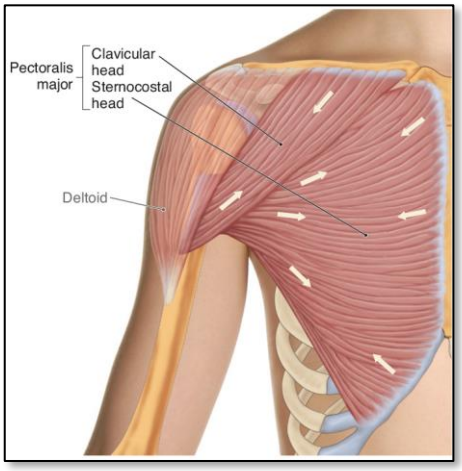

## [2] Muscles of Thorax and Shoulder that move the humerus (Cross shoulder joint)

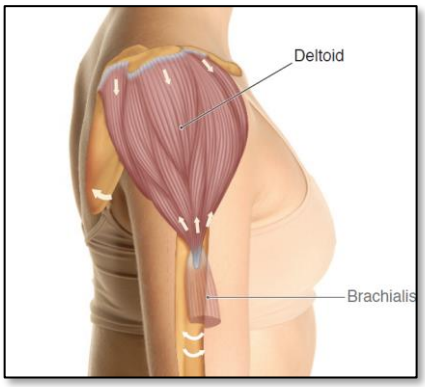
| Muscles of Thorax & Shoulder acting on Humerus | | | |
|---|---|---|---|
| **Axial muscles (Originate from axial skeleton)** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Latissimus dorsi** | Vertebral column | Humerus, anteriorly | Adduct, Flex & Medially rotate the humerus |
| **Pectoralis major** | Clavicle, Sternum, Costal C. | | |
| **Scapular muscles (Originate from scapula)** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Deltoid** | **Anterior fibers** → Clavicle<br>**Lateral fibers** → Acromion<br>**Posterior fibers** → Spine | Humerus, laterally | **Anterior fibers** → flex & medially rotate humerus<br>**Lateral fibers** → abducts humerus<br>**Posterior fibers** → extend & laterally rotate humerus |
| **Coracobrachialis** | Coracoid process | Humerus, medially | Flexes & adducts humerus |
| **Teres major** | Scapula | Humerus | Extends & Adducts humerus |
| **Teres minor** | Scapula | Around the head of humerus | Stabilize the Glenohumeral joint |
| **Subscapularis** | | | |
| **Supraspinatus** | | | |
| **Infraspinatus** | | | |

▪ **Rotator cuff muscles:** deep muscles that strengthen and stabilize the shoulder joint by reinforcing/pressing the humerus against the glenoid cavity of scapula with their flat tendons (like a cuff)

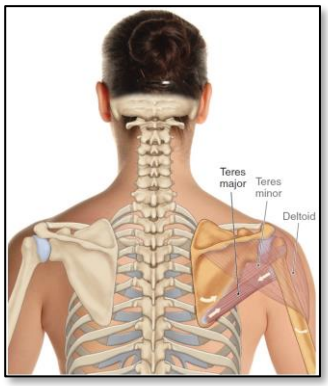
***Note**: Deltoid is the site of intramuscular injections (vaccines)



