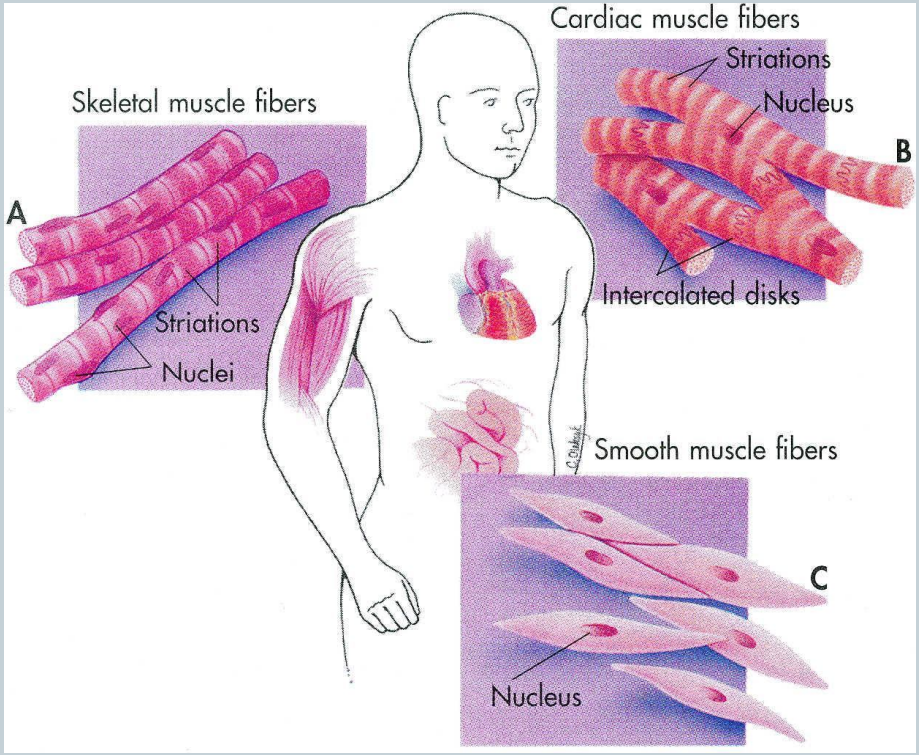
In the name of GOD

MUSCULAR SYSTEM
FOR
PARAMEDICINE STUDENT

DR. SAEEDNIA

Muscular system

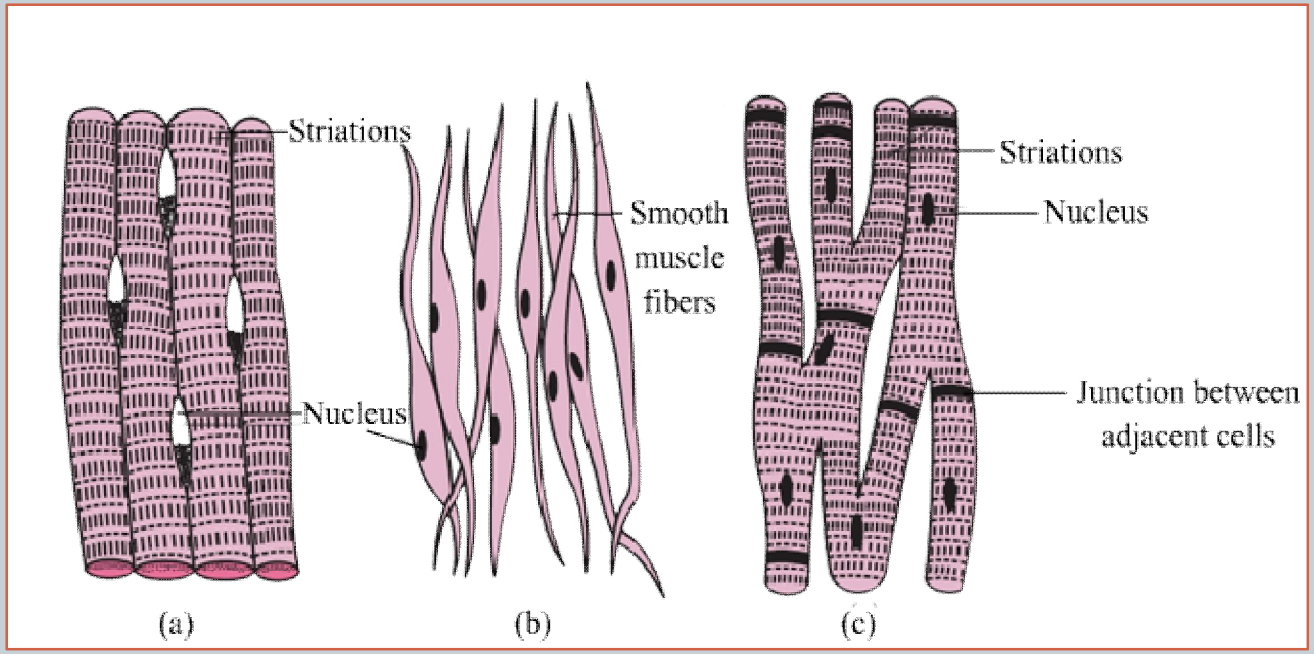


Muscle

- Specialized cells
- Contractile proteins

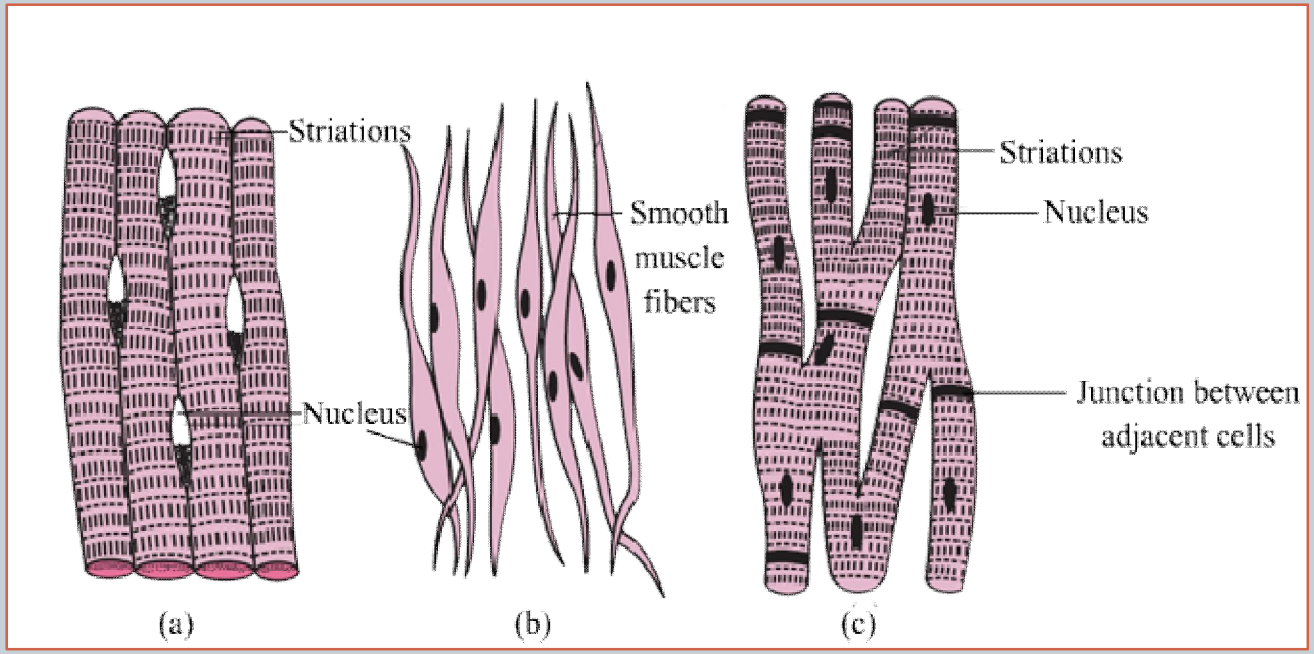
Muscle types:

