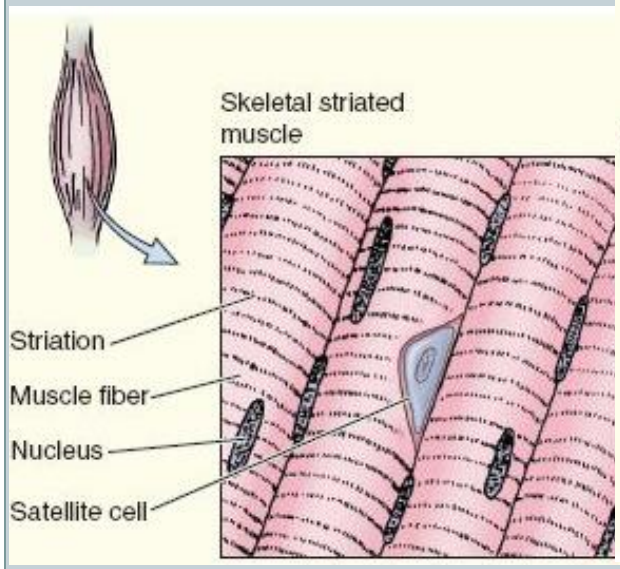
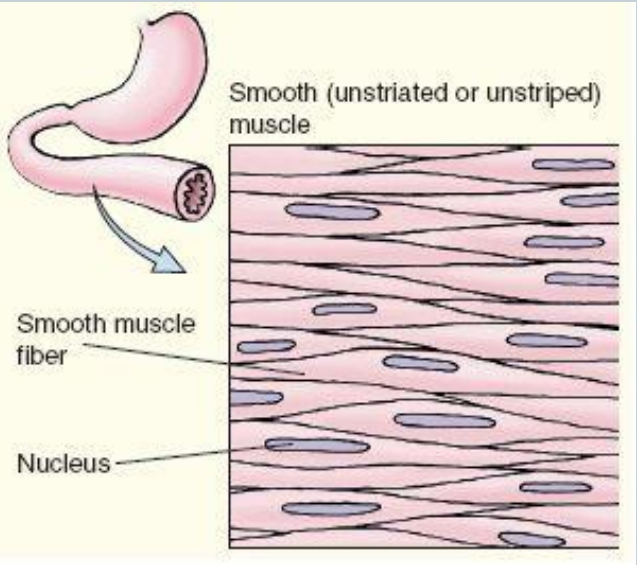
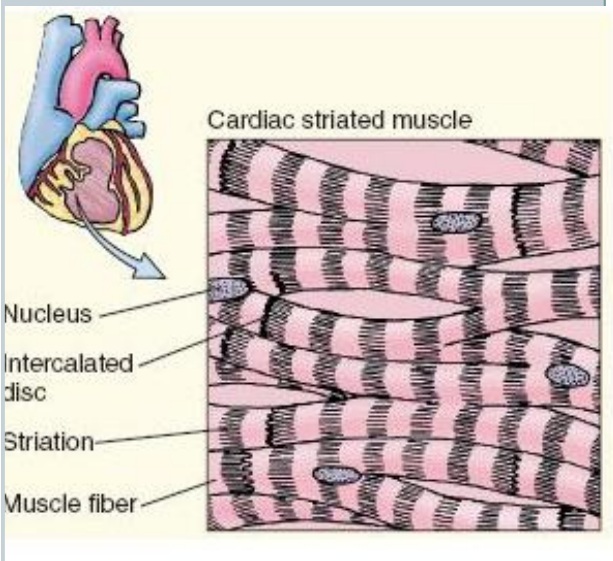
Introduction to muscular system, main muscles of body.

Muscles

- There are 3 types: skeletal, smooth, and cardiac muscles
- they are contractile.







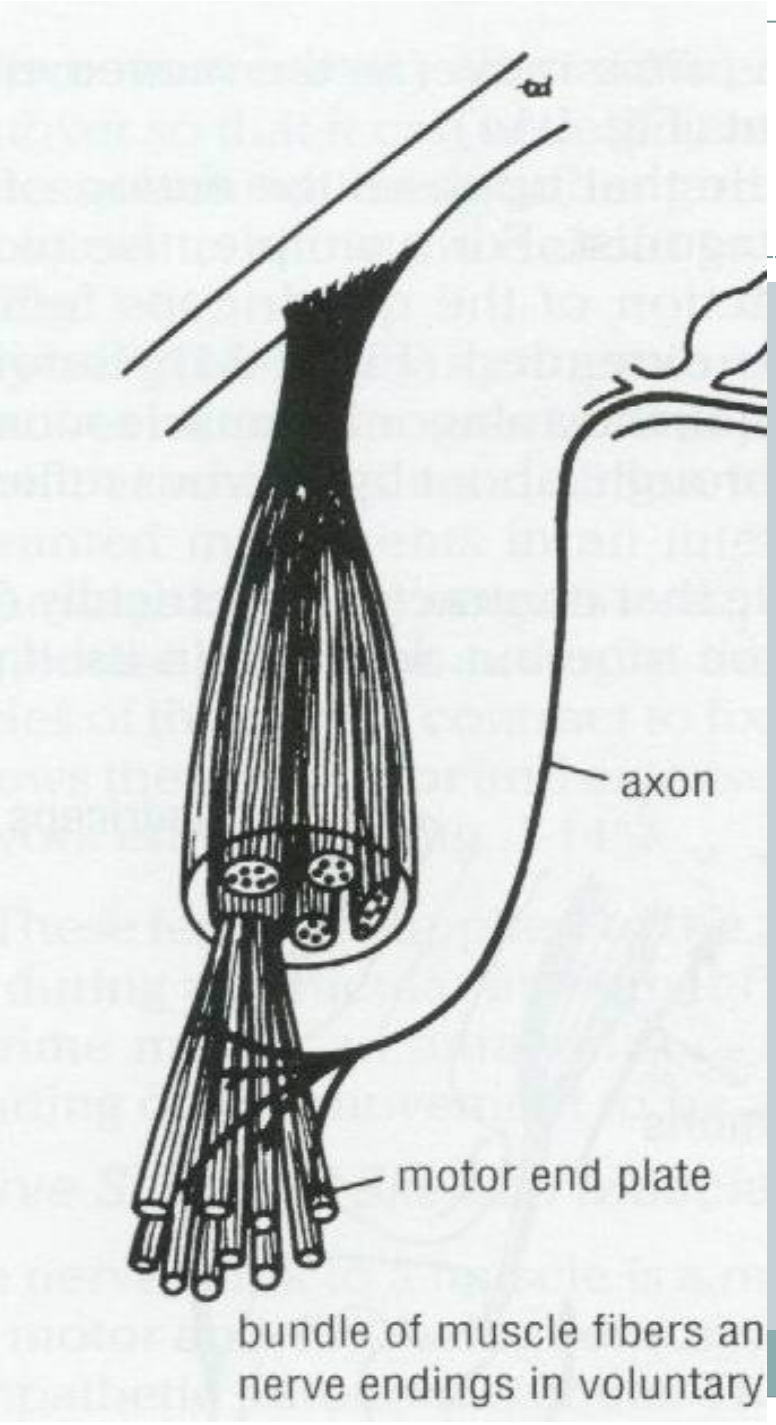
Skeletal muscles

- They produce the movements of the skeleton, they are voluntary and striated. The structural unit is the muscle fibers or cells….the functions:
- 1. produce movement
- 2. maintains posture
- 3. stabilizes joints
- 4. generates heat

- Skeletal muscles have two or more attachments
- The attachment that moves the least is called origin
- The attachment that moves the most is called the insertion.
- The fleshy part is called muscle belly
- The ends of the muscle which is attached to the skeleton are called tendons.
- Occasionally flattened muscles are attached by a thin sheet of fibrous tissue called aponeurosis.

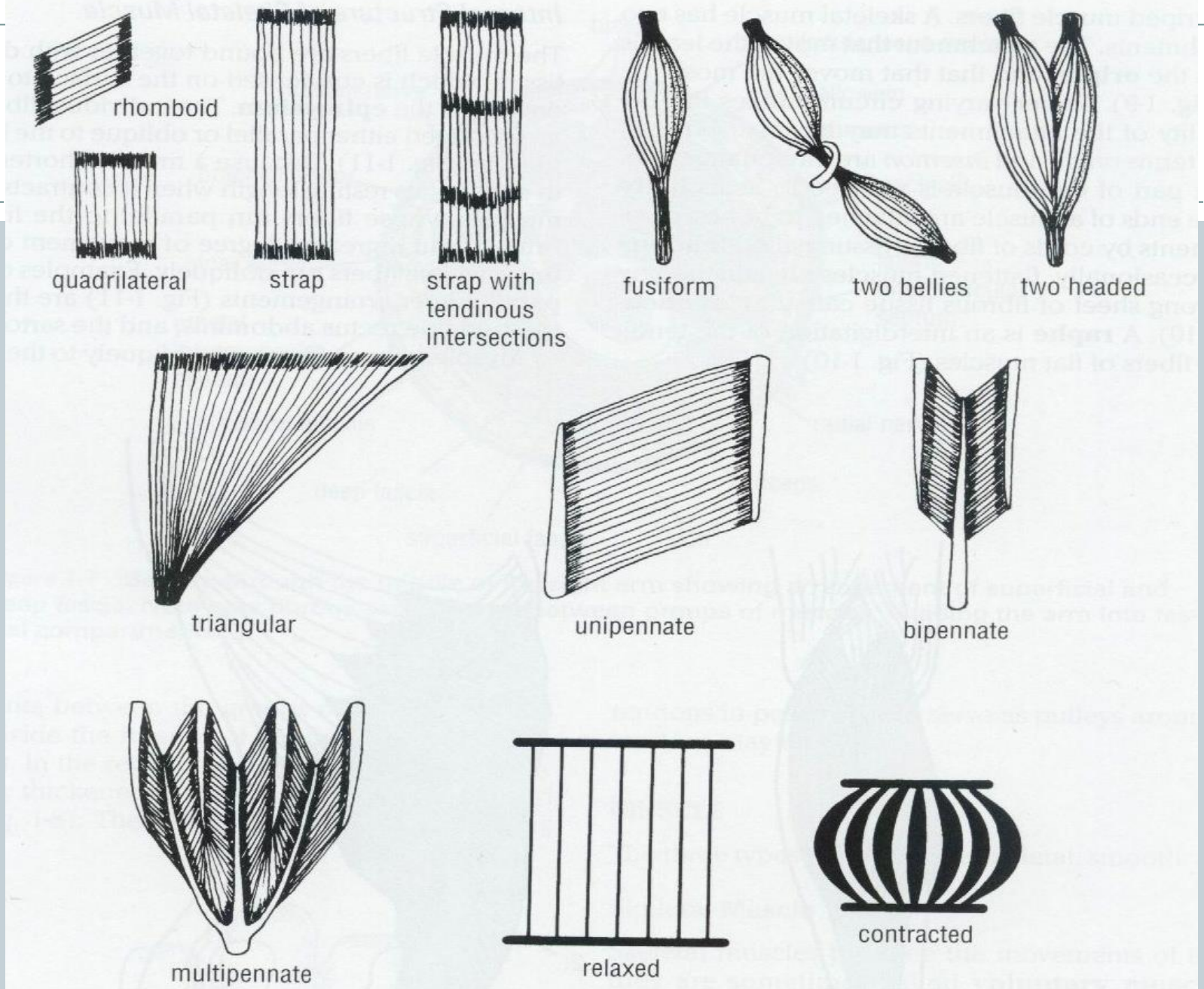
Internal structure of skeletal muscles

- The structural unit is muscle fiber.
- Each muscle fiber is surrounded by connective tissue layer called endomysium.
- Groups of of muscle fibers (fasciculi) have a connective tissue sheath called perimysium.
- The outer surface of a skeletal muscle have a connective tissue sheath called epimysium.



bundle of muscle fibers an
nerve endings in voluntary

- The muscle fibers are parallel to the long axis of the muscle as in sternocledomastoid
- The fibers may be oblique to the line of pull in pennate muscles
- Pennate muscles are either unipennate, bipennate or multipennate.
- Pennate muscles are stronger but with less range of movement for a given volume of muscle.



ure 1-11 Different forms of internal structure of skeletal muscle. A relaxed and a contracted scle are also shown; note how the muscle fibers, on contraction, shorten by one third to one f of their resting length. Note also how the muscle swells.