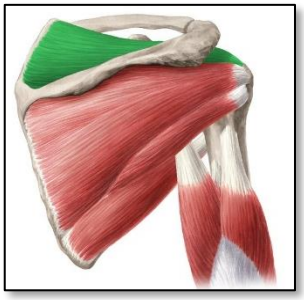



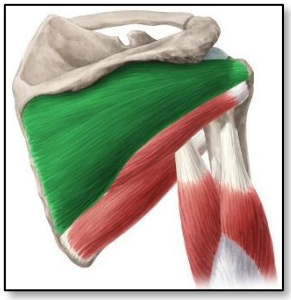




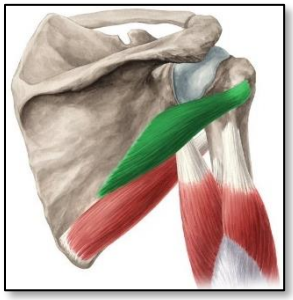

Supraspinatus



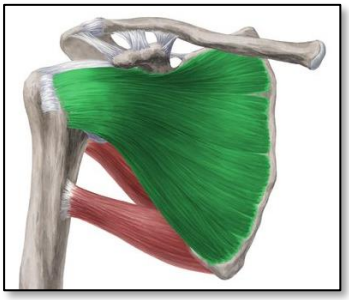
Infraspinatus



Teres minor

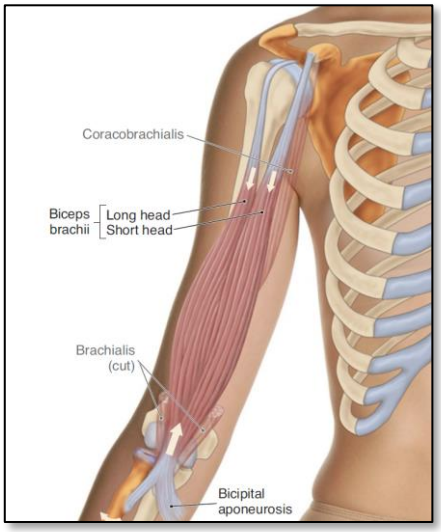


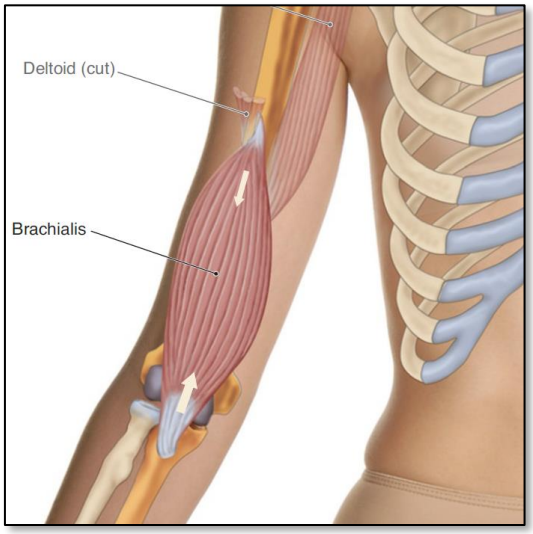
Subscapularis

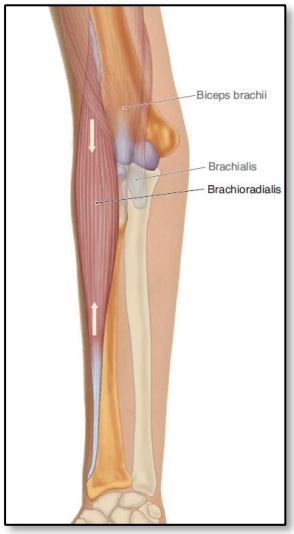


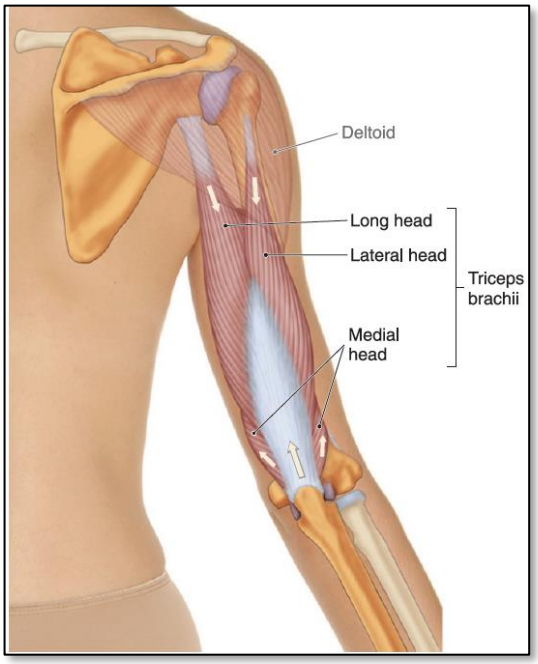
## [3] Muscles of Arm that move Forearm

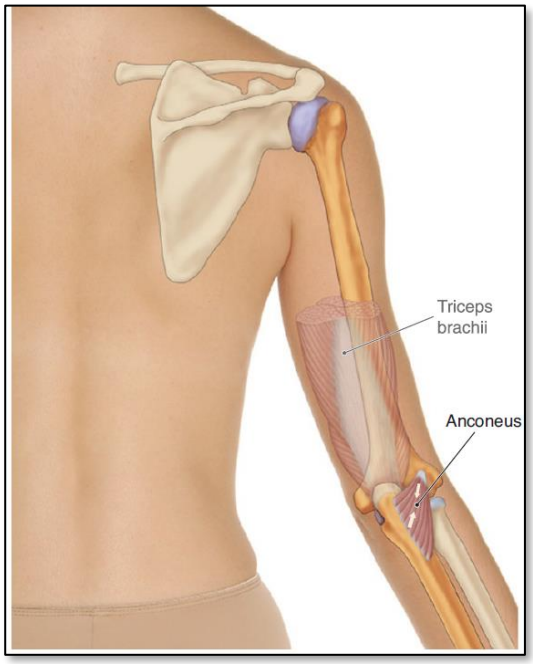
| Muscles of Arm acting of Forearm | | | |
|---|---|---|---|
| **Anterior muscles (Flexors compartment)** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Biceps brachii** | Long head → Supraglenoid tubercle<br>Short head → Coracoid process | Radial tuberosity<br>Bicipital aponeurosis | Flexes arm at shoulder joint<br>Flexes forearm at elbow joint |
| **Brachialis** | Humerus | Ulnar tuberosity | Flexes forearm at elbow joint |
| **Brachioradialis** | Humerus | Styloid process of radius | Flexes forearm at elbow joint |
| **Posterior muscles (Extensors compartment)** | | | |
| **Muscle** | **Origin** | **Insertion** | **Action** |
| **Triceps brachii** | Long head → Infraglenoid tubercle<br>Medial head → Posterior surface of humerus<br>Lateral head → Lateral surface of humerus | Olecranon process of ulna | Extends arm at shoulder joint<br>Extends forearm at elbow joint |
| **Anconeus** | Humerus | Olecranon process of ulna | Extends forearm at elbow joint |




## [4] Muscles of Forearm

- these are the muscles that originate in the forearm and act on the wrist, hand, and fingers
- divided into 2 groups of muscles:

### A. Extrinsic muscles of Hand

- they originate out of the hand (mainly distal humerus) and act on the wrist and digits
- their actions include: (Flexion, Extension, Adduction, Abduction)
- these muscles are the ones that mainly move the palm and fingers (i.e. more than the intrinsic muscles)

### B. Intrinsic muscles of Hand

- they originate and insert in the bones of the hand itself
- their main function is to facilitate the fine and precise movements of the hand and fingers

# Muscles of Forearm (Extrinsic muscles of Hand)

## Anterior compartment (Flexor)

| Superficial muscles | | Deep muscles | |
|---|---|---|---|
| **Muscle** | **Origin** | **Muscle** | **Origin** |
| **Flexor carpi radialis** | Medial epicondyle of humerus | **Flexor digitorum profundus** | Medial epicondyle of humerus |
| **Flexor carpi ulnaris** | | **Flexor pollicis longus** | |
| **Flexor digitorum superficialis** | | | |
| **Palmaris longus** | | | |