1. Skeletal m.
2. Cardiac m.
3. Smooth m.

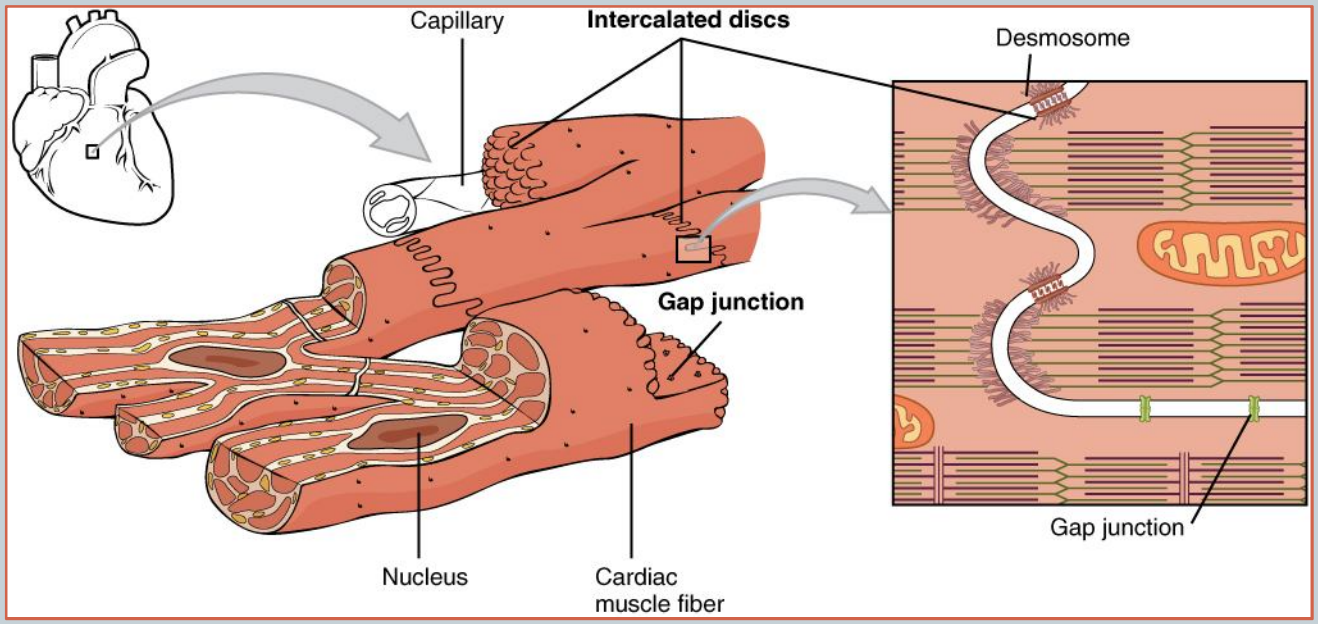


Skeletal muscle

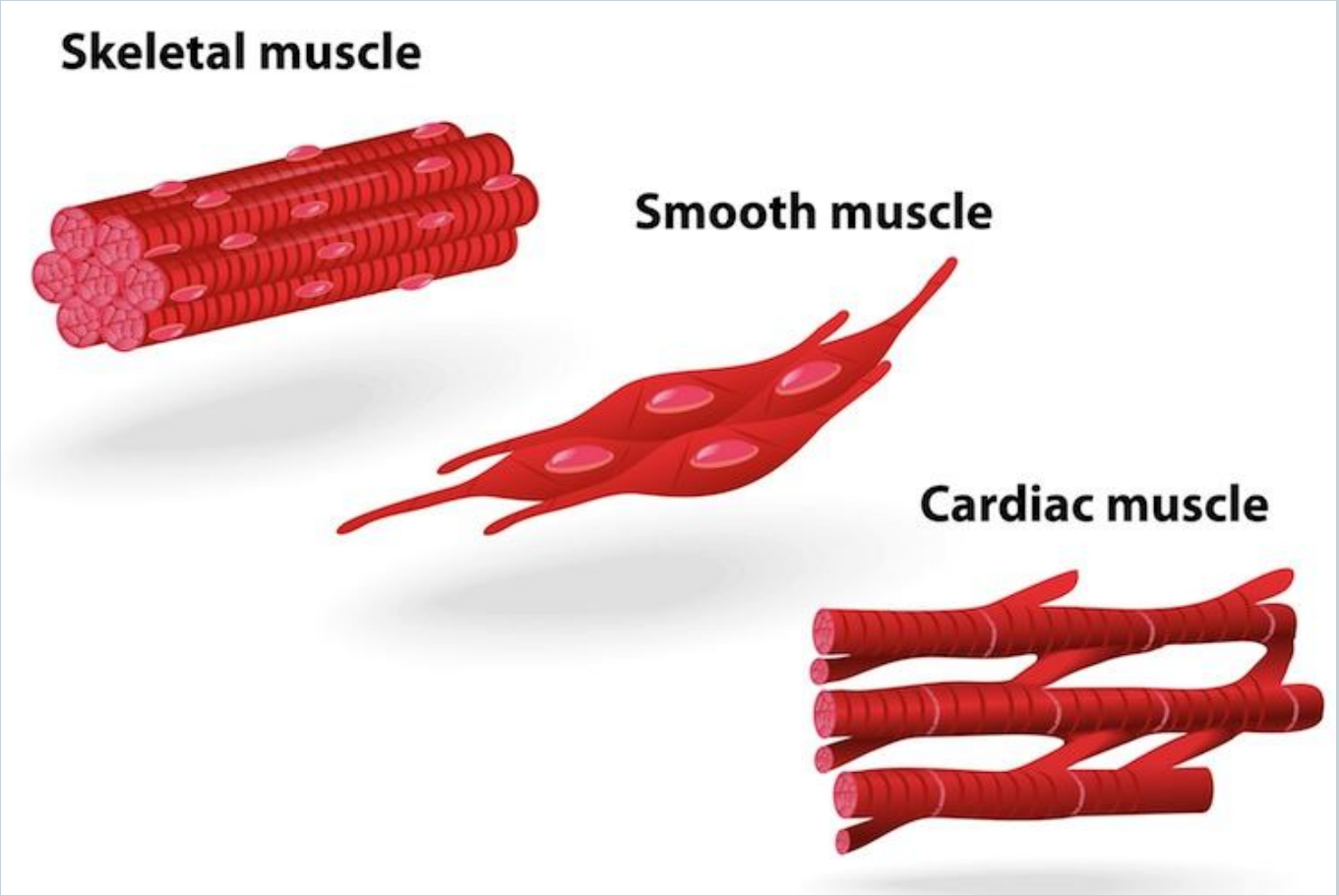
- Striated
- Actin & myosin proteins



Cardiac Muscle



Smooth Muscle



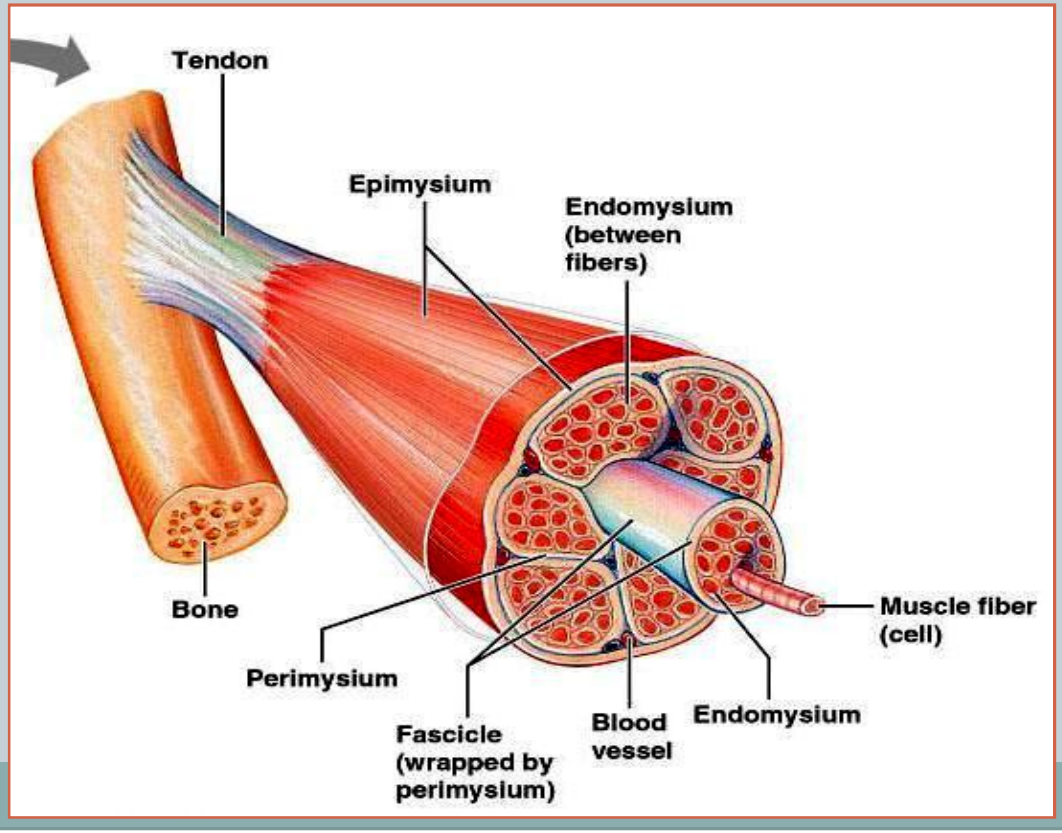
Skeletal muscle

Compose of:

- Muscle Fibers= length 30 cm / diameter 10-100 μm
- Muscle Fascicle
- Whole muscle

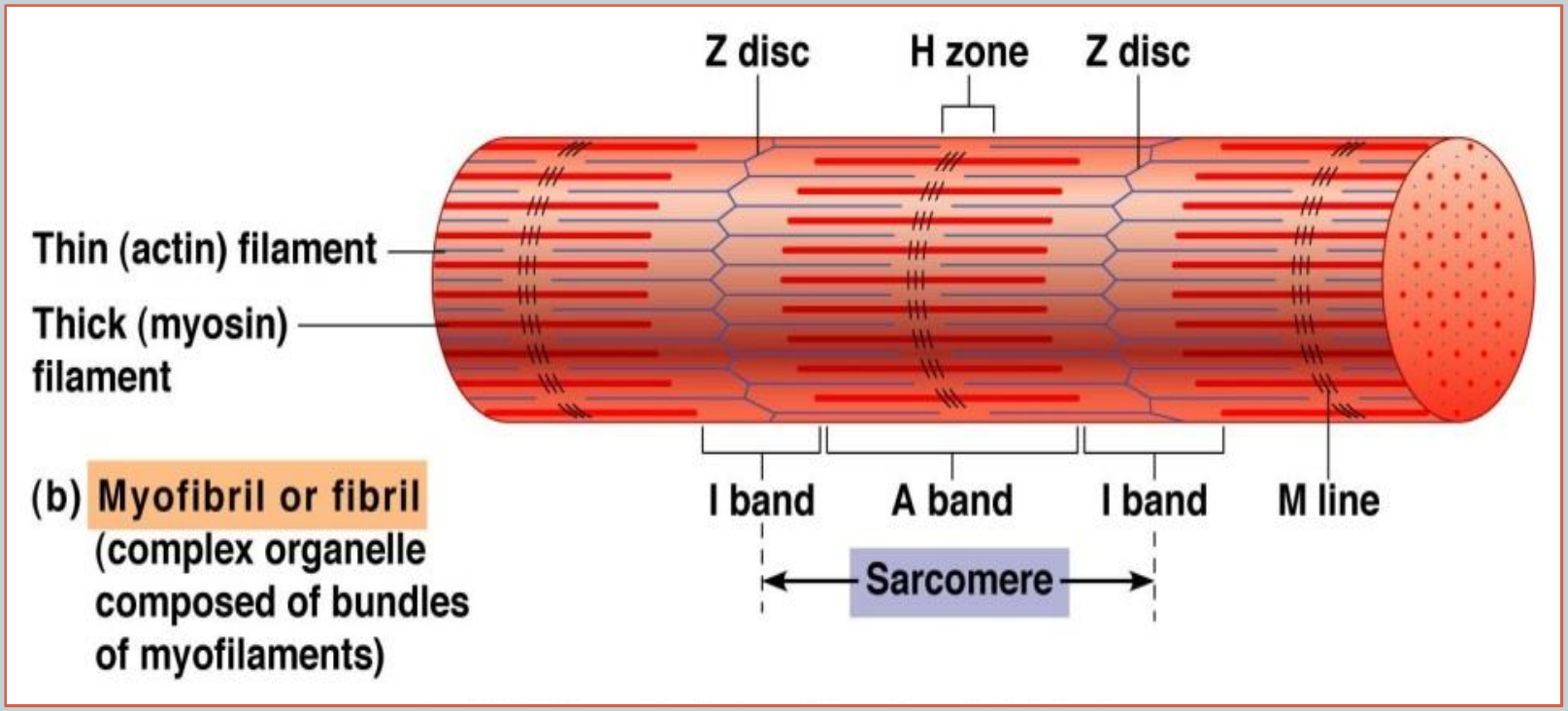
Connective tissue:

- Endomysium
- Perimysium
- Epimysium



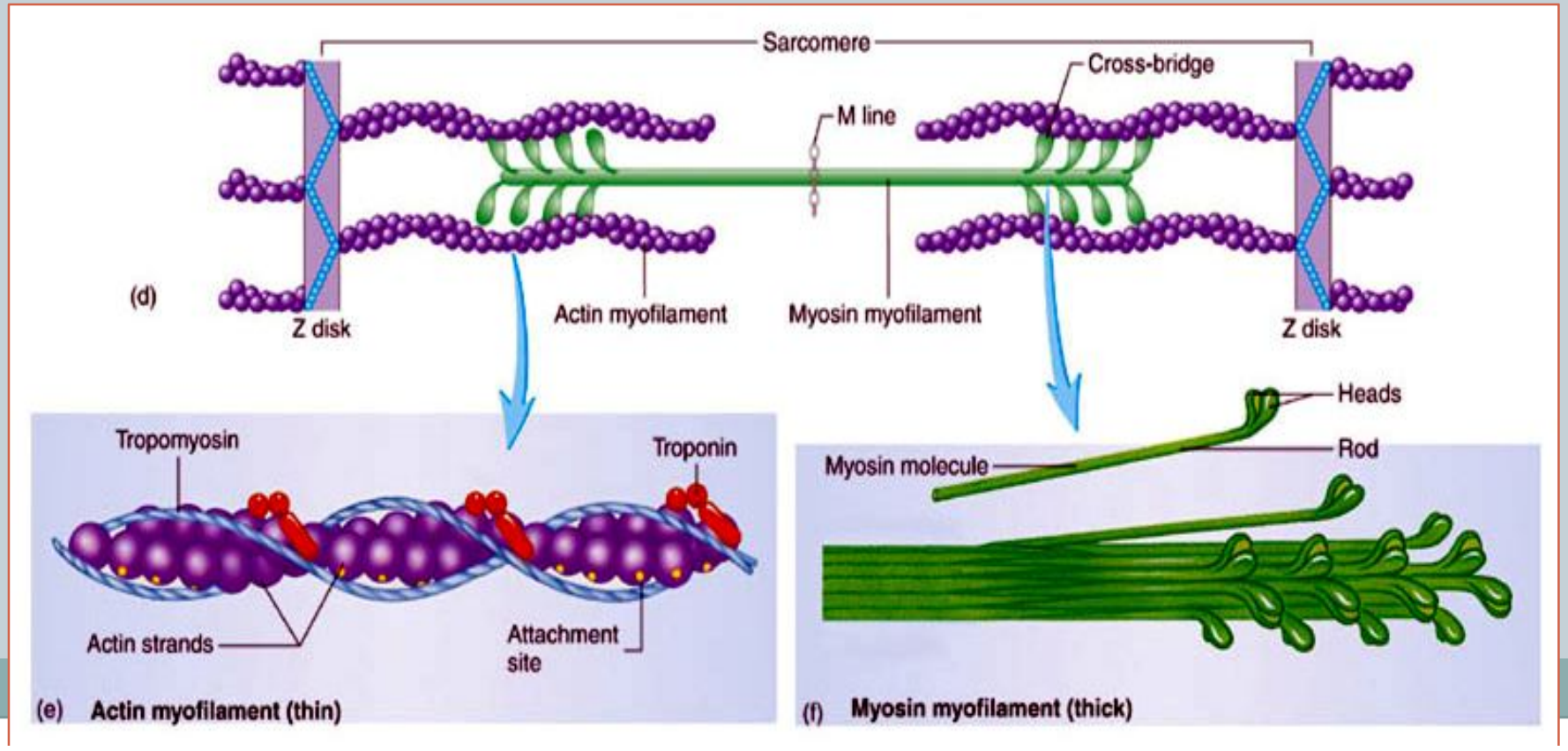
Muscle Fiber structure

- A. Band
- I. Band
- Z line (disc) & sarcomer (2.5 mm)



Muscle fiber proteins

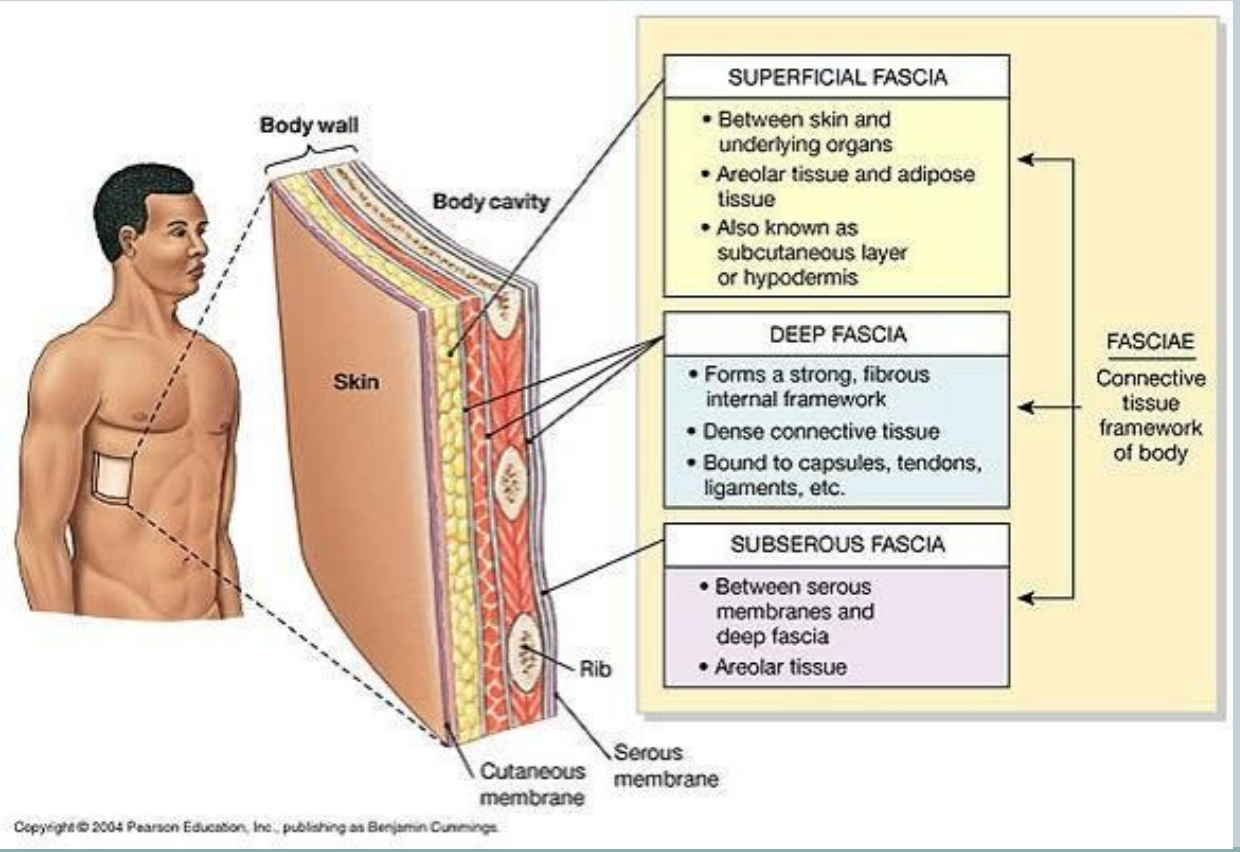
1. Actin
2. Troponin
3. Tropomyosin
4. myosin