Naming of skeletal muscles:

- According to shape:

Deltoid , delta shaped

Trapezius, trapezium in shape, rhomboid, rhombic

2. size, major, minor

3. Number of heads, triceps..biceps

4. action: extensor, flexor

5. attachment: sternocledomastoid

6. depth: superficialis,,profundus

7. length: longus ...brevis

Nerve supply of skeletal muscles

- Nerves supplying the skeletal muscles are mixed nerves.
- Motor fibers supply the muscle fibers and stimulate them to contract.
- Each motor nerve fiber will divide into a number of branches and supply several muscle fibers.
- The site where a nerve fiber meets a muscle fiber to supply it is called motor end plate.
- Longer muscle fibers may have more than one motor end plate.

Nerve supply of skeletal muscles

- The nerve supplying the muscle also contains sympathetic fibers for the wall of its blood vessels for regulation of blood flow to the muscle.
- If a nerve trunk of a muscle is severed the muscle can not contract and lead to paralysis of the muscle and there will be loss of the muscle tone in that muscle.

Muscle action

- A muscle may work in the following four ways:
- 1. Prime mover: a muscle is a prime mover when it is the chief muscle or member of a chief group of muscles responsible for a particular movement.
- 2. antagonist: any muscle that opposes the action of the prime mover is an antagonist. ex. The biceps femoris opposes the action of the quadriceps femoris when the knee is extended. Before prime mover can contract the antagonist must be equally relaxed.

- 3. fixator: a fixator contracts isometrically.(contraction increases the tone without movement in the muscle) this is to stabilize the origin of the prime mover so that it can act efficiently.
- 4. synergist: in many locations in the body the prime mover crosses several joints before it reaches the joint at which its main action takes place. To prevent unwanted movements in an intermediate joint, groups of muscles called synergists contract and stabilizes the intermediate joints.

- Any muscle can act as prime mover, antagonist, fixator or synergist in different circumstances, according to movement to be accomplished.

Smooth muscle

- They are involuntary muscles.
- They are non-striated when examined by microscope.
- In the tubes of the body it provides the motive power for propelling the contents.
- In the wall of blood vessels control the caliber of these vessels.
- They are made to contract by nerve impulses from the autonomic nervous system or by hormonal stimulation, or by local stretching of the fibers.

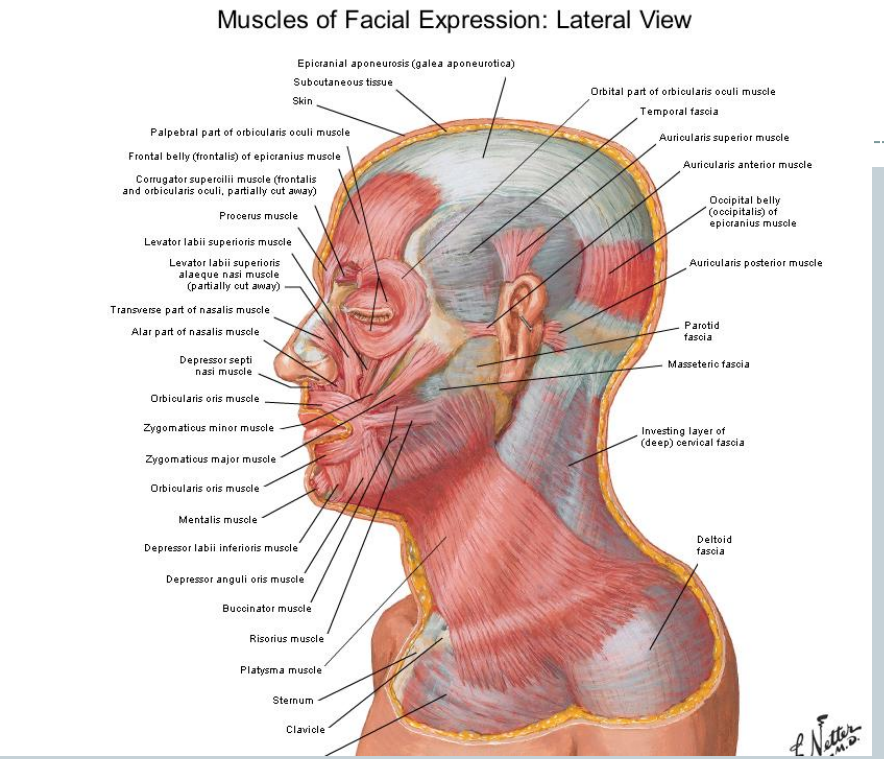
Cardiac muscle

- They are involuntary.
- They are striated.
- Present in the myocardium of the heart.
- They have the property of spontaneous and rhythmic contraction.

Muscles of facial expression

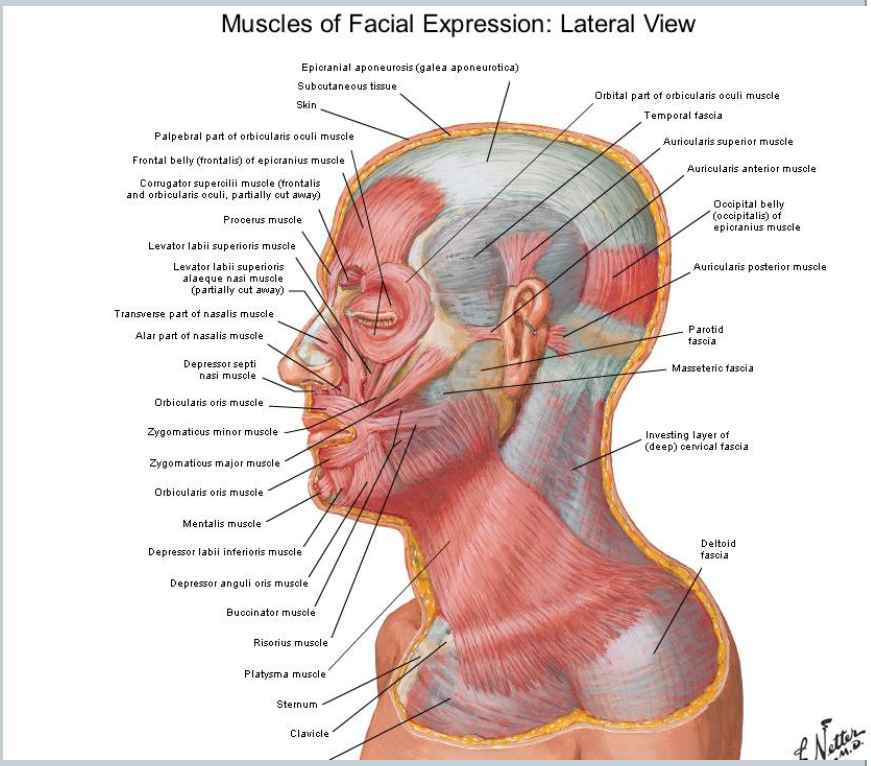
- They provide us the ability to express emotions.
- They lie within the superficial fascia of the face, originate in fascia or bones of skull and insert into the skin.
- They move the skin rather than joints.
- They may act as sphincters (those which encircle the orifices of the face such as eyes , nose , mouth)
- They may act as dilators, opening the orifices.

- The orbicularis oculi is a sphincter of the eye lids,
- levator palpebrae superioris opens the eye lid.
- The sphinctor muscle of the nostril

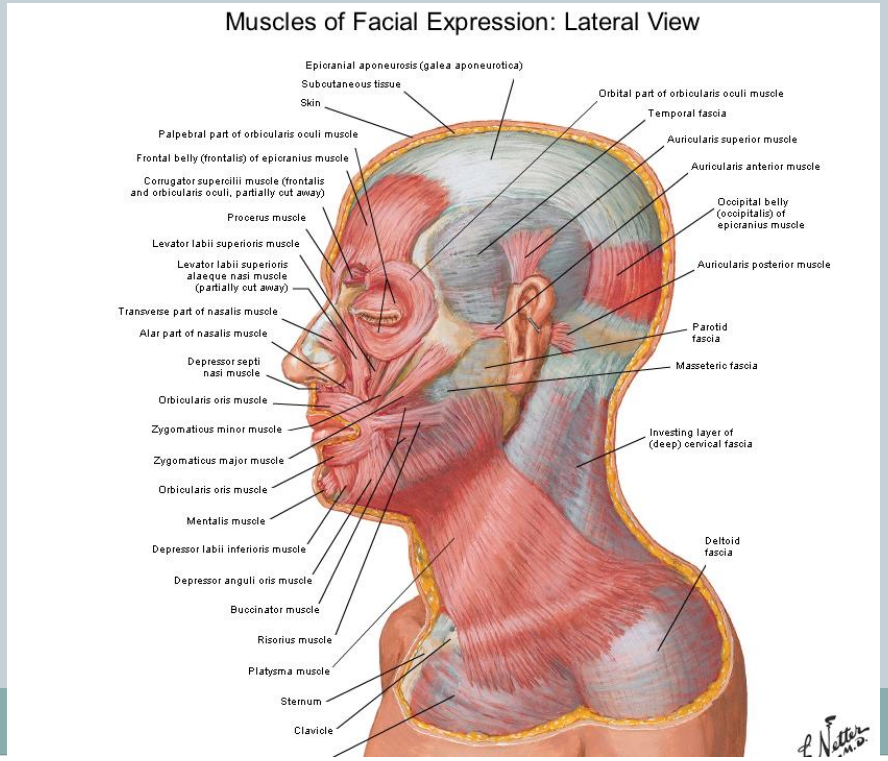


Muscles of the cheeks and lips

- The sphincter muscle is orbicularis oris.
- The dilator muscles
- Buccinator muscle forms the major muscular portion of the cheek, it compresses the cheek during blowing.