### Pronators

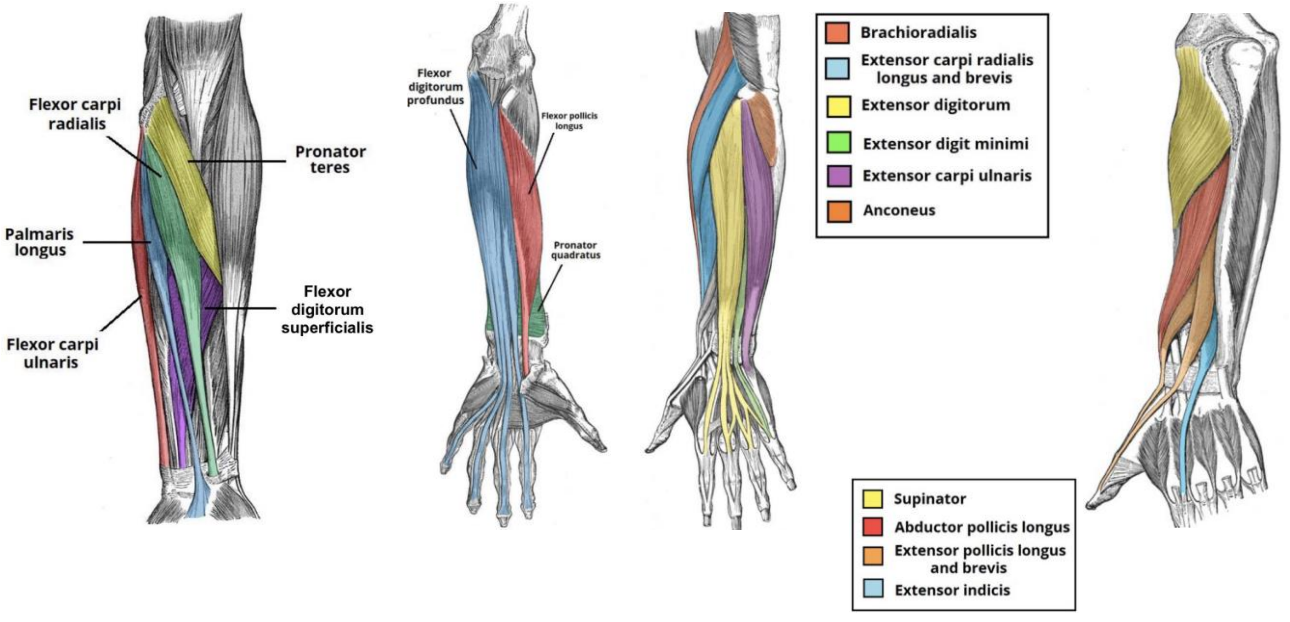
| Muscle |
|---|
| **Pronator teres** |
| **Pronator quadratus** |

## Posterior compartment (Extensors)

| Superficial muscles | | Deep muscles | |
|---|---|---|---|
| **Muscle** | **Origin** | | |
| **Extensor carpi radialis longus** | Lateral epicondyle of humerus | **Abductor pollicis longus** | Lateral epicondyle of humerus |
| **Extensor carpi radialis brevis** | | **Extensor pollicis brevis** | |
| **Extensor carpi ulnaris** | | **Extensor pollicis longus** | |
| **Extensor digitorum** | | **Extensor indicis** | |
| **Extensor digiti minimi** | | | |

### Supinators

| Muscle |
|---|
| **Supinator** |




- **Retinaculum**: bands of fascia that hold the tendons of wrist and ankle in place

# Muscles of Lower limbs

## Muscles of Pelvis acting on Thigh

### Superficial muscles

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Iliacus** | Iliac fossa | Lesser trochanter of femur | Flexes thigh |
| **Psoas major** | Lumbar vertebrae | | |
| **Gluteus maximus** | Ilium | Greater trochanter of femur | Extends & Laterally rotates thigh |
| **Gluteus medius** | | | Abducts & Medially rotates thigh |
| **Gluteus minimus** | | | |
| **Tensor facia latae (TFL)** | | | Maintain extended knee in erect posture |