Superficial fascia (hypoderm)

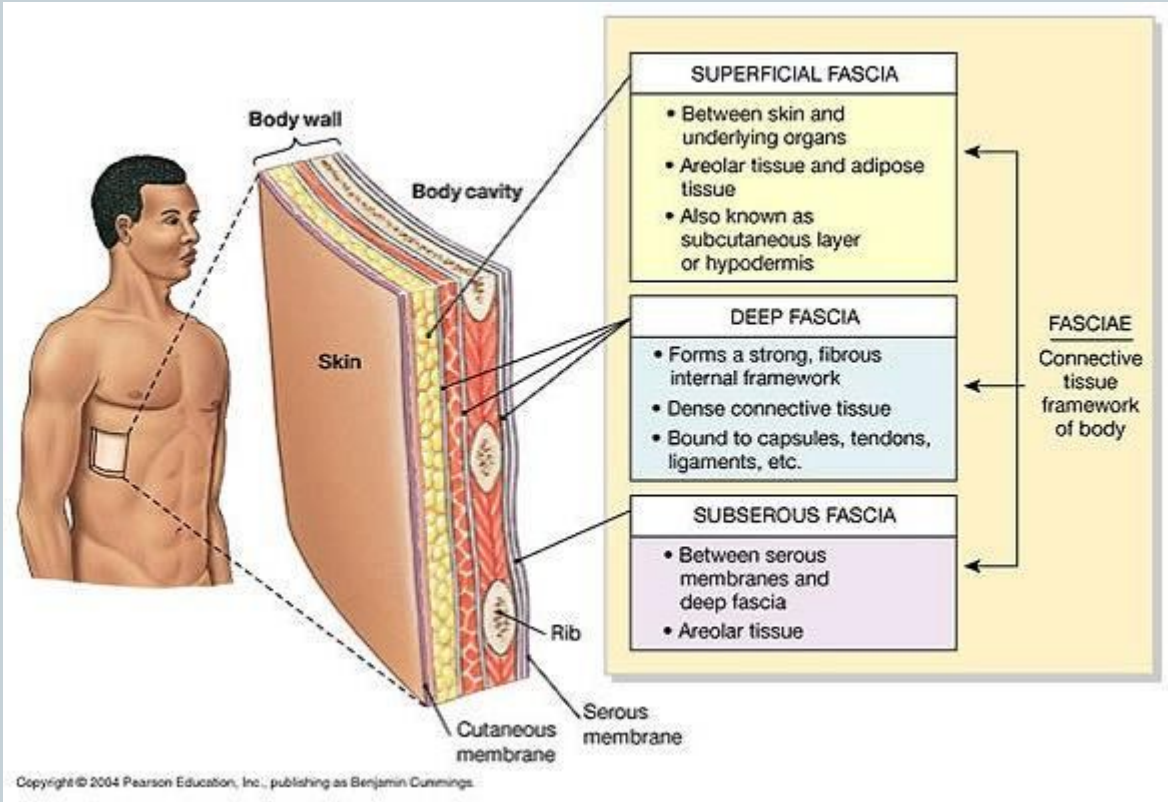
- Connective tissue
- Between skin & muscle

- Component:
- Adipose (yes / No)
- Vessels
- Nerves
- Sweet glands



Deep fascia

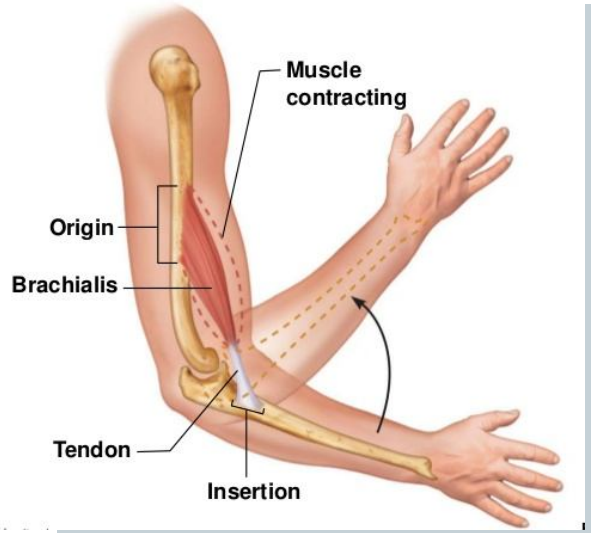
- Connective tissue
- Between muscle
- Septum (bone)
- Prevent Infection spread

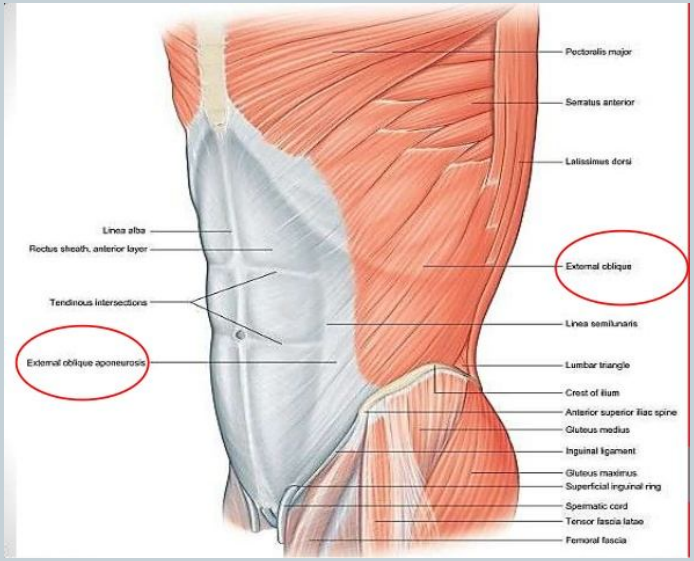


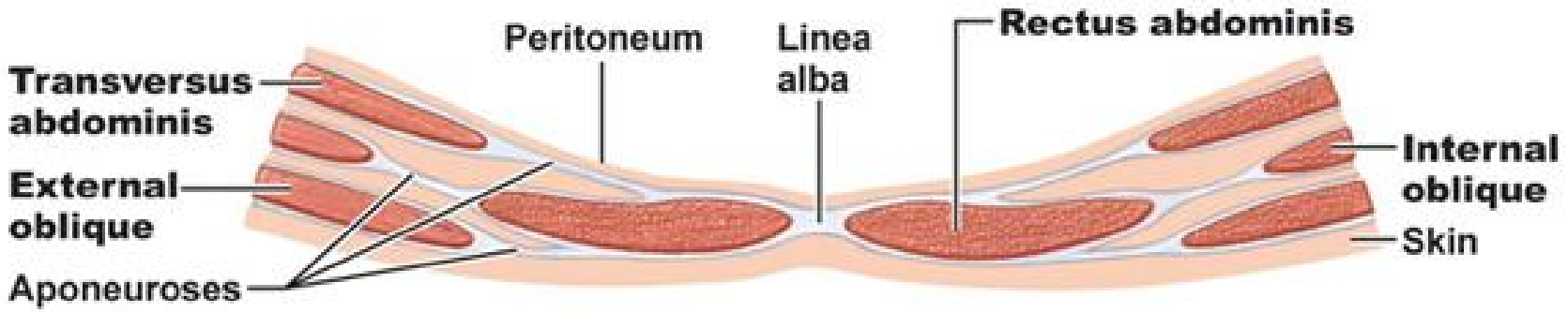
Muscle attachment site

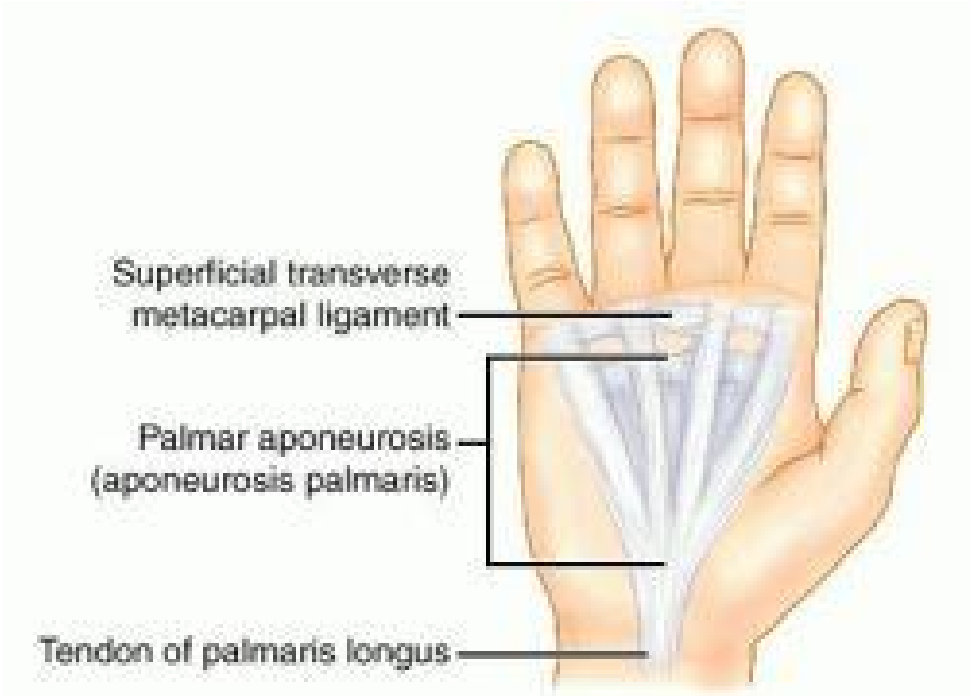
- Origin
- Belly (middle part)
- Insertion:

- Tendon (collagen)
- Aponeurosis (connective tissue)






Peritoneum
Linea alba
Rectus abdominis
Transversus abdominis
External oblique
Aponeuroses
Internal oblique
Skin


Superficial transverse metacarpal ligament
Palmar aponeurosis (aponeurosis palmaris)
Tendon of palmaris longus

Nomination

- Size (pectoral major & minor)
- Shape (deltoid)
- Head number (biceps)
- Position (supra & infra spinous)
- Deepness(felexor digitorum superficialis / prefundus)
- Adhesion (sternocleidomastoid)
- Function (levator scapula)

Muscle classification

- Head & neck muscles:

Facial expression m.
Mastication m.
Neck region m.
Lingual m.
Pharyngeal m.
Supra & infra hyoid
Extra ocular muscle

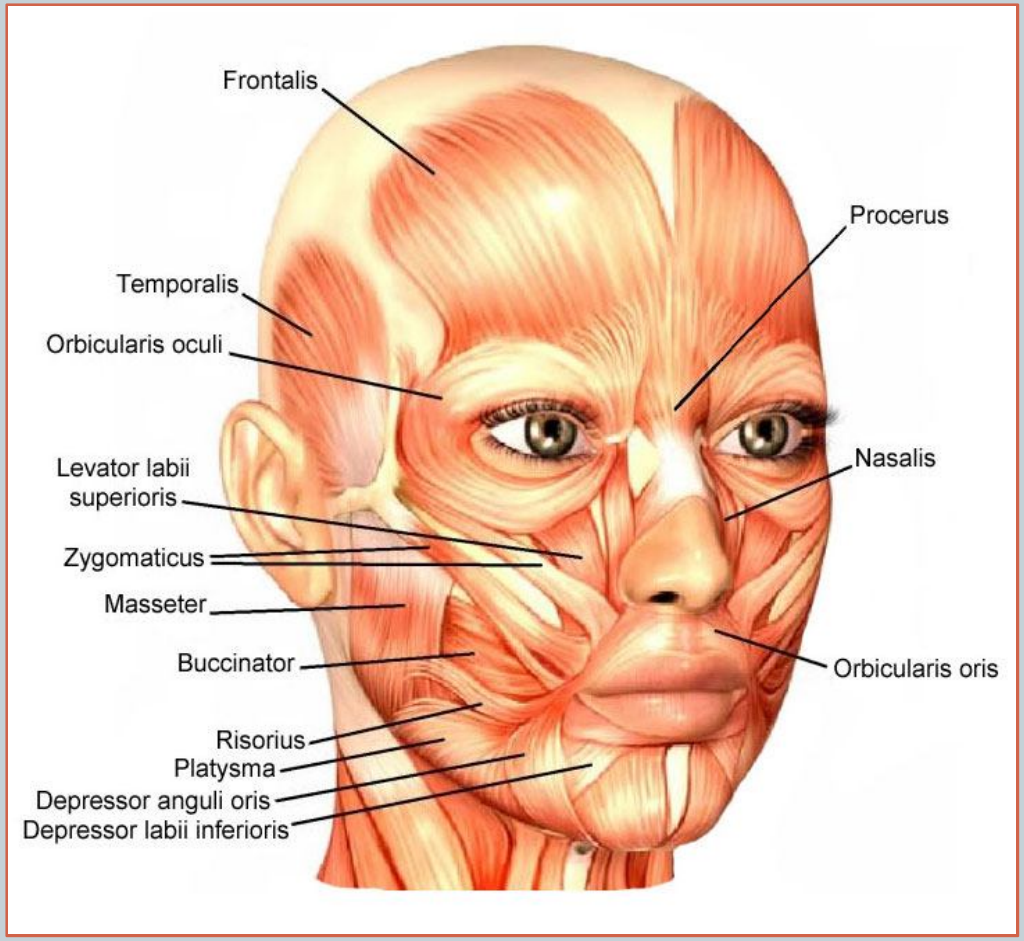
- Trunk muscles:

- Limb muscles:

1. Upper limb
2. Lower limb

Facial expression muscles

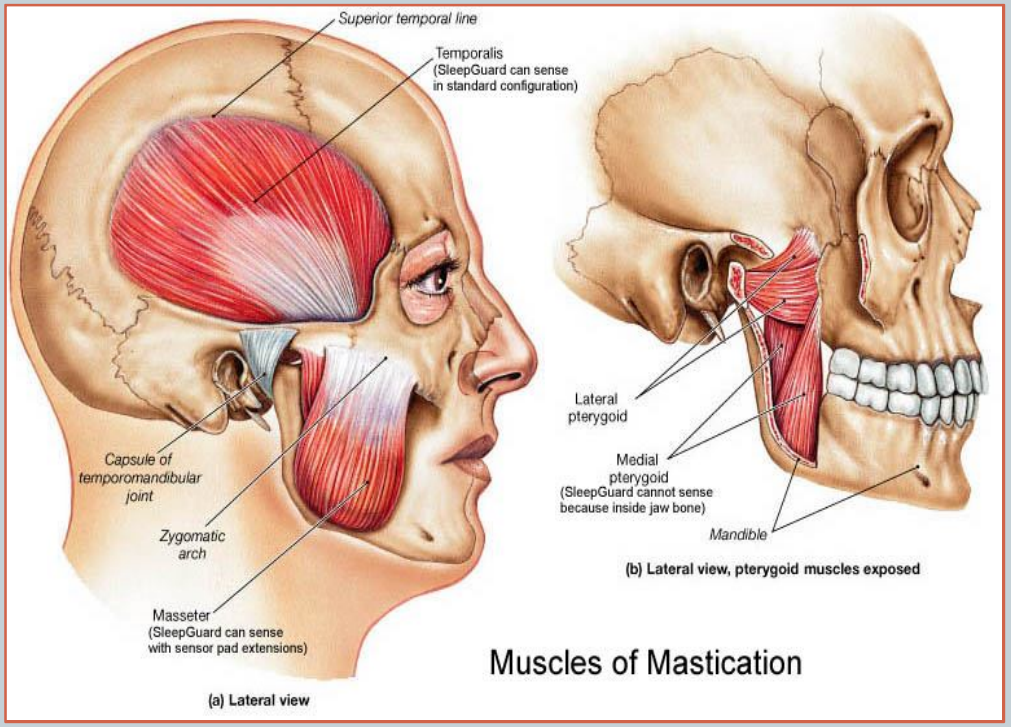
- Express the emotion
- End to skin
- Innervation: facial n. (7^{th})



Muscles of mastication

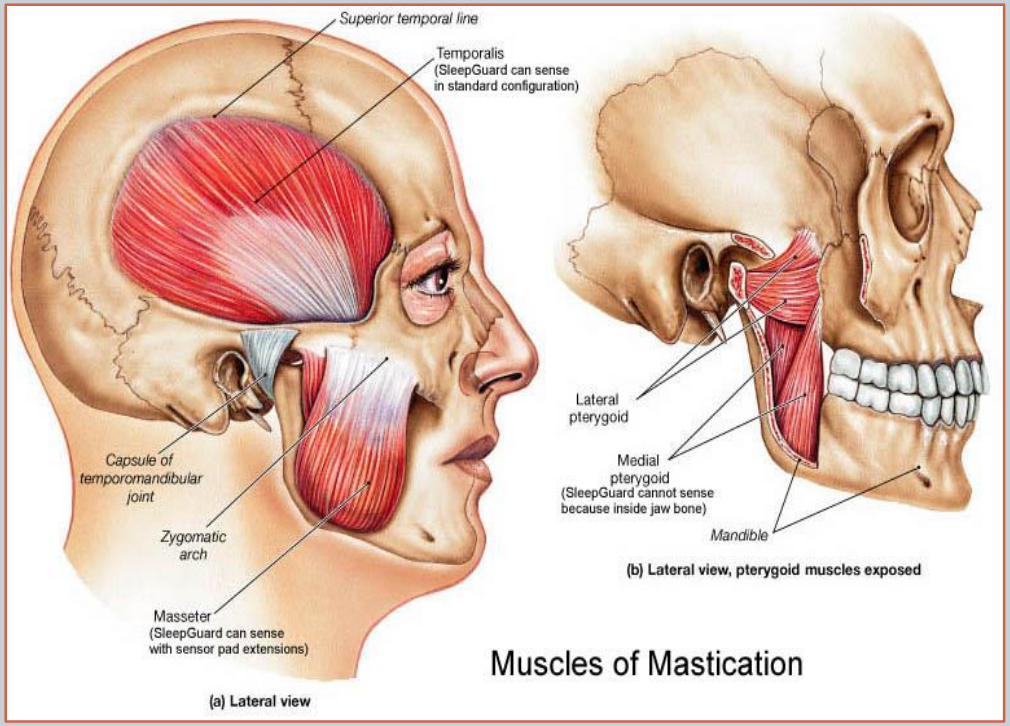
1. Masseter (close)
2. Temporalis (close)
3. Medial Petrigoid (close)
4. Lateral Petrigoid (open)

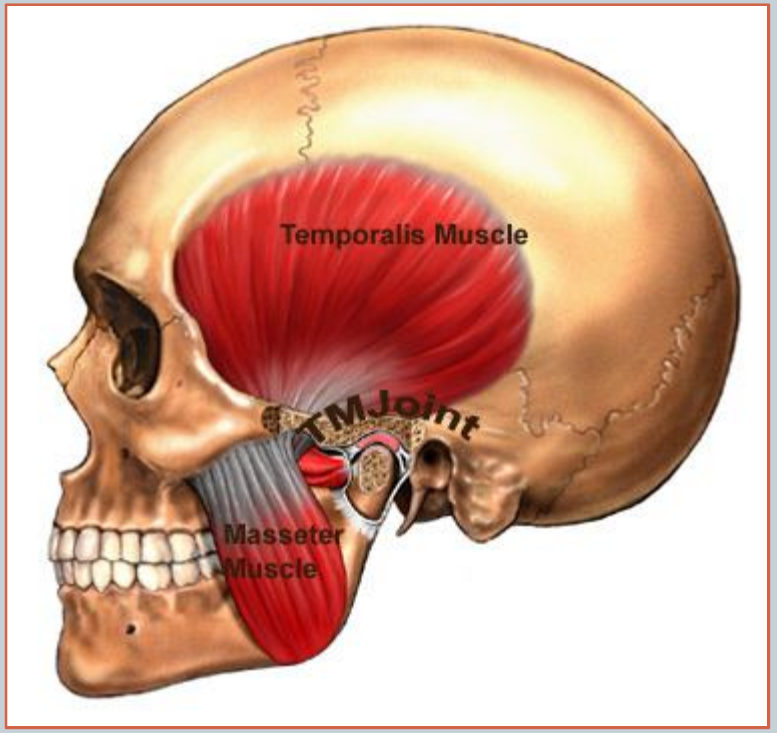
Innervation: trigeminal n. (5^{th})



Masseter

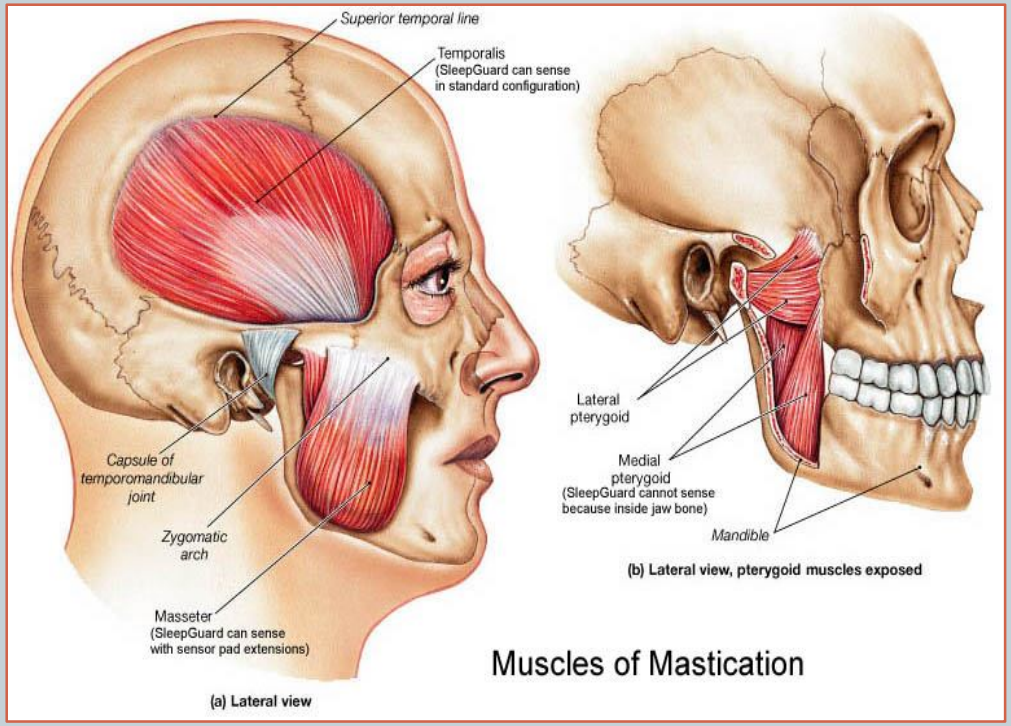
- O: Zygomatic Pro. Of maxilla & zygomatic Arch
- I:mandible angle & ext. sur. Of mandible ramus
- F: close

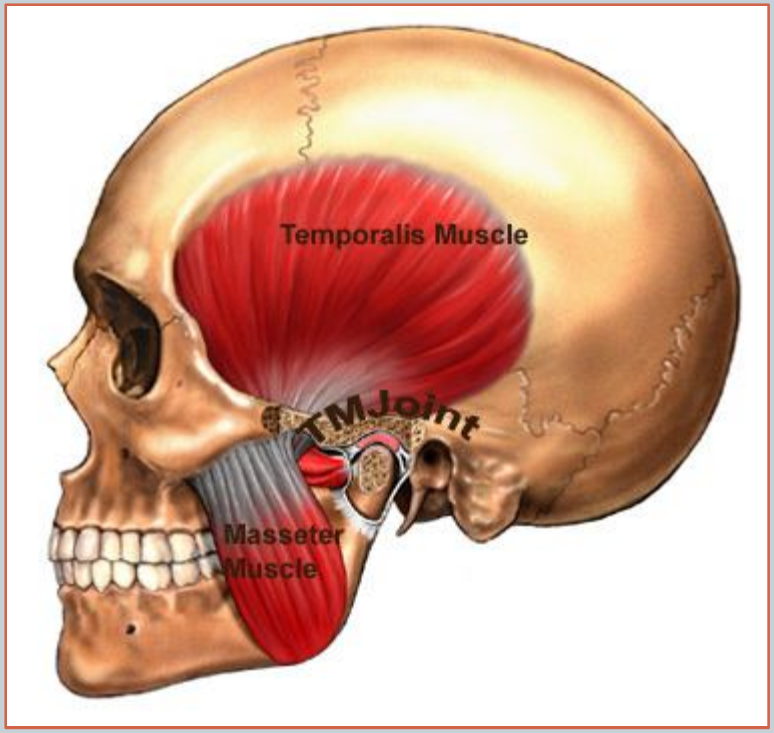




Temporalis m.