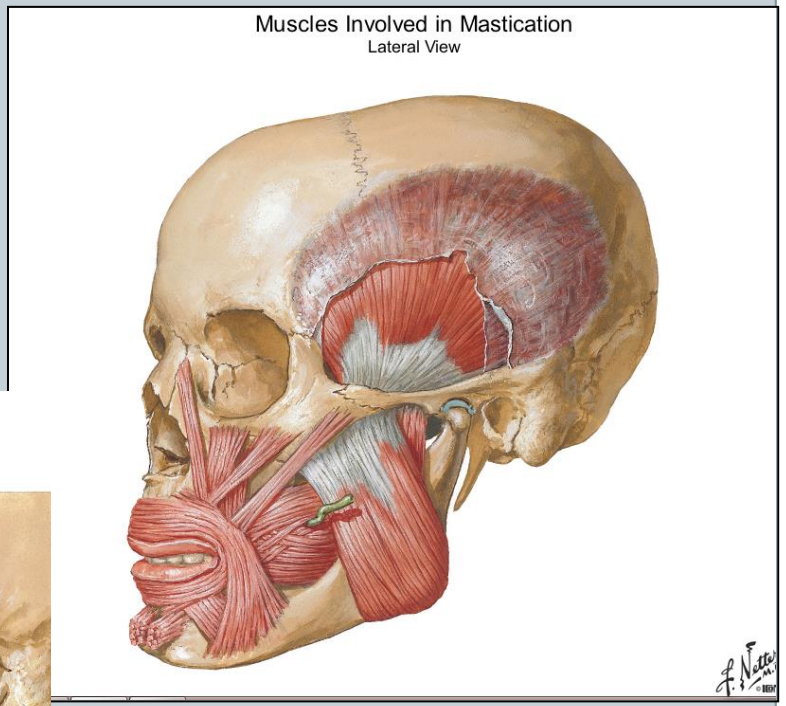
- Occipitofrontalis is made up of two parts,
- anterior part is called frontal belly which is superficial to frontal bone, and
- posterior part called occipital belly which is superficial to occipital bone.
- The two bellies are held together by epicranial aponeurosis.

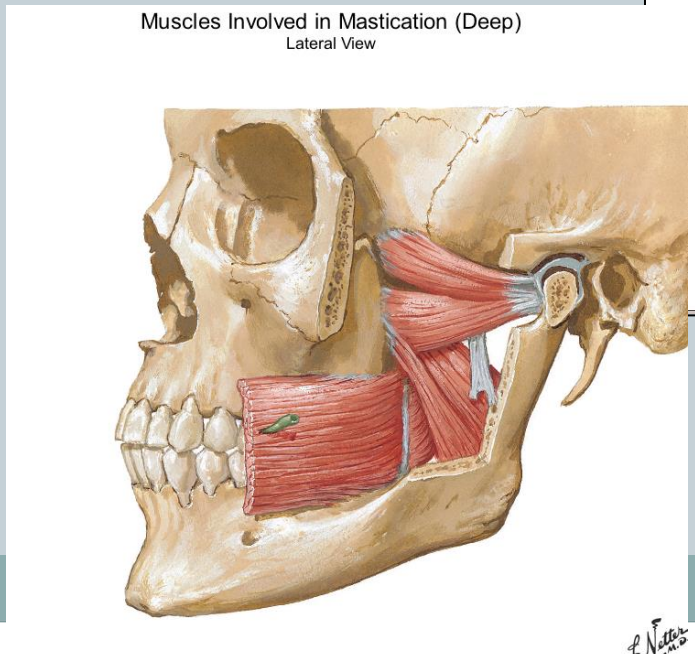


- All the muscles of facial expression are supplied by the facial nerve which is the 7^{th} cranial nerve.
- Bell's palsy is unilateral paralysis of muscles of facial expression and is due to damage or disease of facial nerve. In severe cases the patient cant close the eye pucker the lips or wrinkle the forehead.

Muscles of mastication

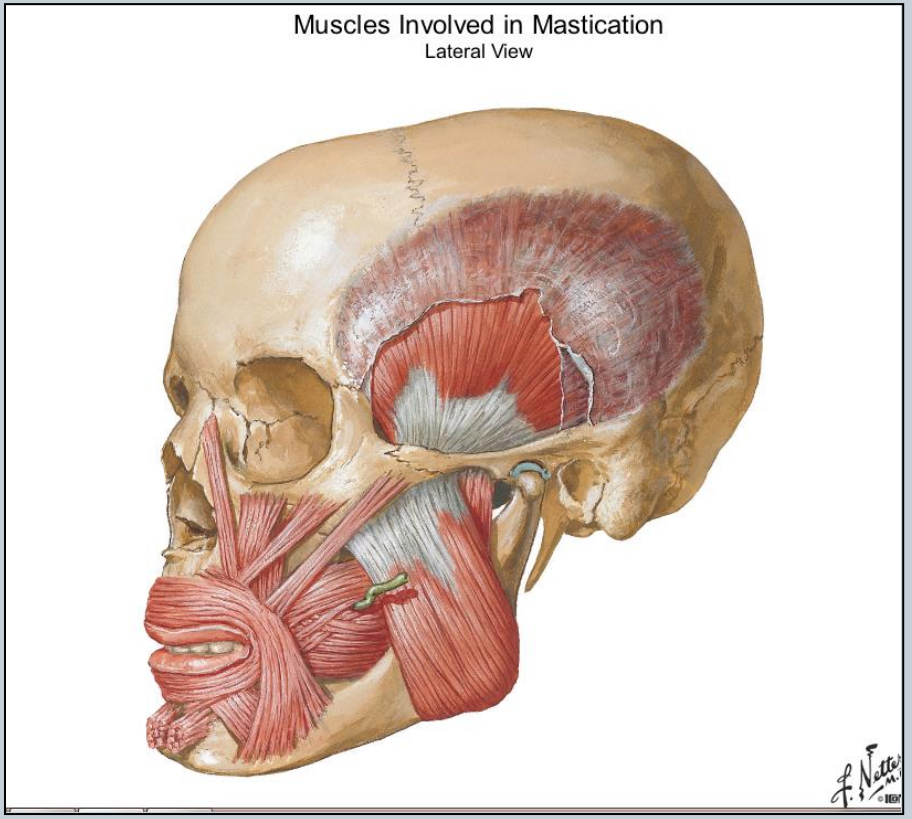
- They move lower jaw bone (chewing)
- They are four pairs: masseter, temporalis, medial pterygoid, lateral pterygoid.





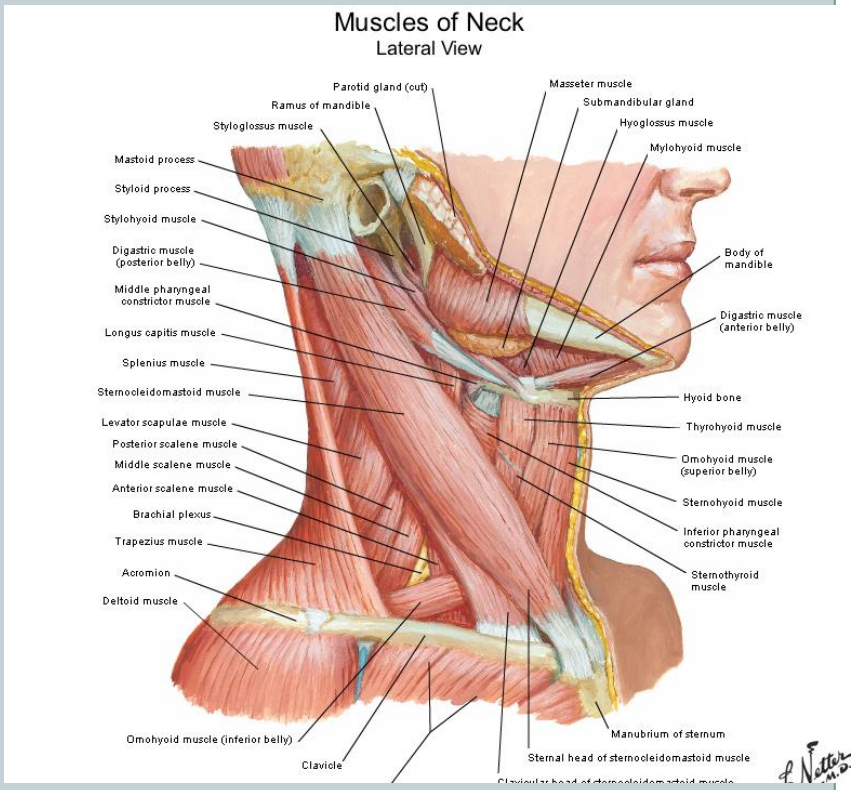
Muscles of mastication

- The first 3 close the jaw .
- Lateral pterygoid assists in chewing by moving mandible from side to side.
- All are supplied by mandibular division of trigeminal nerve.



Sternocleidomastoid

- It arise from clavicle and sternum and is inserted into mastoid process of temporal bone.
- Its motor supply is by accessory nerve (11th CN)
- It is an important landmark in the neck, that divides the neck into anterior and posterior triangles.