### Deep muscles

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Piriformis** | Sacrum | Greater trochanter of femur | Abducts & Laterally rotates thigh |
| **Superior gemellus** | Ischial tuberosity | | |
| **Inferior gemellus** | | | |
| **Quadratus femoris** | | | |
| **Obturator externus** | Obturator membrane | | |

## Muscle of Thigh acting on Leg

### Anterior muscles (Extensors of Knee)

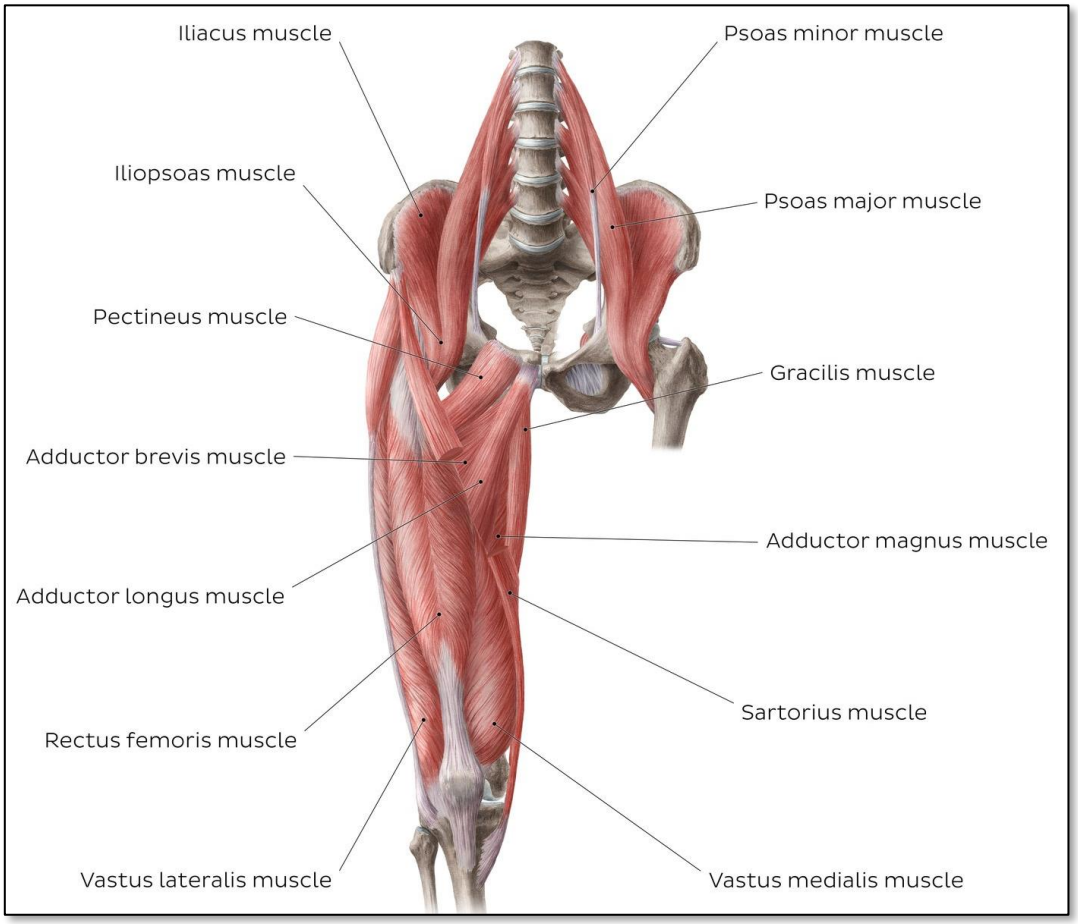
| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Rectus femoris** | AIIS | Patella | Flex thigh at hip joint<br>Extend leg at knee joint |
| **Vastus lateralis** | Femur | | |
| **Vastus intermedius** | | | |
| **Vastus medialis** | | | |
| **Sartorius** | ASIS | Tibia | |