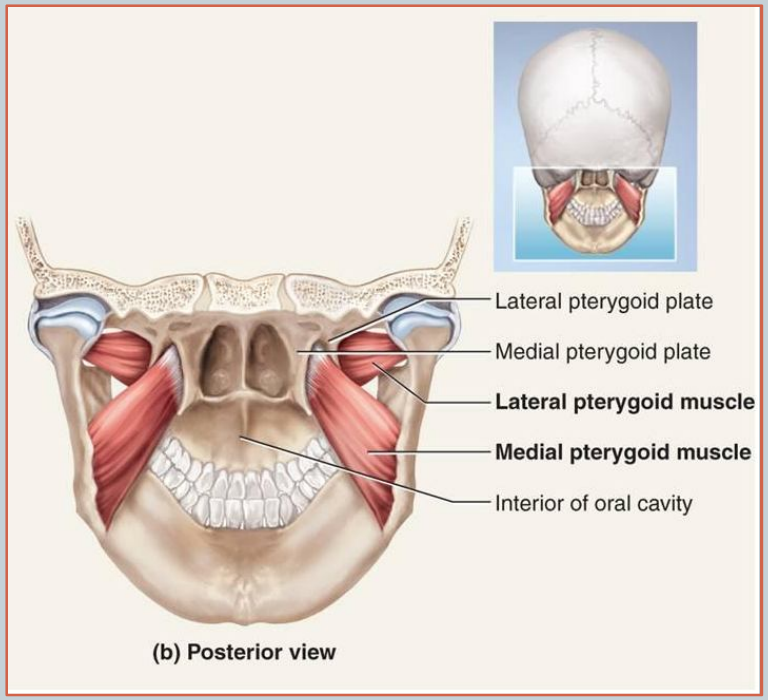
- O: Temporal fossa
- I: cronoid pro. Of mandible
- F: close

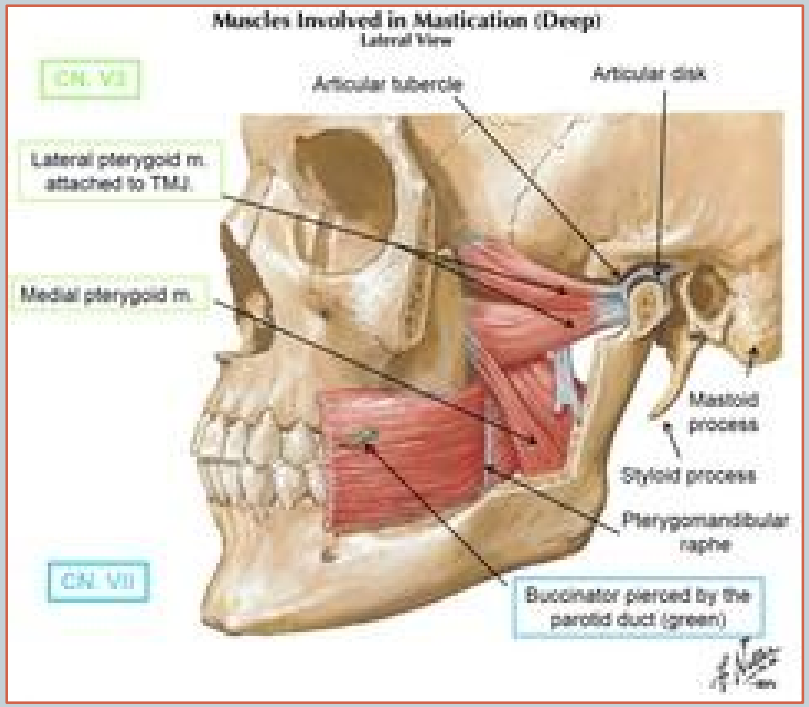




Medial Pterygoid m.

- O: med surface of lateral peterygoid process & palatine bone
- I: med. Surface of mandible ramus & mandible angle
- F: close





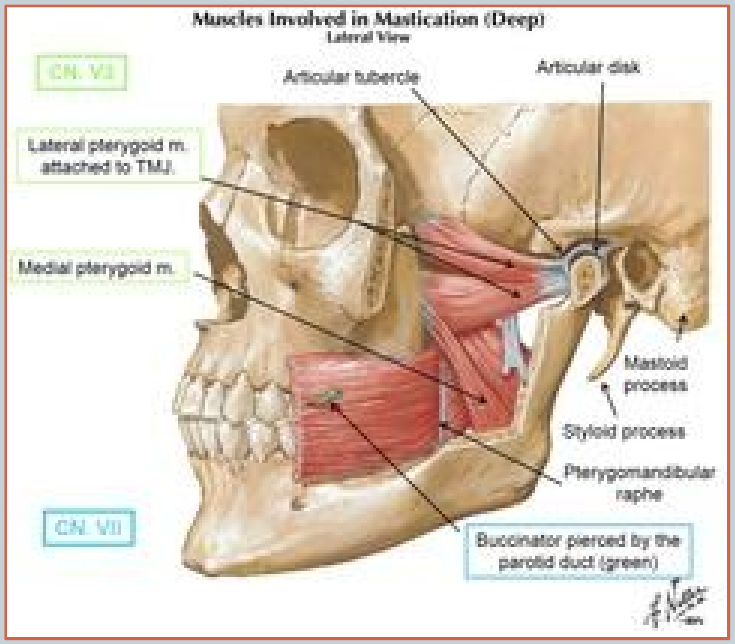
Lateral Pterygoid m.

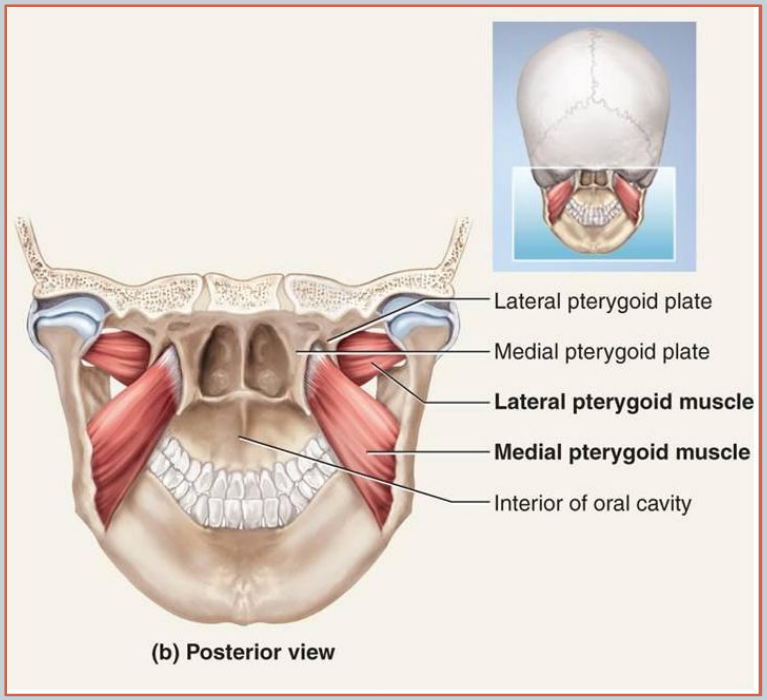
- O:

lat. Surface of greater wing of sphenoid

Lat. surface of lateral peterygoid process

- I: mandible condyle & TMJ disc
- F: open





Neck muscles

- Superficial m.

Platysma

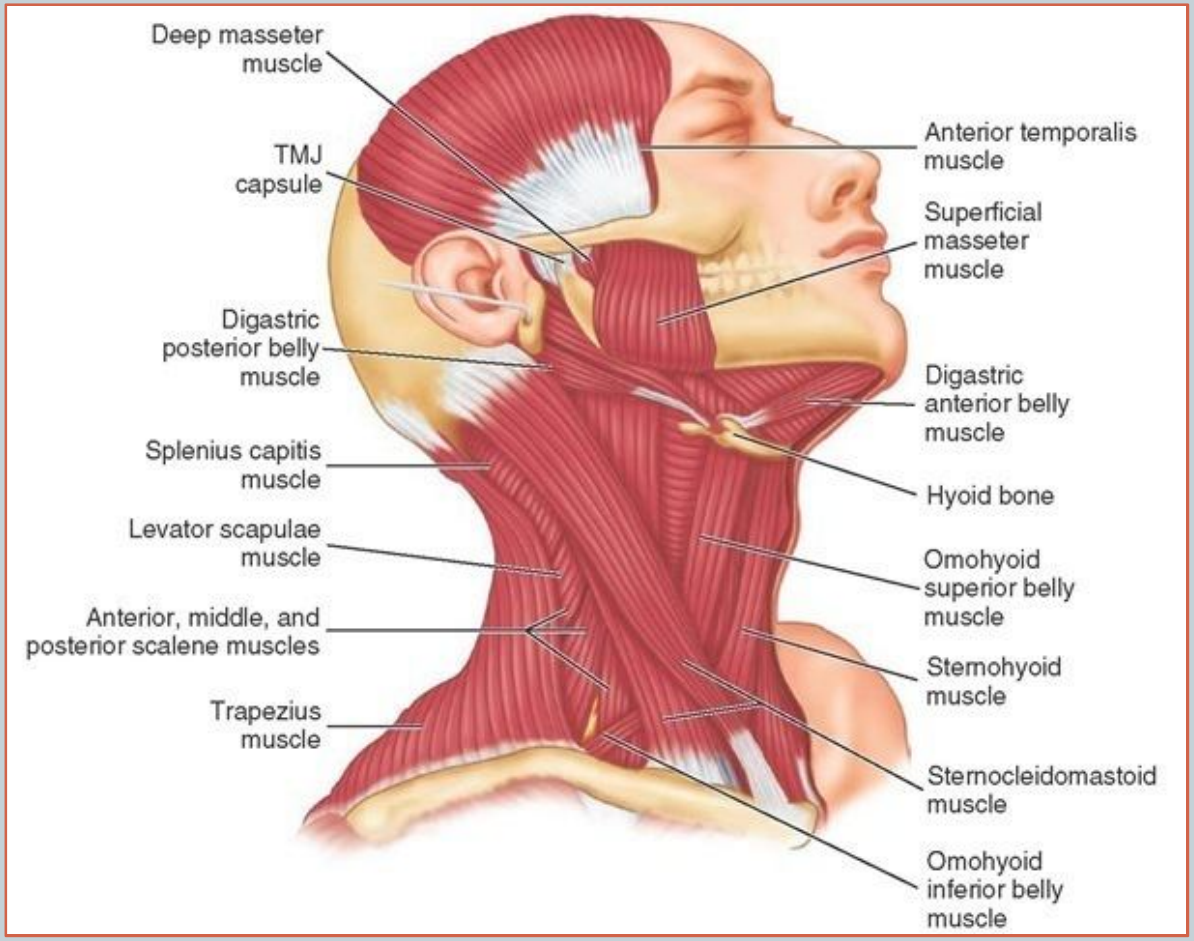
Sterno Cleido Mastoid m.

- Antero lateral m.

Anterior scalene

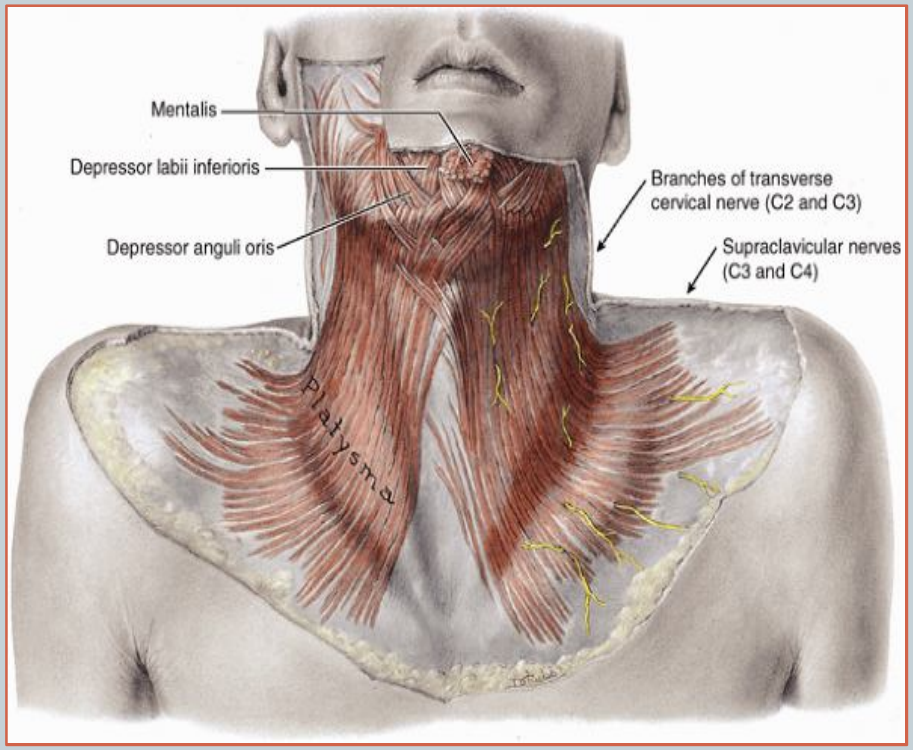
Middle scalene

Posterior scalene



Platysma

- O: deep fascia of pectoral major & deltoid m.
- I: inf. Border of mandible, inf. Lip
- F: make folds in neck skin & depression of inf. Lib skin & ...