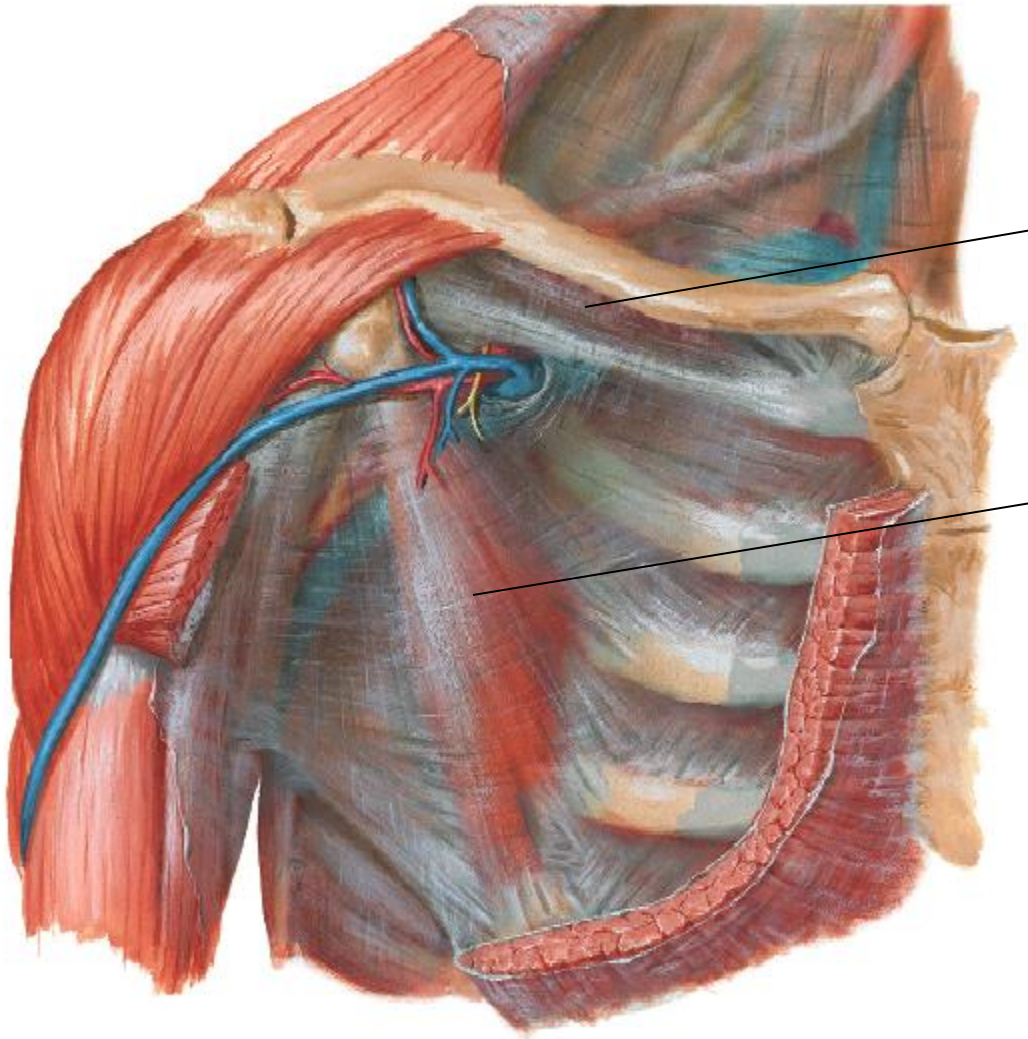


Muscles that move the shoulder girdle

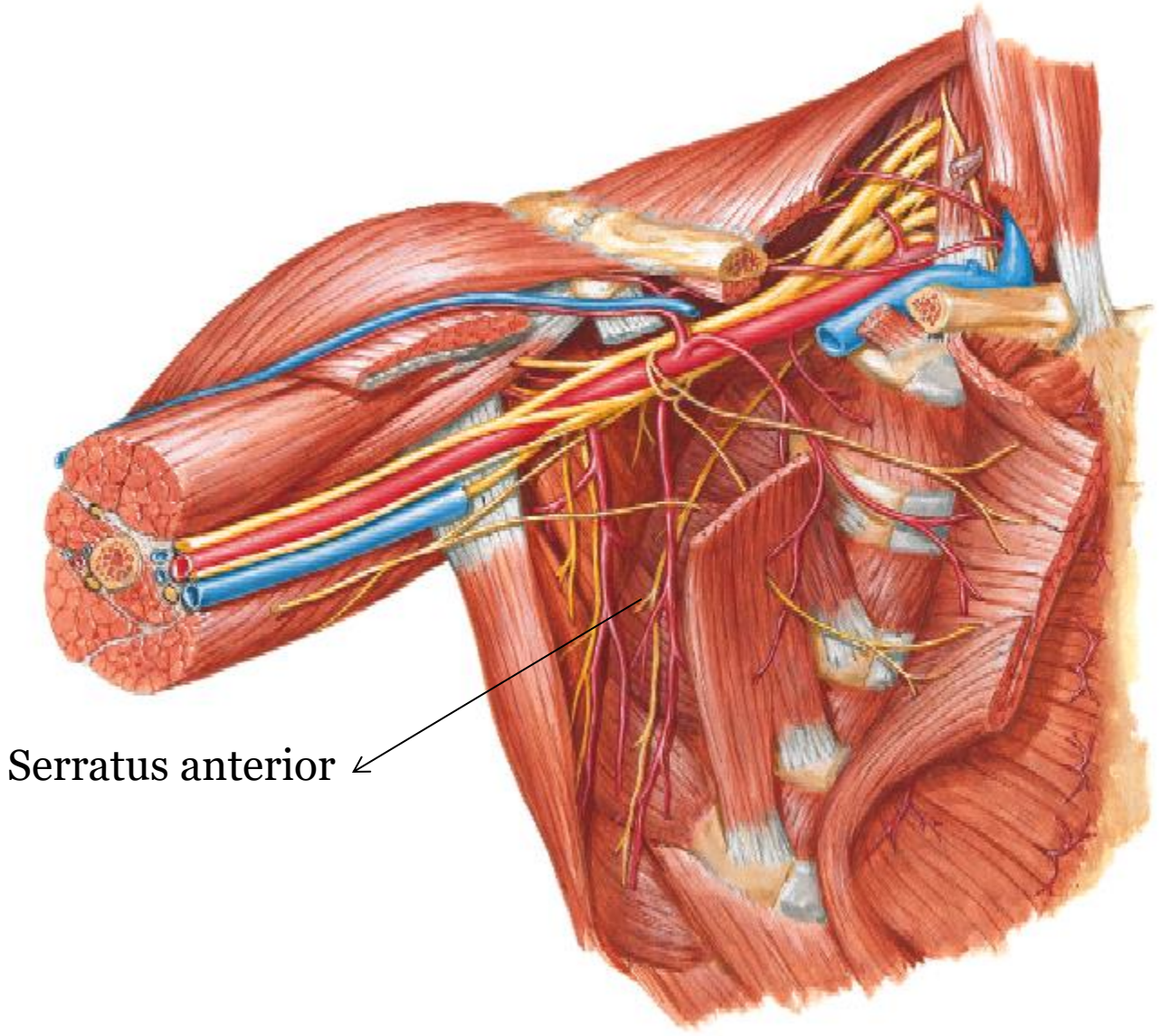
- These can be classified into two groups: anterior and posterior thoracic muscles.
- Anterior thoracic muscles are subclavius, pectoralis minor and serratus anterior.
- The subclavius is a small muscle under the clavicle, it steadies the clavicle during movement of shoulder girdle.
- Pectoralis minor is a triangular muscle deep to pectoralis major, it protracts the scapula.

Pectoral, Clavipectoral and Axillary Fasciae

Anterior View



- Serratus anterior arises from upper 8 ribs and is inserted into the medial border of scapula. It is important in horizontal arm movement such as pushing.

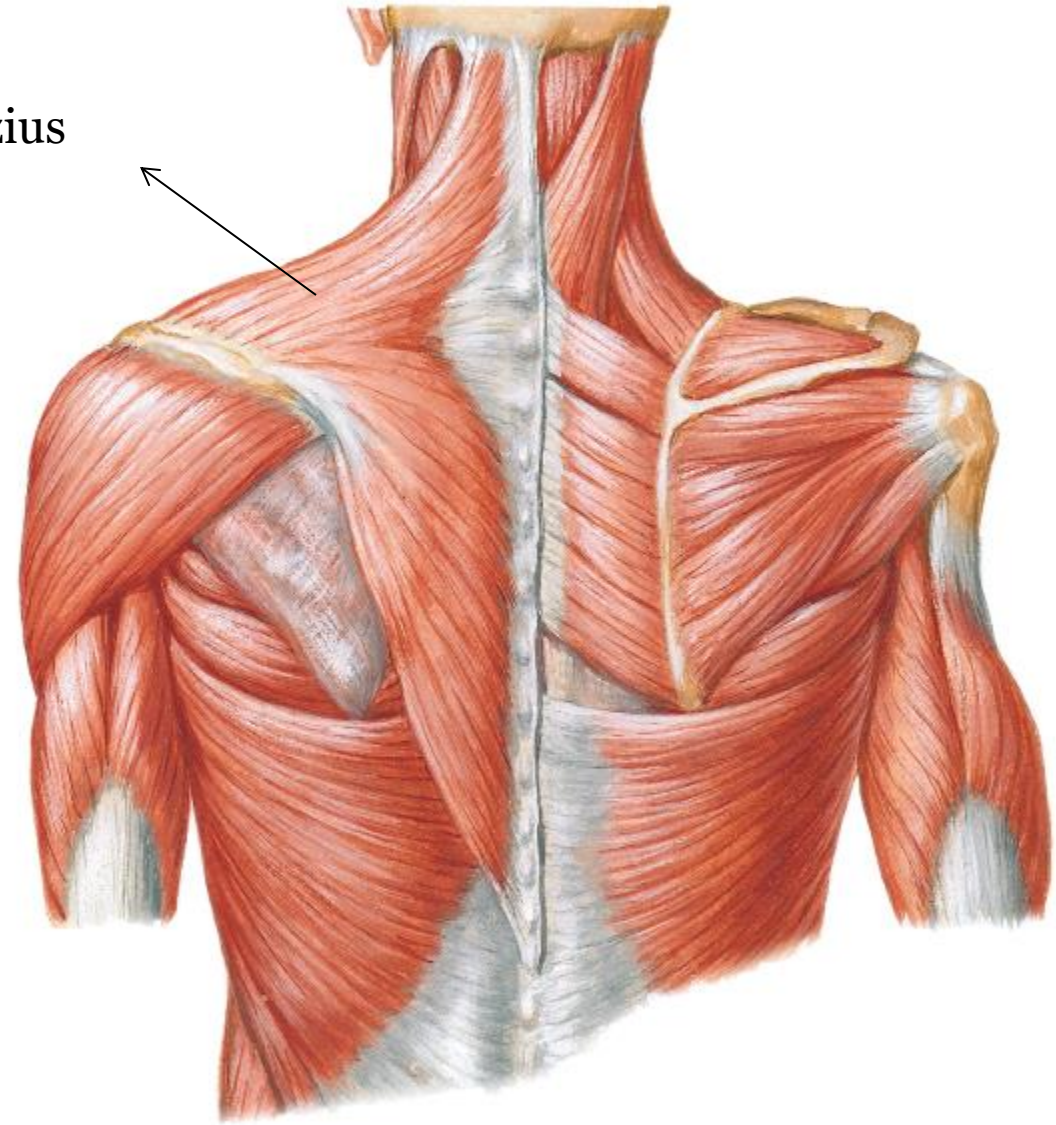

Serratus anterior

- The posterior thoracic muscles are the trapezius levator scapulae, rhomboid major, and rhomboid minor.
- Trapezius is a large triangular muscle extending from the skull and vertebral column medially to the clavicle and scapula laterally.
- Is the most superficial muscle of back of neck and back of trunk.
- Is supplied by accessory nerve (11^{th} CN)