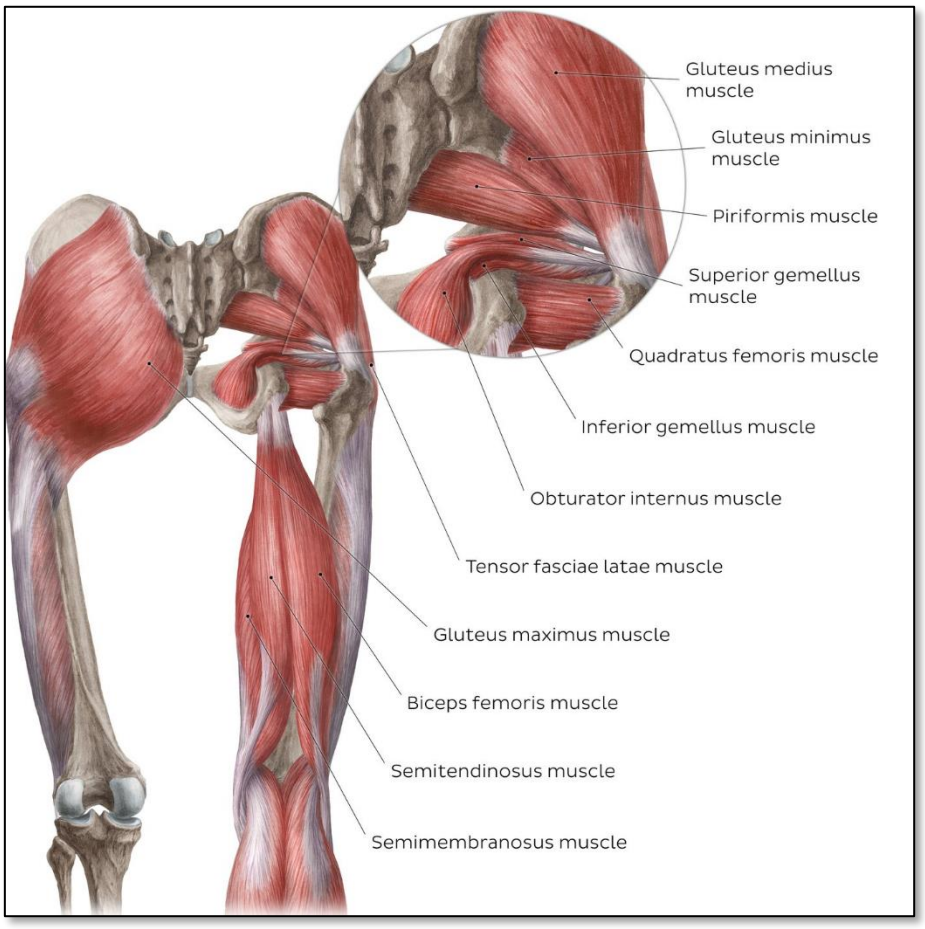
### Posterior muscles (Flexors of Knee) “Hamstrings”

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Biceps femoris** | Long head → Ischium<br>Short head → Linea aspera | Tibia | Extend thigh at hip joint<br>Flex leg at knee joint |
| **Semitendinosus** | Ischium | | |
| **Semimembranosus** | Ischium | | |

### Medial muscles (Adductors of Thigh)

| Muscle | Origin | Insertion | Action |
|---|---|---|---|
| **Adductor longus** | Pubis | Posterior aspect of femur | Adduct the thigh<br>Except Gracilis → flexes the leg |
| **Adductor brevis** | | | |
| **Adductor magnus** | | | |
| **Pectineus** | | | |
| **Gracilis** | | Tibia | |