SCM

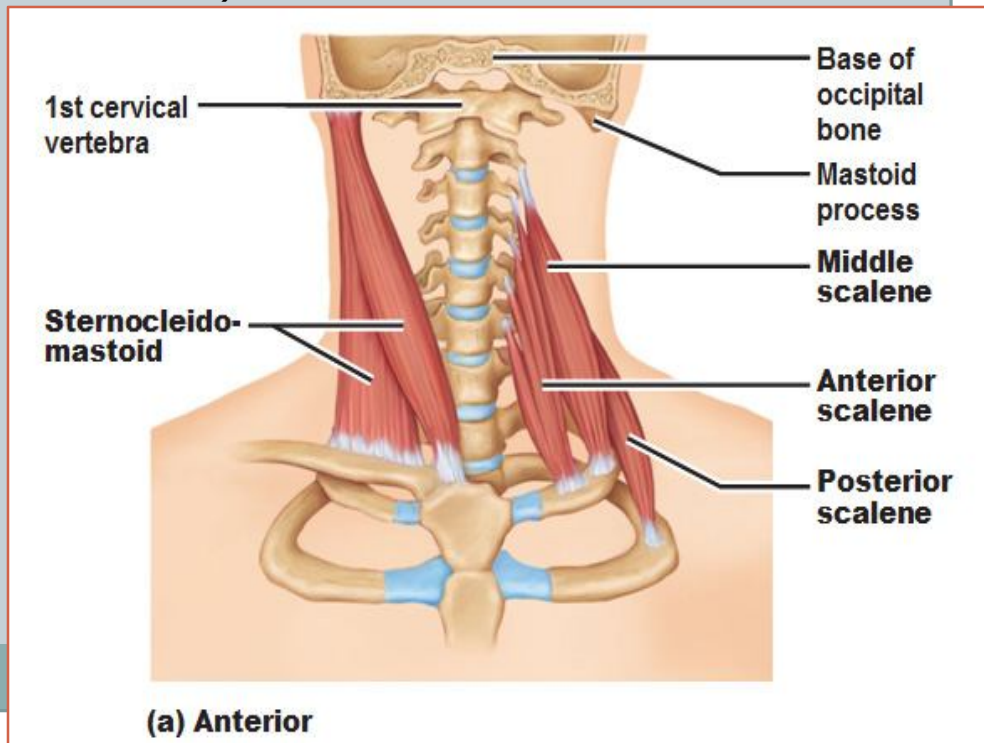
- O:

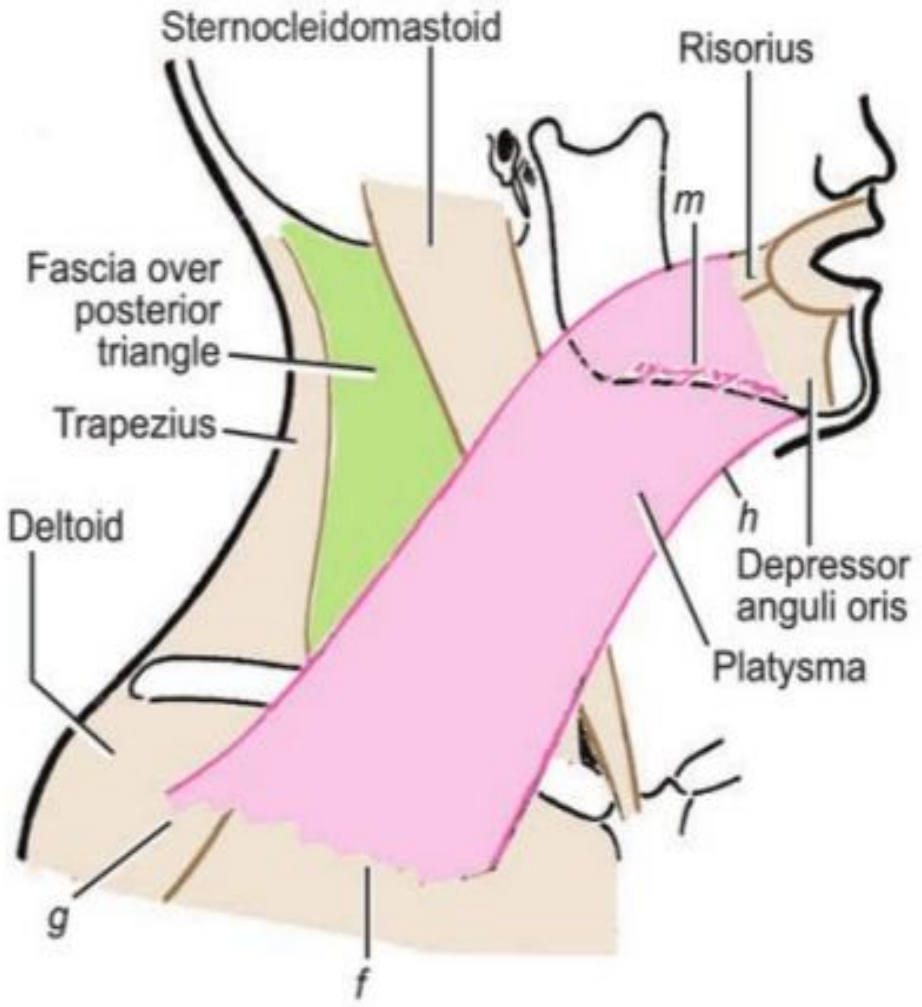
manubrium sternum

Sternal end of clavicle

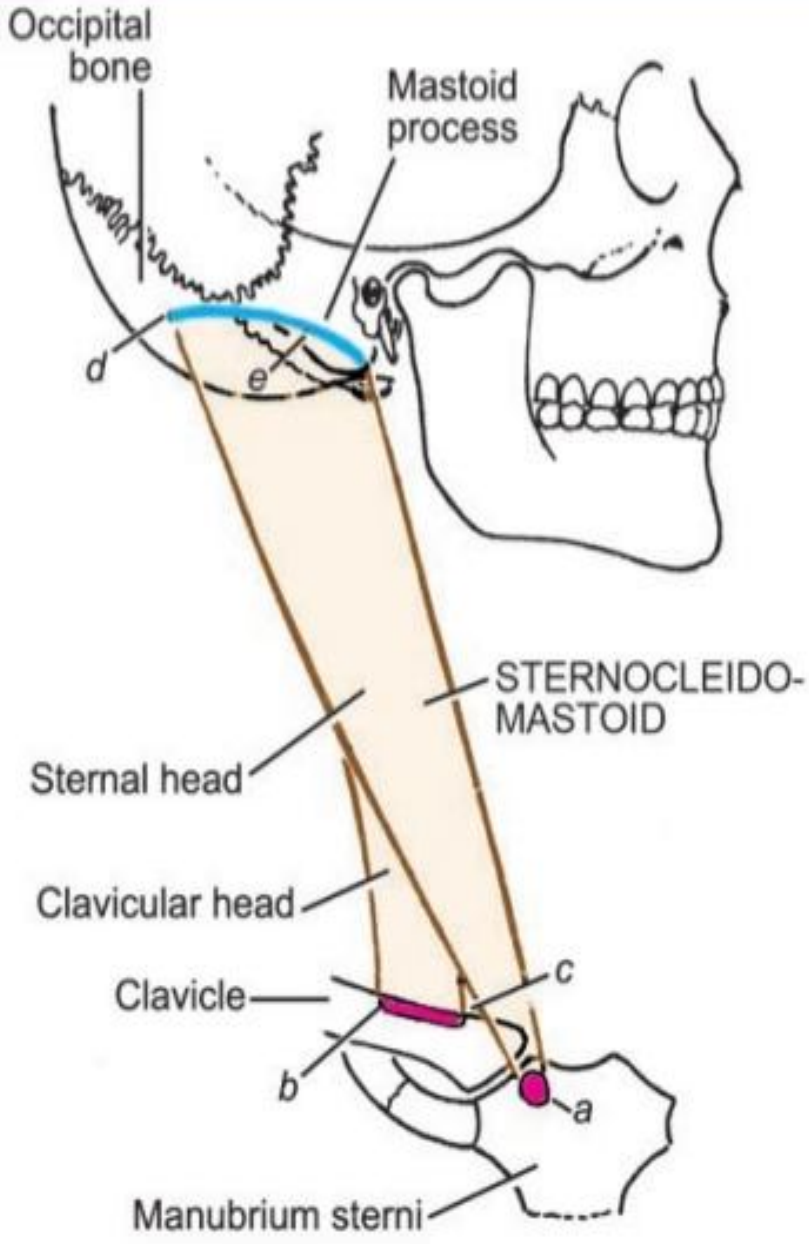
- I: mastoid pro. Of temporal
- F: flexion of head to front (bilateral contraction) &

Lateral flexion(unilateral contraction)





41.4: The platysma muscle



41.5: Scheme to show the attachments of the sternocleidomastoid muscle

Triangle of neck

- In each side of neck SCM make 2 triangles:

➢ Ant. Triangle border:

Lat. = ant. SCM

Ant. = middle line of neck

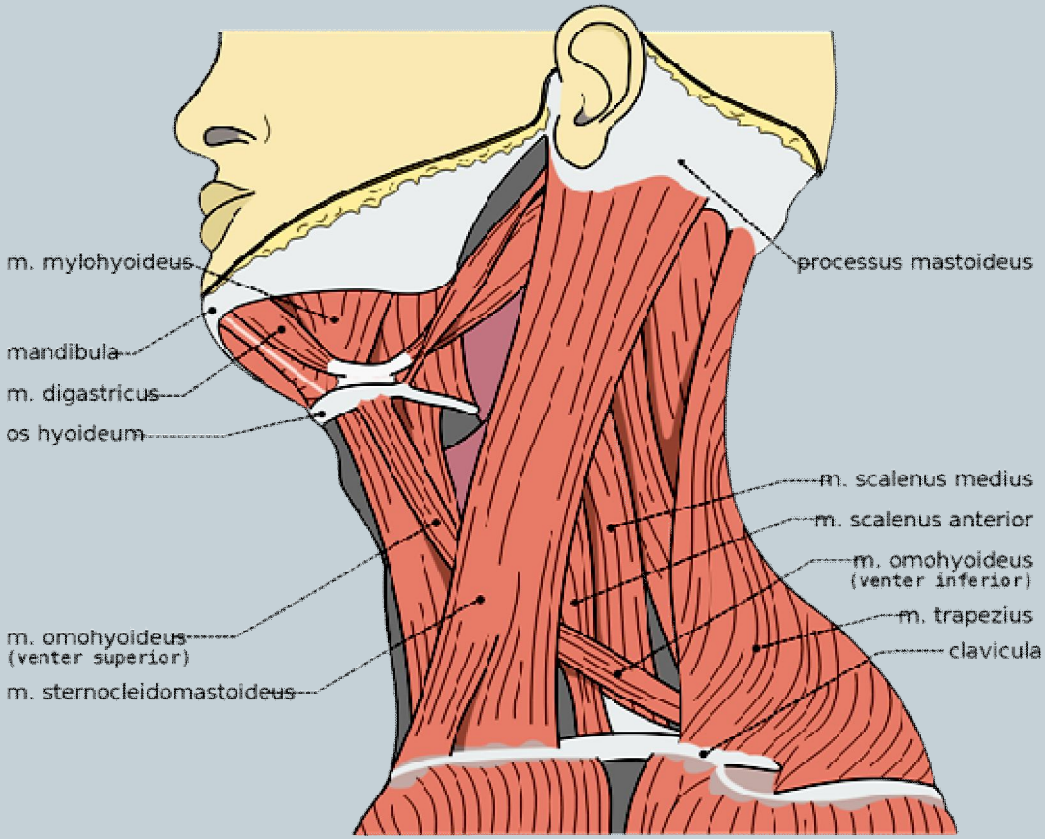
Sup. = mandible body

➢ Post. Triangle border:

Ant. = post. SCM

Post. = trapezius m

Inf. = middle 1/3 clavicle



Scalene Muscles

- Anterior Scalene

0: transverse pro. C3-C6

I: superior surface of first rib

- Middle scalene

O: transverse pro. Cervical vertebrae

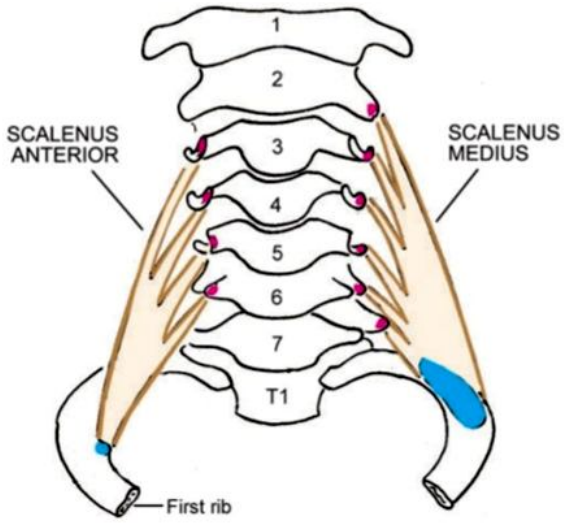
I: first rib

- posterior Scalene

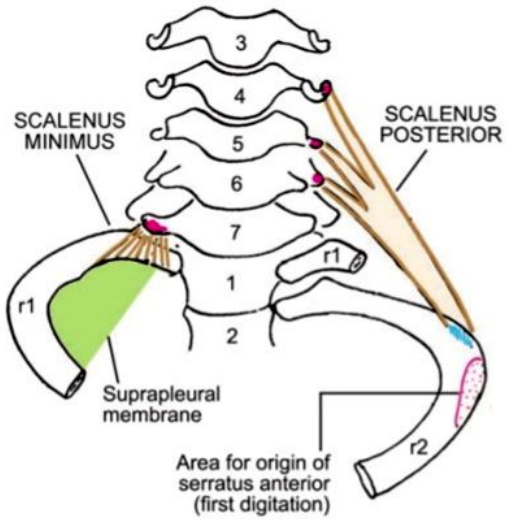
O: transverse pro. C5-C6

I: Second or third rib

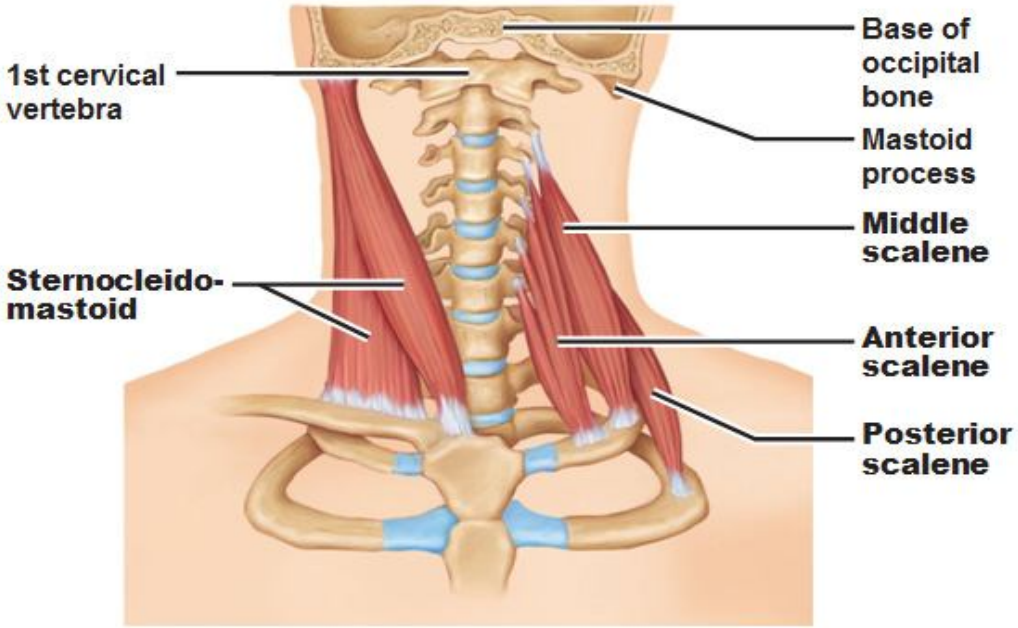
Function: inspiration / flexion of neck



41.10: Attachments of the scalenus anterior and scalenus medius muscles



41.11: Attachments of the scalenus posterior and scalenus minimus muscles

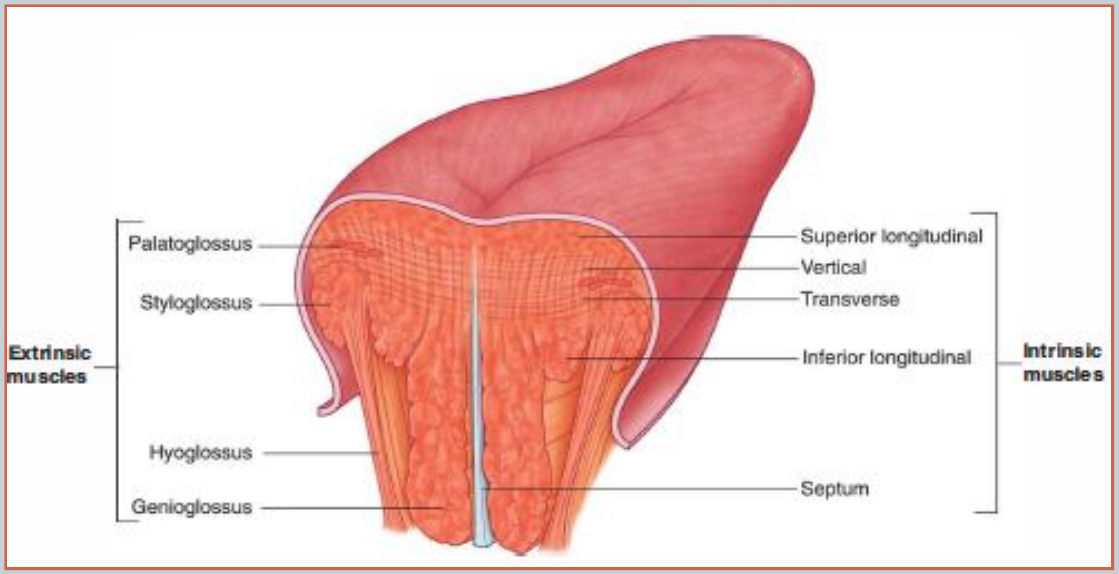


(a) Anterior

Lingual Muscle

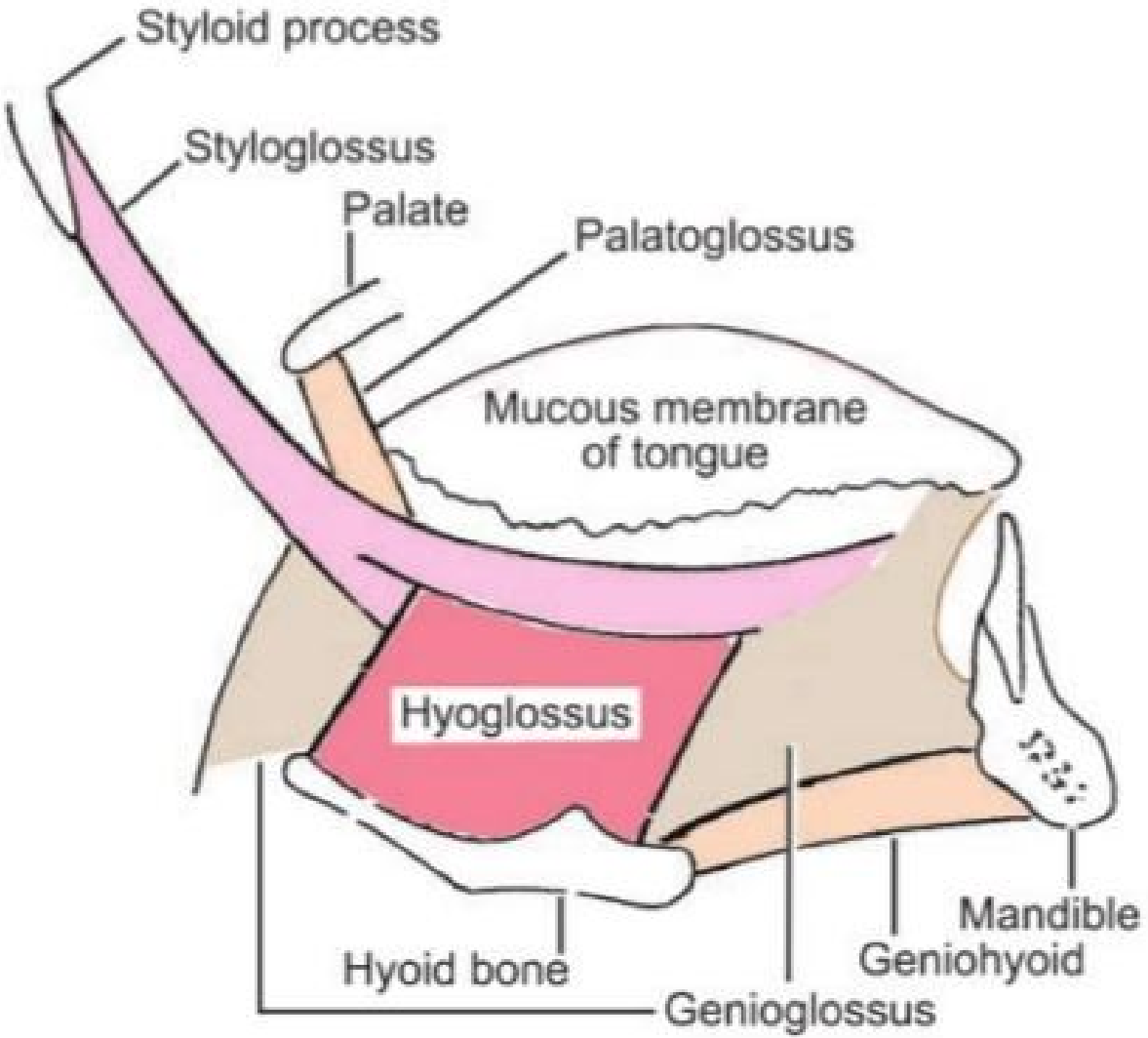
- Intrinsic

1. Superior longitudinal
2. Vertical
3. Transverse
4. Inferior longitudinal

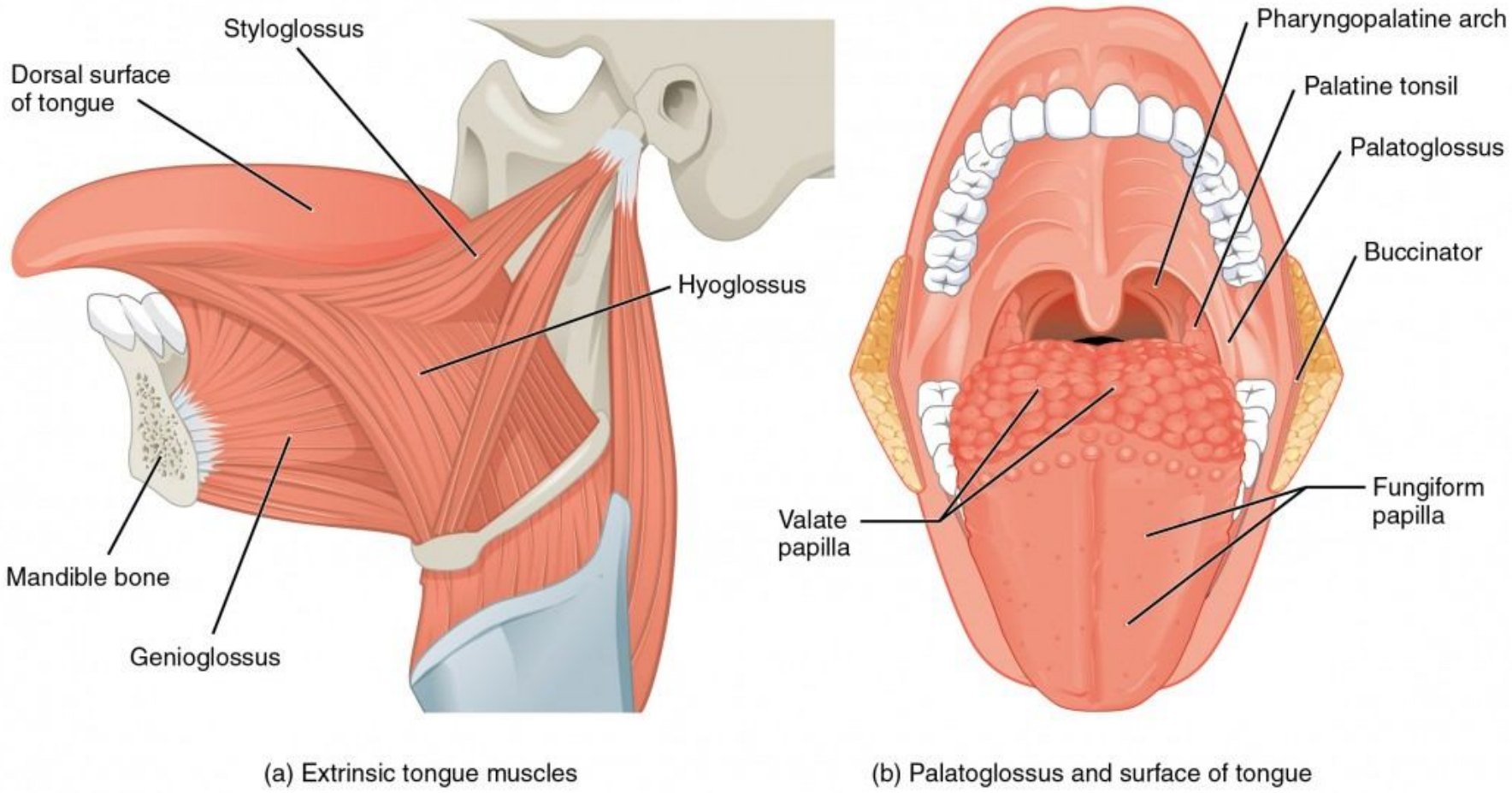


- Extrinsic

1. Genio glossus m. (out)
2. Hyo glossus m. (broad)
3. Stylo glossus m. (up & posterior)
4. Palato glossus m. (up the back part)