Muscles of Shoulder

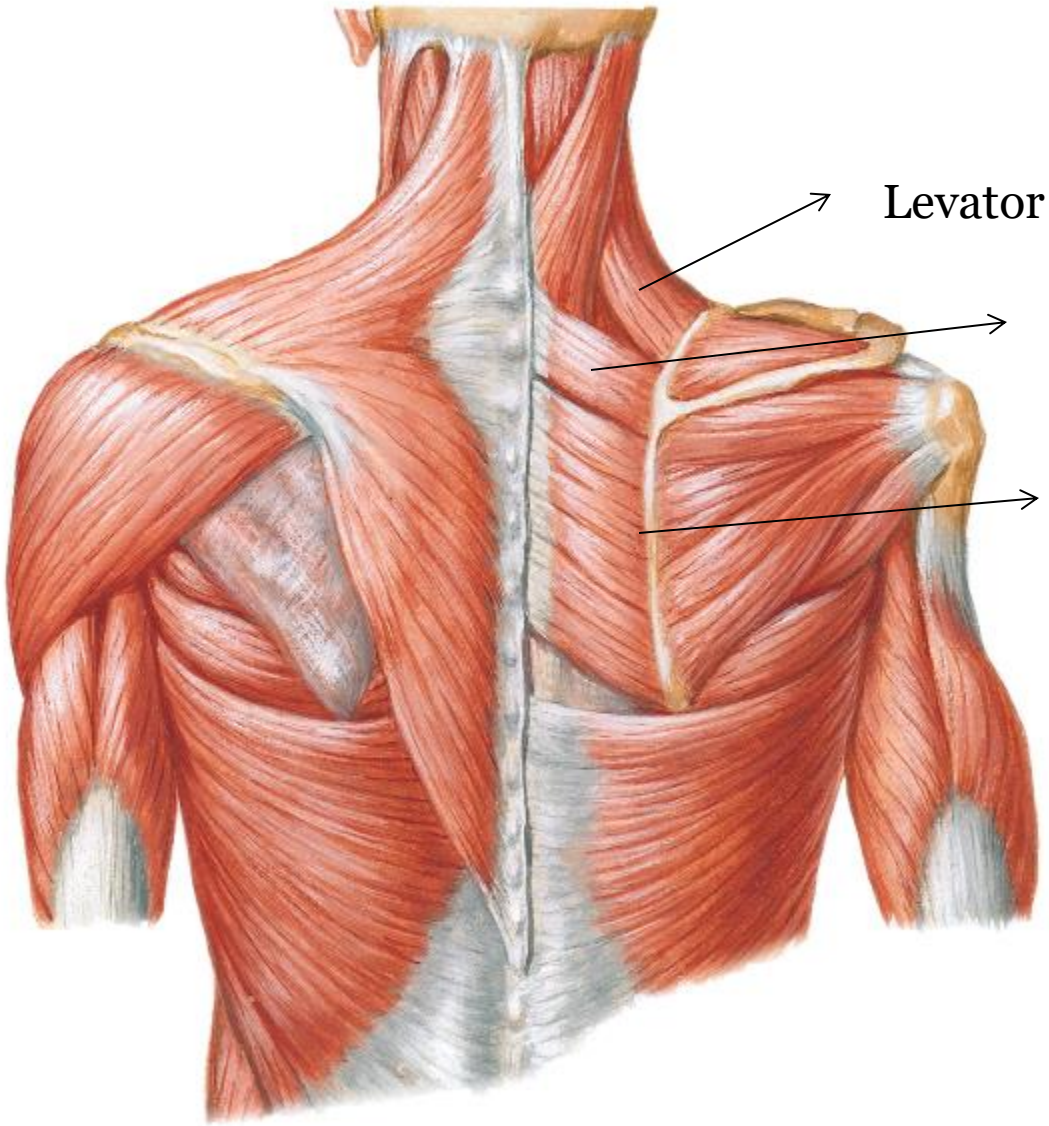
Posterior View

trapezius



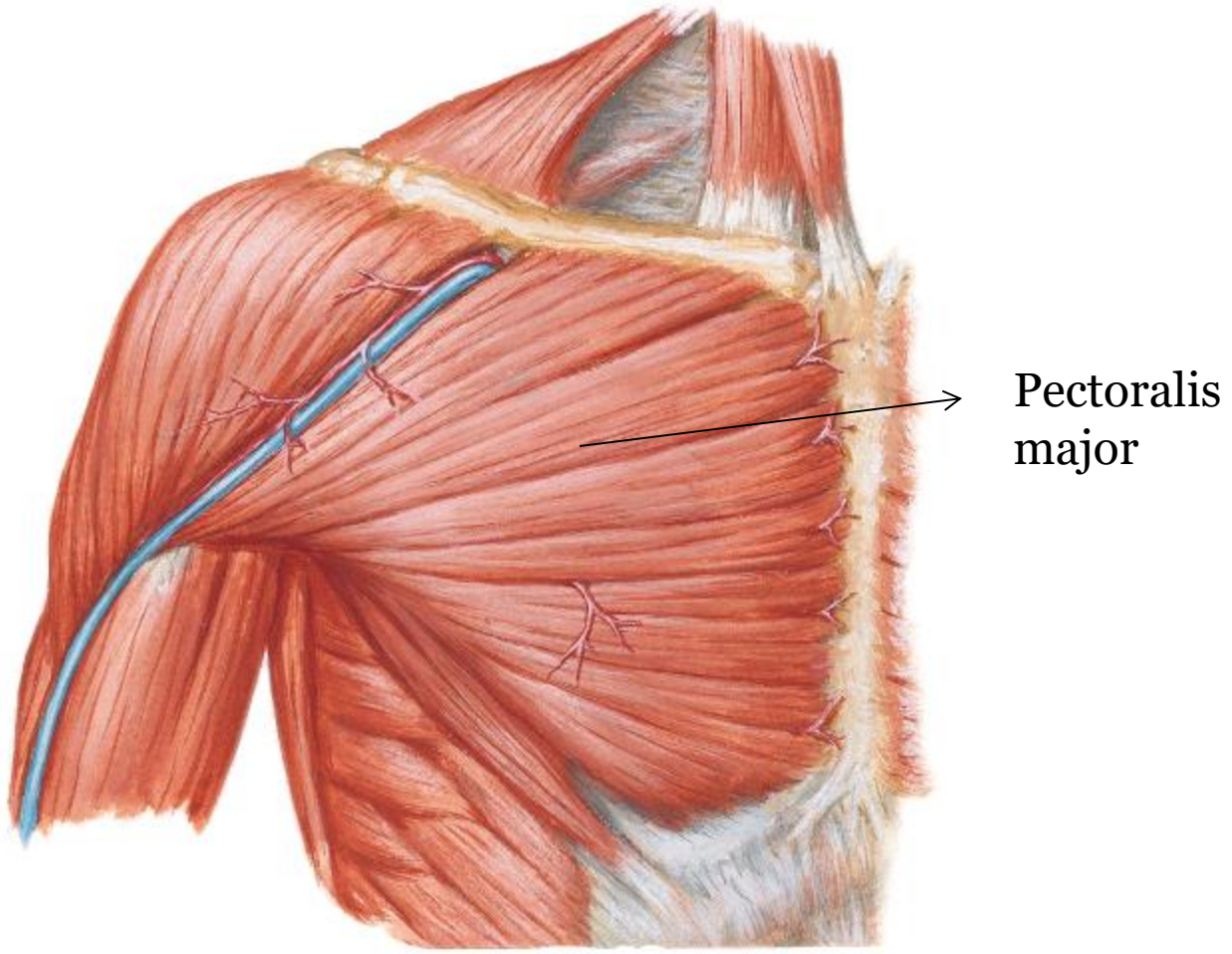
Muscles of Shoulder

Posterior View



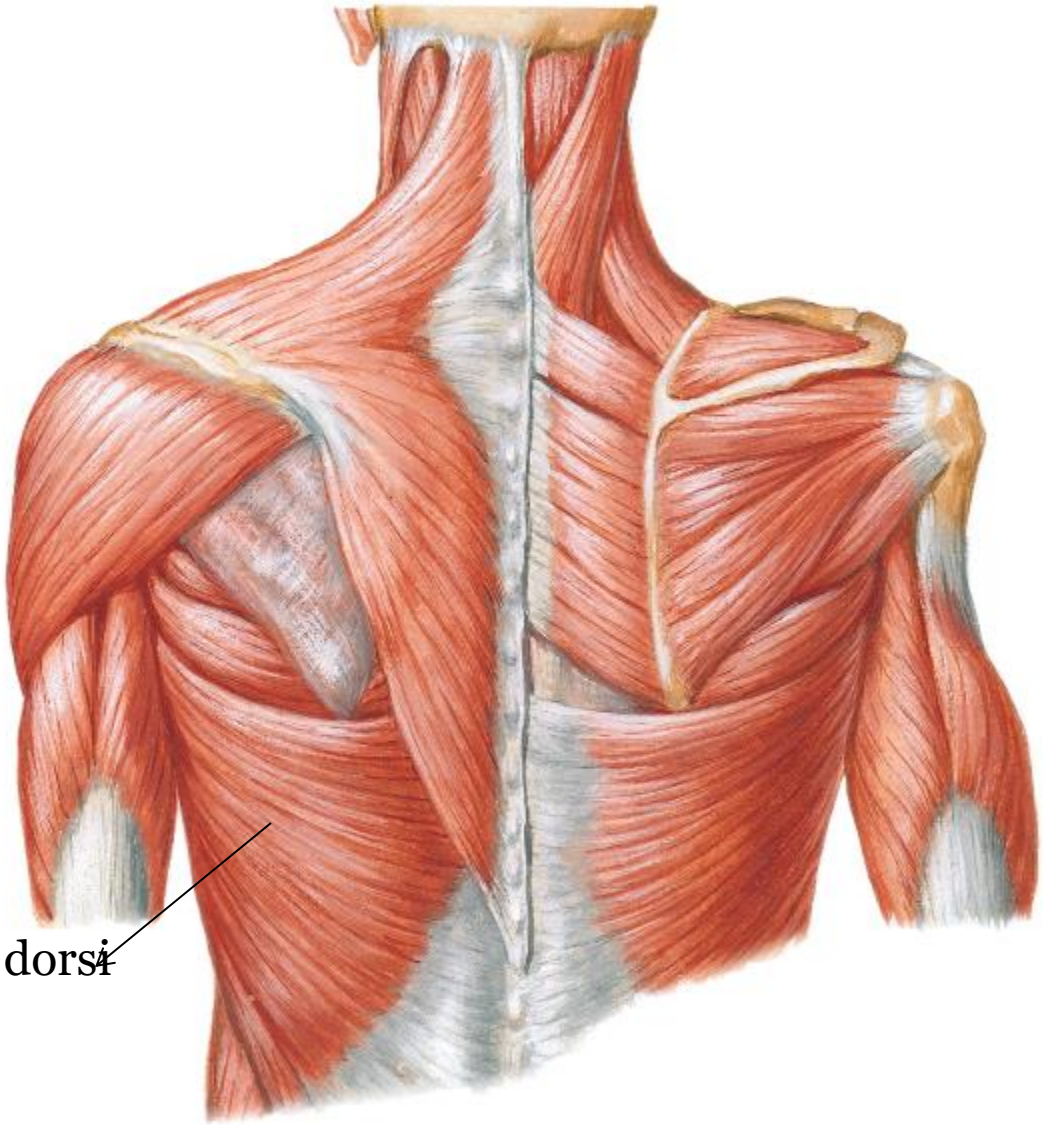
Muscles that move the humerus

- These include:
- 1. pectoralis major: is a large muscle,that covers the superior part of the thorax, it has two origions ; clavicular head and sternocostal head. It adducts and medially rotates the humerus.
- Latissimus dorsi: is a broad triangular muscle, located on the inferior part of the back, it adducts, extends and medially rotates the arm.