Iliacus muscle
Psoas minor muscle
Iliopsoas muscle
Psoas major muscle
Pectineus muscle
Gracilis muscle
Adductor brevis muscle
Adductor magnus muscle
Adductor longus muscle
Sartorius muscle
Rectus femoris muscle
Vastus lateralis muscle
Vastus medialis muscle


Gluteus medius muscle
Gluteus minimus muscle
Piriformis muscle
Superior gemellus muscle
Quadratus femoris muscle
Inferior gemellus muscle
Obturator internus muscle
Tensor fasciae latae muscle
Gluteus maximus muscle
Biceps femoris muscle
Semitendinosus muscle
Semimembranosus muscle

## ❖ Structures of the Thigh ❖

### ➢ Fasciae latae

- the fascia that encircles the whole muscles of the thigh

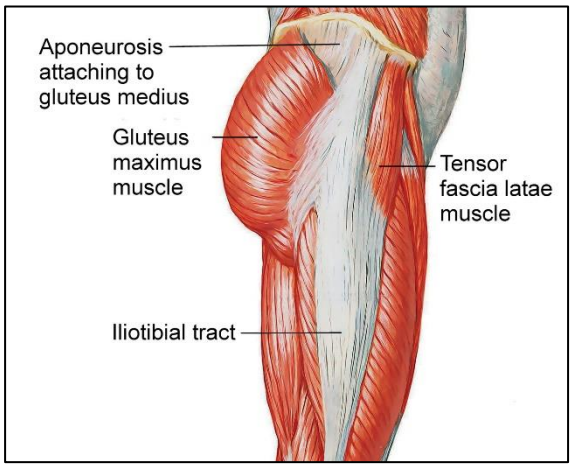
### ➢ Iliotibial tract

- CT band that extends from iliac crest to tibia, located between TFL anteriorly and Gluteus maximus posteriorly

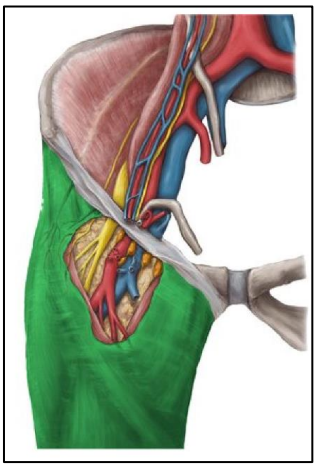
### ➢ Femoral triangle

- located between:
  - Inguinal ligament (Superiorly)
  - Adductor longus (Medially)
  - Sartorius (Laterally)
- contains the following structures:
  - Femoral artery
  - Femoral vein
  - Femoral nerve
  - Deep inguinal lymph nodes
- **Clinical correlation**: Femoral artery is the insertion site for angiography & coronary catheterization (القسطرة)

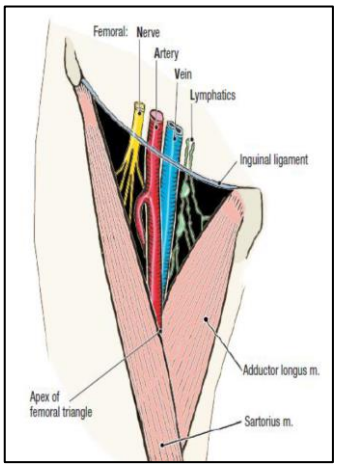
**Iliotibial tract**




**Fascia latae**



**Femoral triangle**

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## ✪ Compartments of Skeletal muscles

- these are cross-sections of the appendicular skeleton
- these muscles are separated into groups by septa of CT
- usually, muscles of one compartment will have the same innervation, blood supply, and embryonic origin
- Example:
  - **Muscles of Arm** → 2 compartments
  - **Muscles of Thigh** → 3 compartments