Pectoralis
major

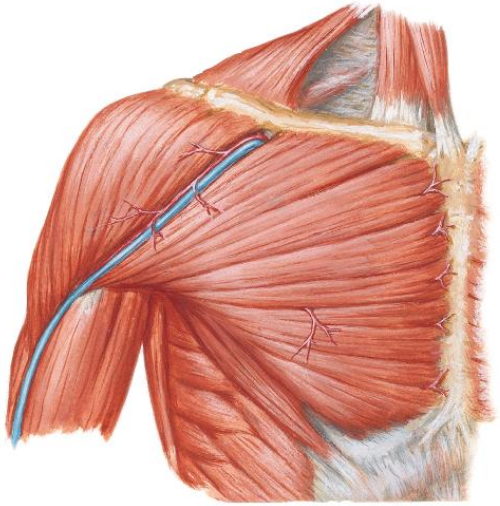
Muscles of Shoulder

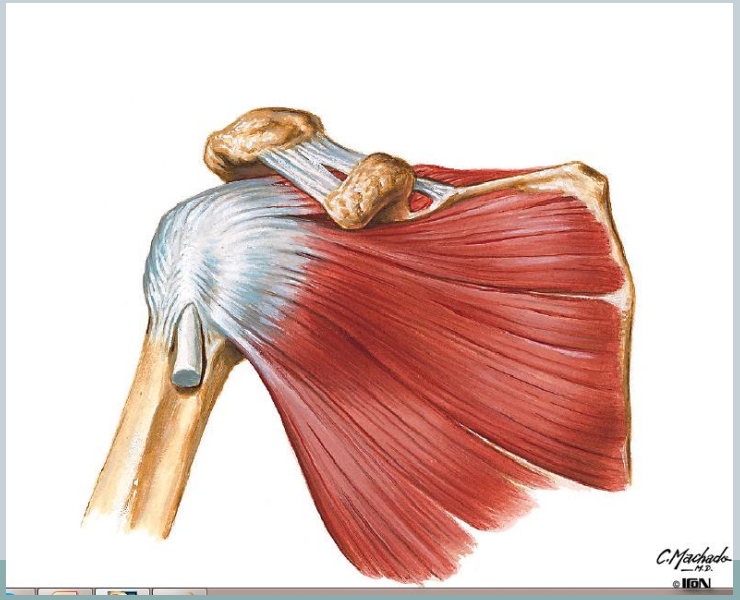
Posterior View



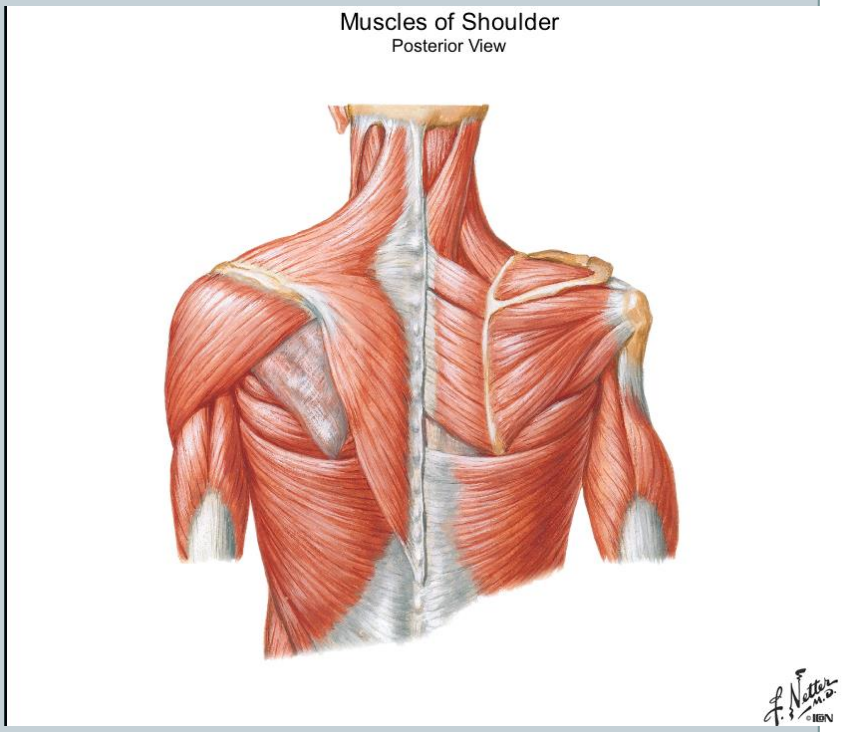
Latissimus dorsi

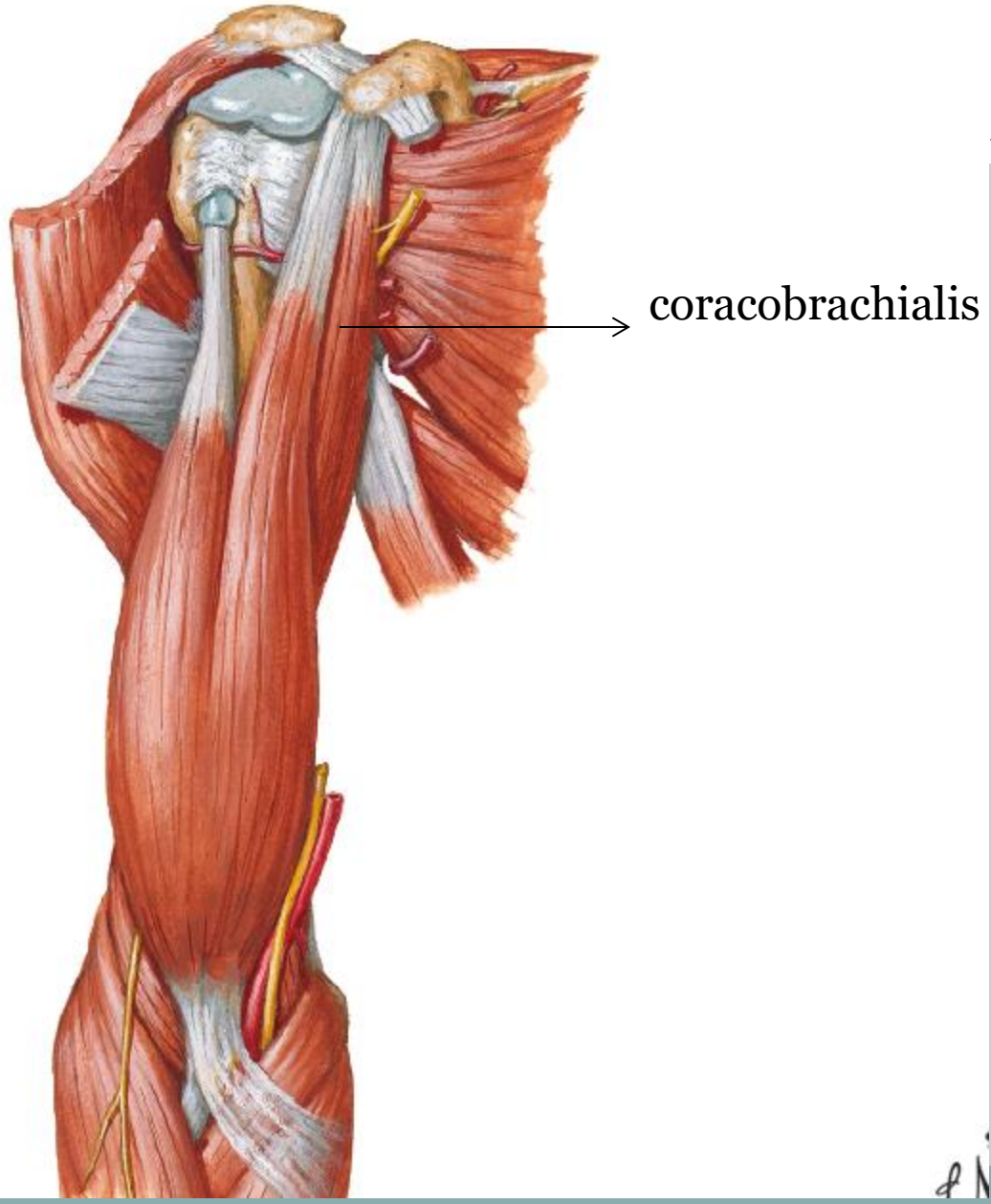
- 3. deltoid: is delta shaped, it covers the shoulder joint, arise from clavicle and scapula, inserted into the humerus, its main action is abduction.
- 4. subscapularis:





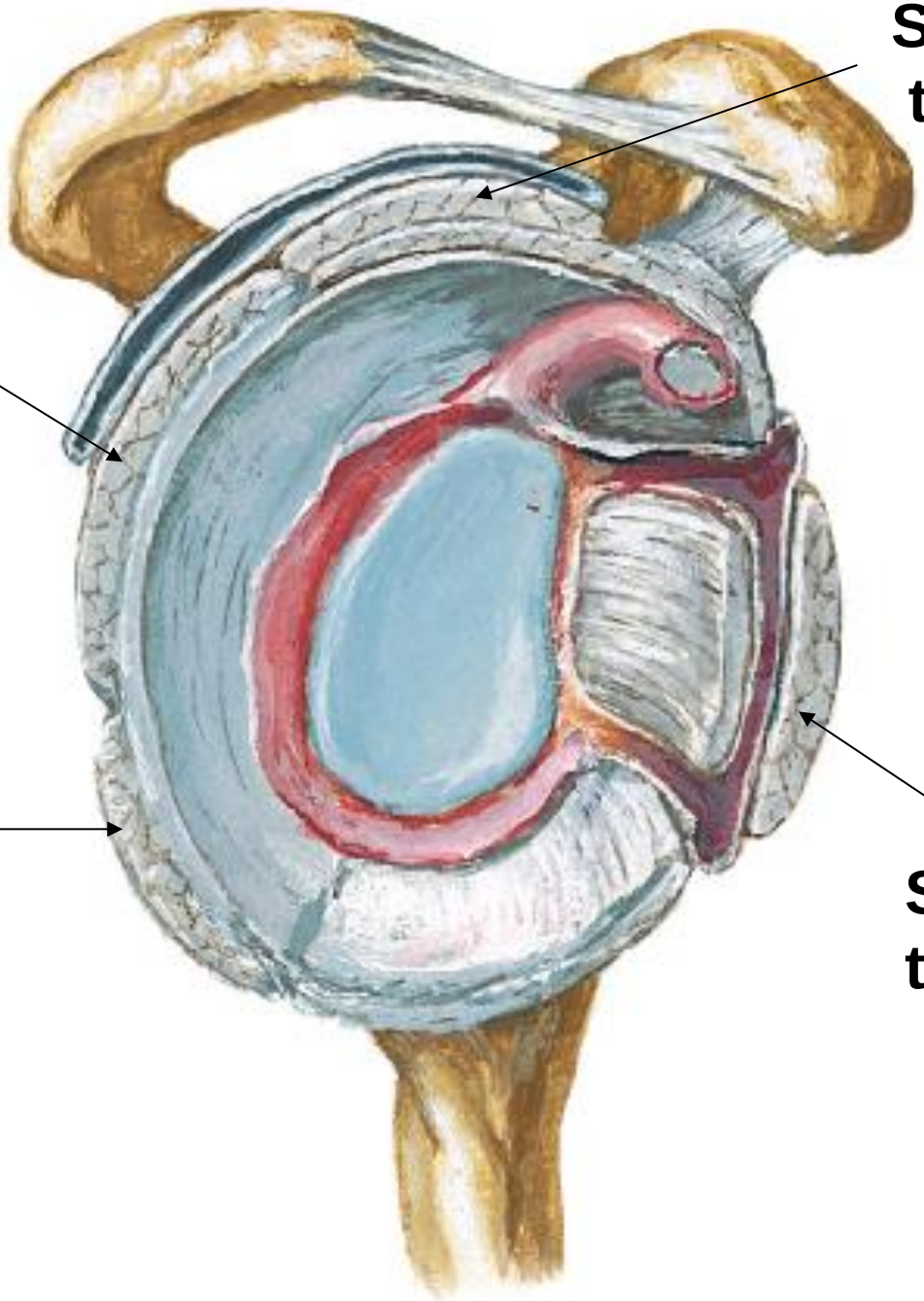
- 5. supraspinatus :lies in supraspinous fossa, deep to trapezius.
- 6. infraspinatus : lies in infraspinous fossa.
- 7. teres major.
- 8. teres minor.
- 9. coracobrachialis.: arises from coracoid process and inserted into humerus.



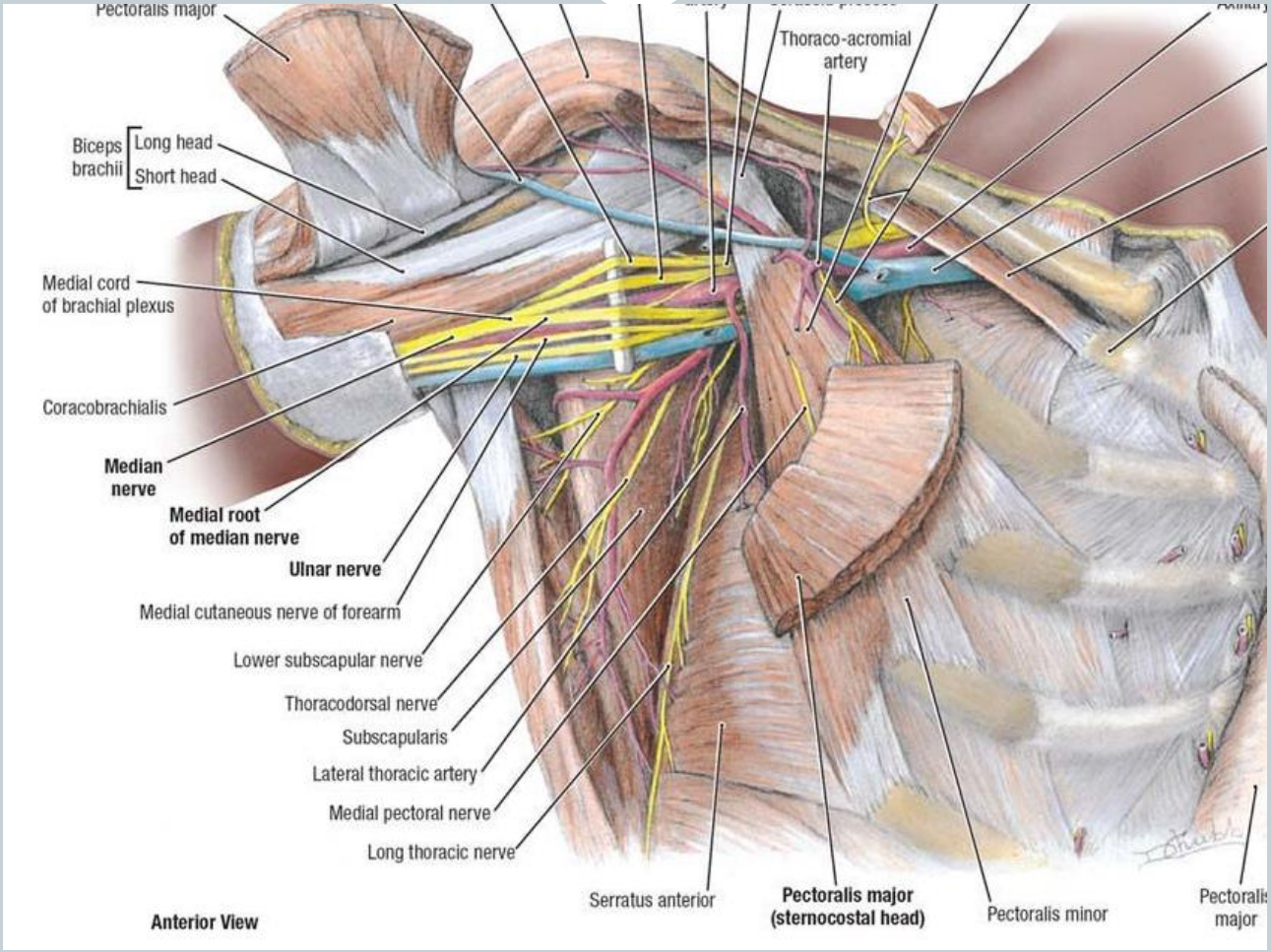

coracobrachialis

Rotator cuff

- Four deep muscles of the shoulder, subscapularis, supraspinatus, infraspinatus, and teres minor, strengthen and stabilize shoulder joint.
- These muscles join the scapula to the humerus. Their flat tendons fuse together to form rotator cuff. Which is a nearly complete circle of tendons around the shoulder joint.


Supraspinatus tendon
Infraspinatus tendon
Teres minor
Subscapularis tendon

Axilla

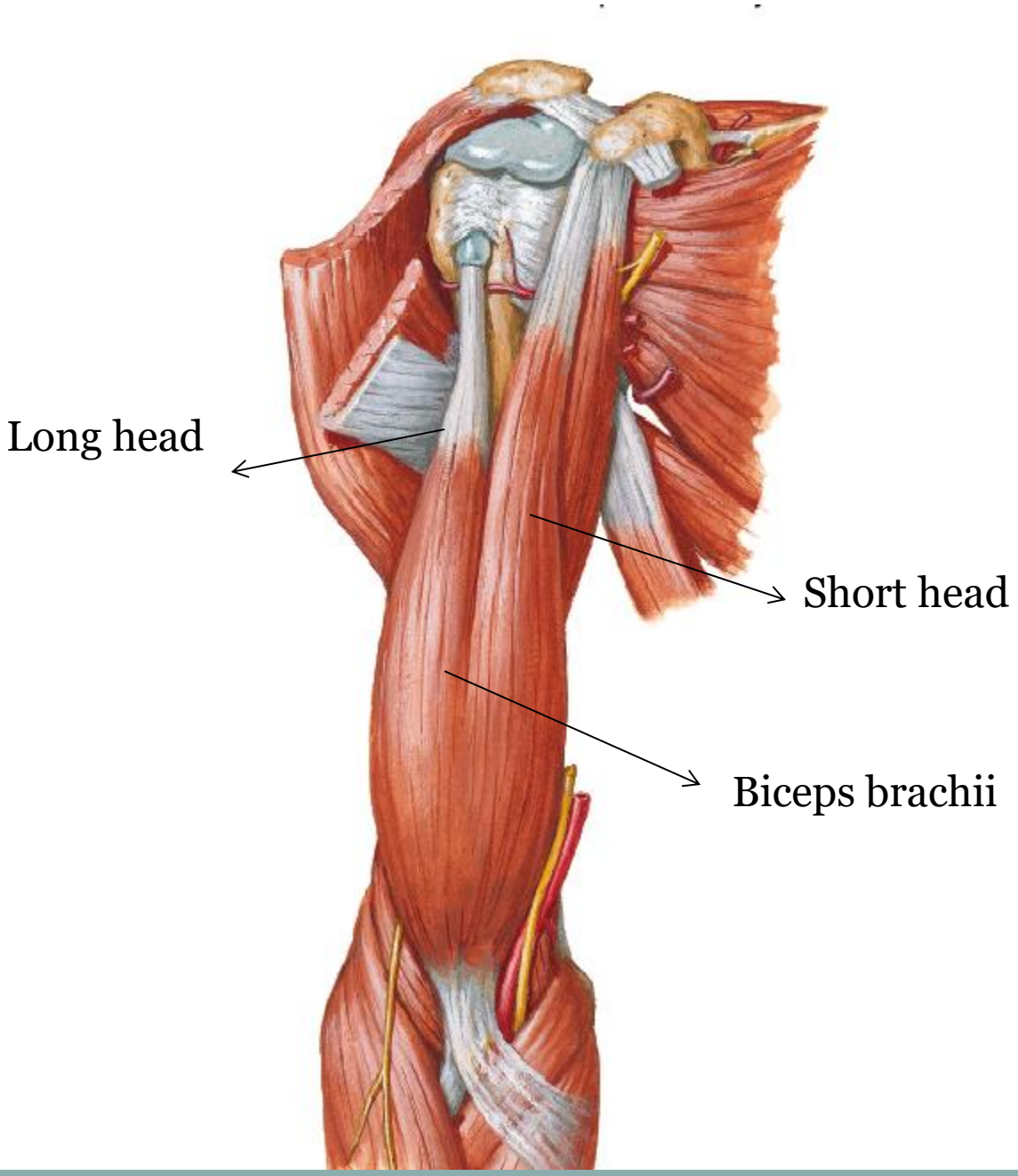

Pectoralis major
Thoraco-acromial artery
Biceps brachii
Long head
Short head
Medial cord of brachial plexus
Coracobrachialis
Median nerve
Medial root of median nerve
Ulnar nerve
Medial cutaneous nerve of forearm
Lower subscapular nerve
Thoracodorsal nerve
Subscapularis
Lateral thoracic artery
Medial pectoral nerve
Long thoracic nerve
Serratus anterior
Pectoralis major (sternocostal head)
Pectoralis minor
Pectoralis major
Anterior View

CONTENTS OF THE AXILLA

- 1.axillary artery and its branches
- 2. axillary vein and its tributaries
- 3. brachial plexus
- 4. axillary lymph nodes
- All embedded in fat.

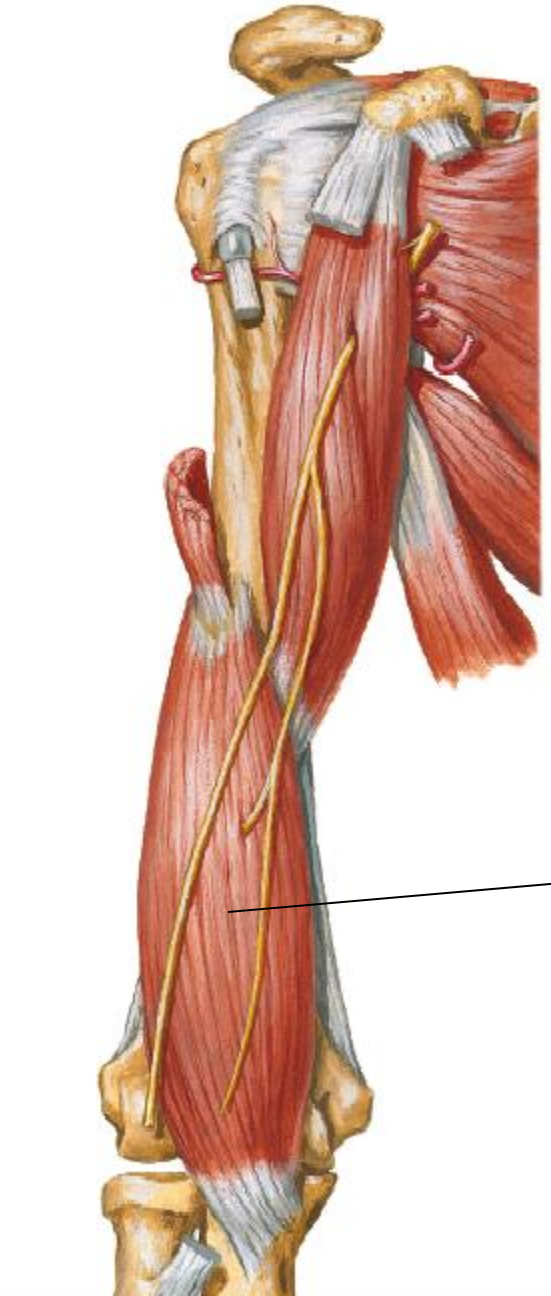
Muscles that move the forearm bones

- Biceps brachii, brachialis, and brachioradialis are flexors.. Triceps and anconeus are extensors of the elbow.
- Biceps brachii is also a supinator.
- Biceps brachii has two heads of origin, short head and long head.
- Triceps has 3 heads of origin, long head, medial head and lateral head.


Long head
Short head
Biceps brachii

Muscles of Arm

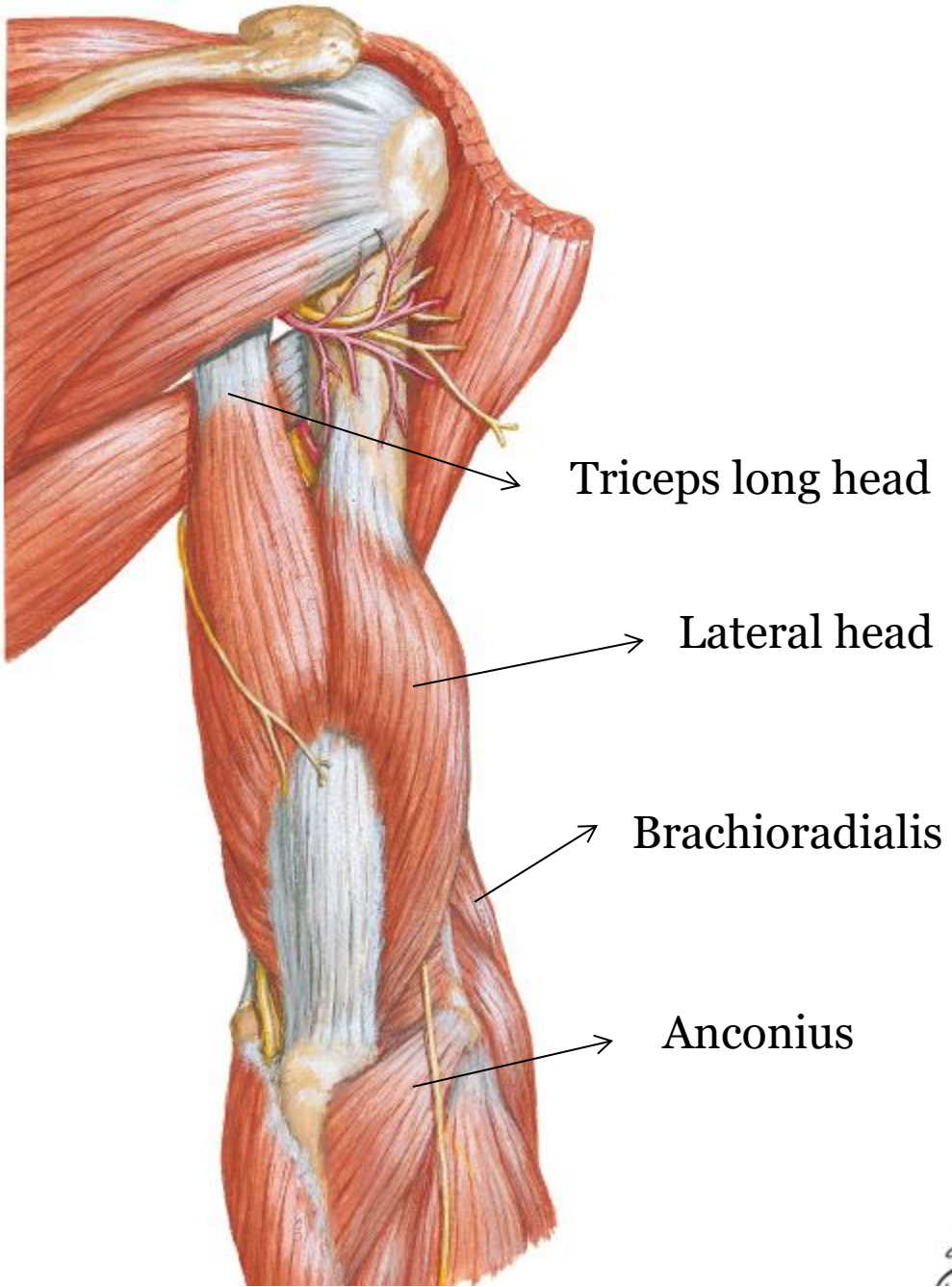
Anterior View - Deep Layer



brachialis

Muscles of Arm

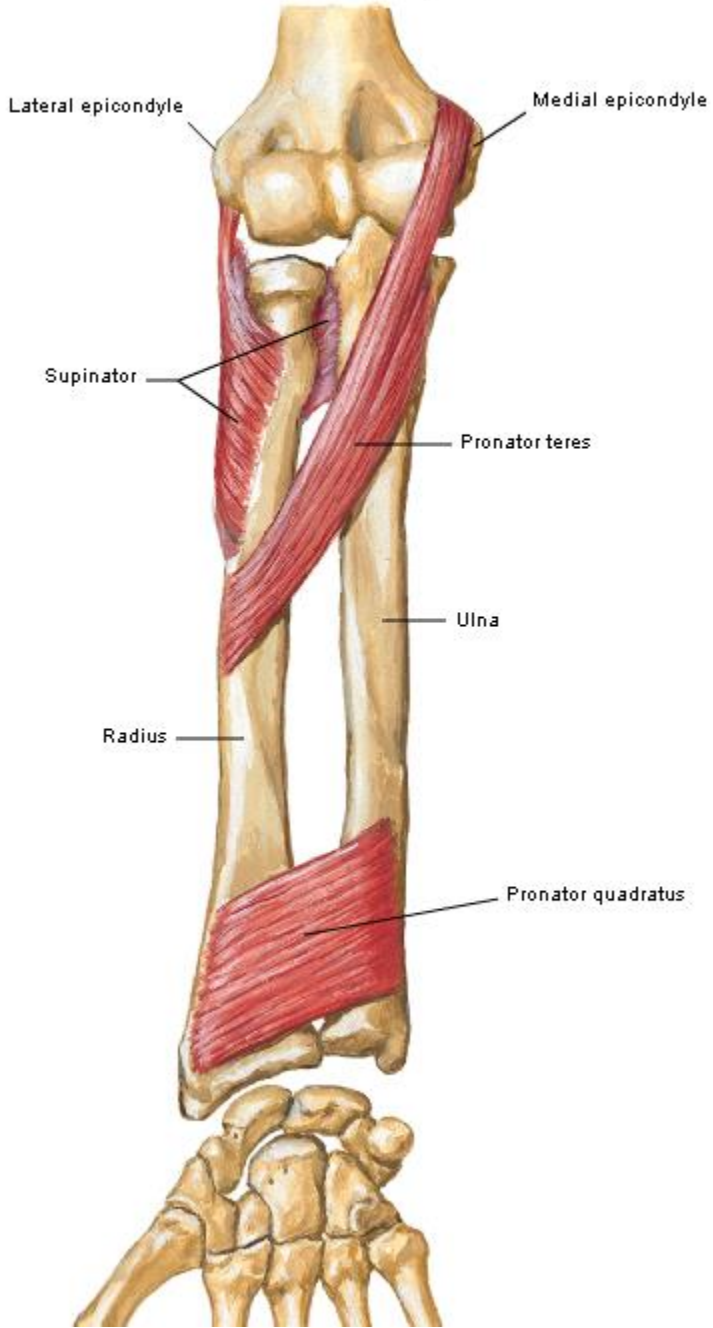
Posterior View - Superficial layer



- In the limbs, functionally related skeletal muscles are grouped together by fascia into regions called compartments. In the arm the extensors lie in posterior compartment and the flexors lie in the anterior compartment.
- The biceps, brachialis, and coracobrachialis are supplied by musculocutaneous nerve.
- Triceps and anconeus are supplied by radial nerve.

Individual Muscles of Forearm

Rotators of Radius - Supinated Position



1. Muscles of the anterior compartment of the forearm

(Flexors of the wrist)

- All anterior compartment muscles of the forearm are supplied by median nerve except flexor carpi ulnaris ulnar half of flexor digitorum profundus which are supplied by ulnar nerve.
- The superficial muscles of anterior compartment of the forearm arise from the medial epicondyle of the humerus by common flexor tendon.

2. Muscles of the posterior compartment of the forearm

(Extensors of the wrist)

- Most of superficial muscles of the posterior compartment of the forearm arise from lateral epicondyle of the humerus by common extensor tendon.

- All muscles of posterior compartment of forearm are supplied by radial nerve.
- Injury to radial nerve leads to inability to extend the wrist and the wrist assumes flexed position by flexors of the wrist a condition known as wrist drop.

Wrist drop