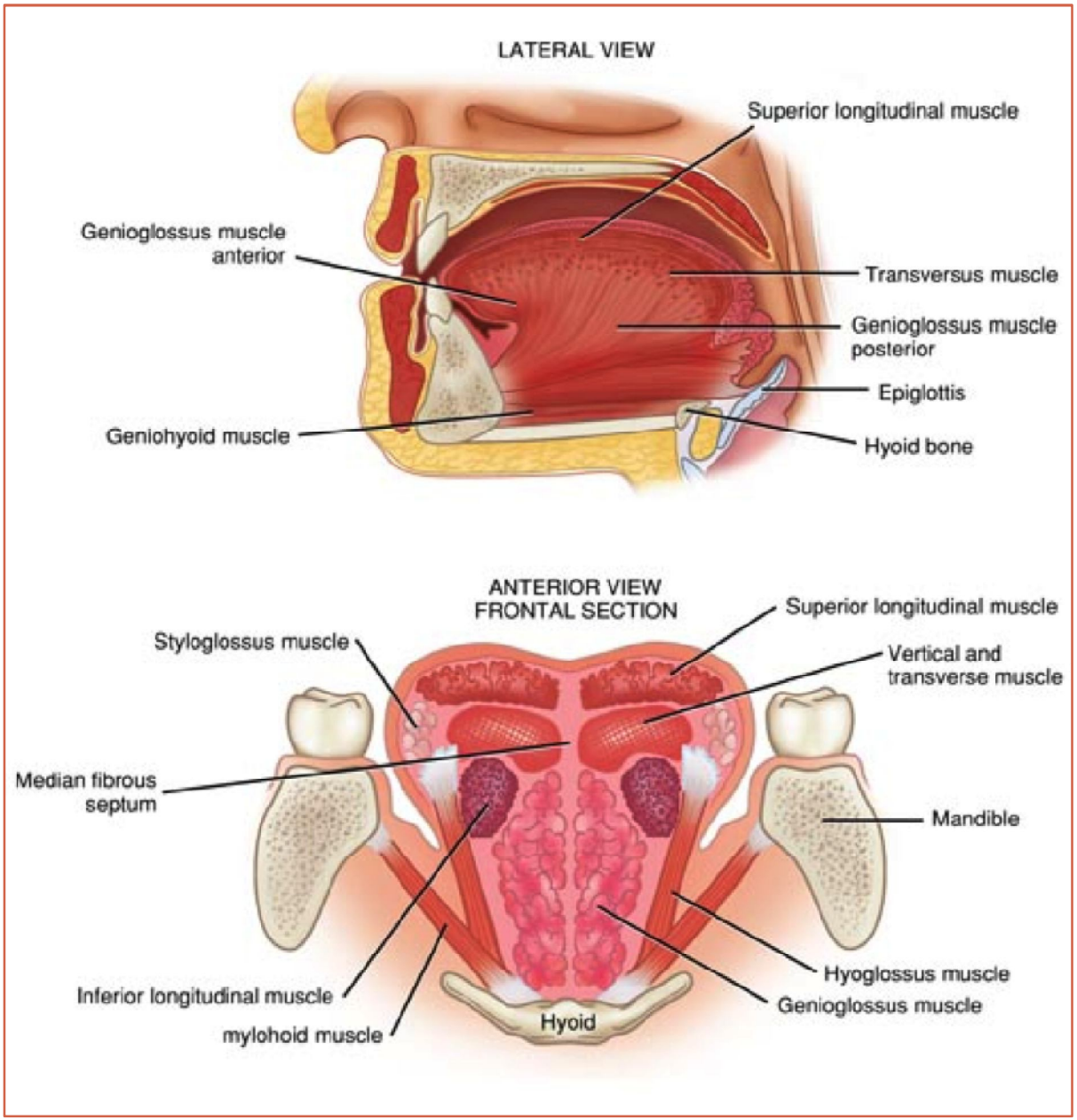


39.13: Drawing to show the extrinsic muscles of the tongue



(a) Extrinsic tongue muscles

(b) Palatoglossus and surface of tongue


LATERAL VIEW
Superior longitudinal muscle
Genioglossus muscle anterior
Transversus muscle
Genioglossus muscle posterior
Epiglottis
Geniohyoid muscle
Hyoid bone
ANTERIOR VIEW FRONTAL SECTION
Superior longitudinal muscle
Styloglossus muscle
Vertical and transverse muscle
Median fibrous septum
Mandible
Hyoglossus muscle
Inferior longitudinal muscle
Genioglossus muscle
mylohoid muscle
Hyoid

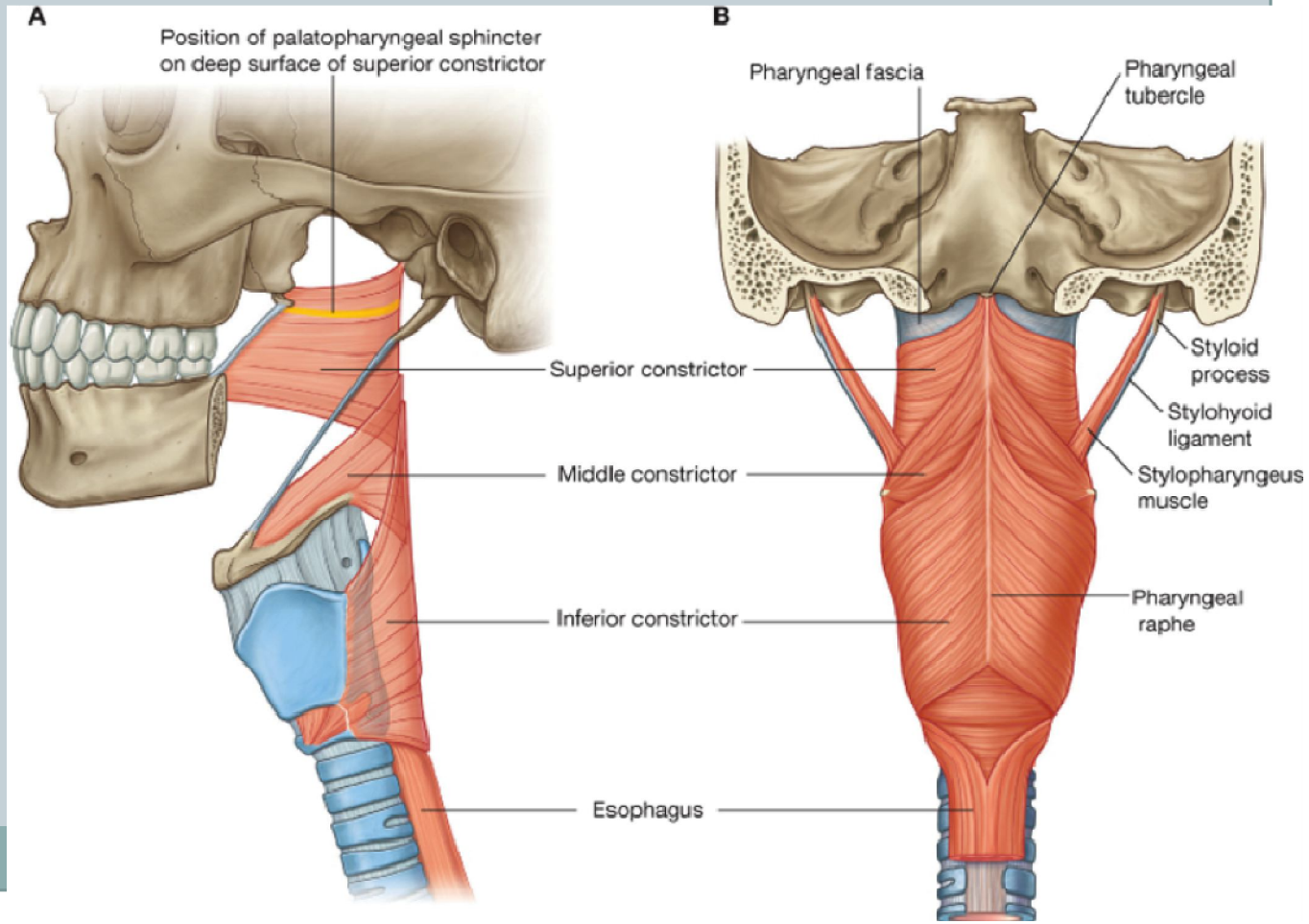
Pharyngeal Muscle

1. Longitudinal m.
2. Constrictor m.

Superior

Middle

Inferior



Supra & infra hyoid m.

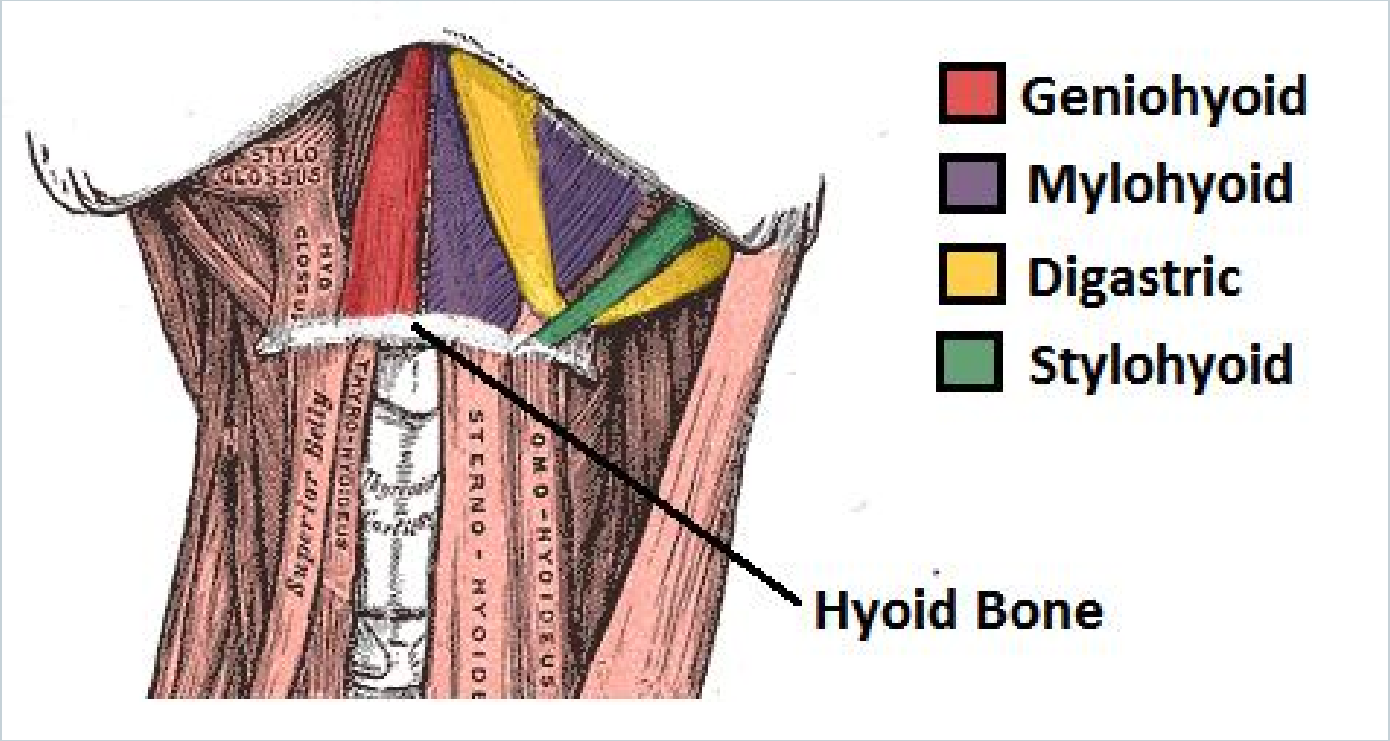
- Supra hyoid m.:

Digastric m.

Mylohyoid m.

Stylohyoid m.

Geniohyoid



Supra & infra hyoid m.

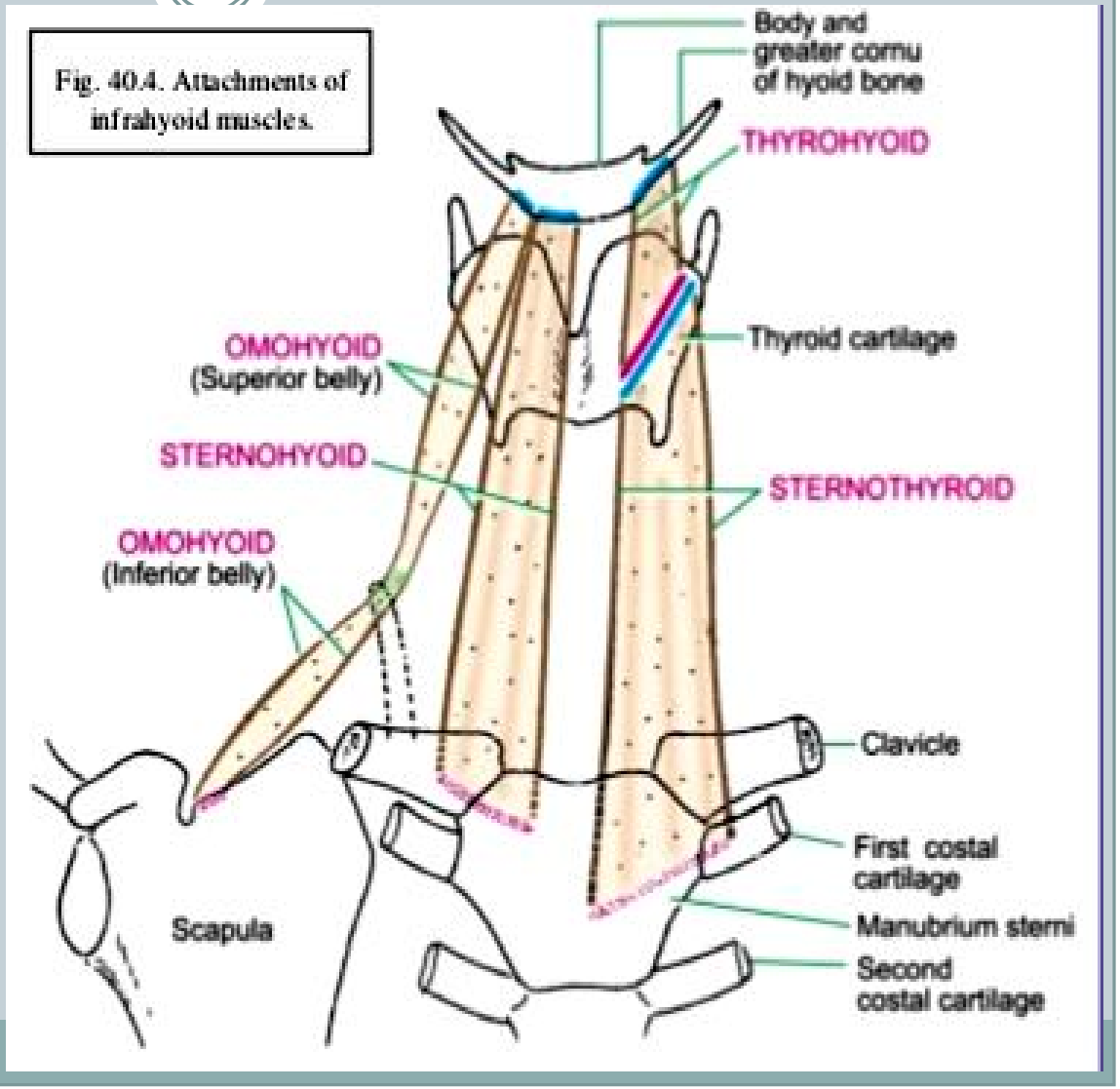
- Infra hyoid m.:

Sternohyoid

Sternothyroid

Thyrohyoid

omohyoid



Extra ocular muscles

- Levator palpebral. Sup
- Lat. Rectus
- Med. Rectus
- Sup. Rectus
- Inf. Rectus
- Sup. Oblique
- Inf. oblique

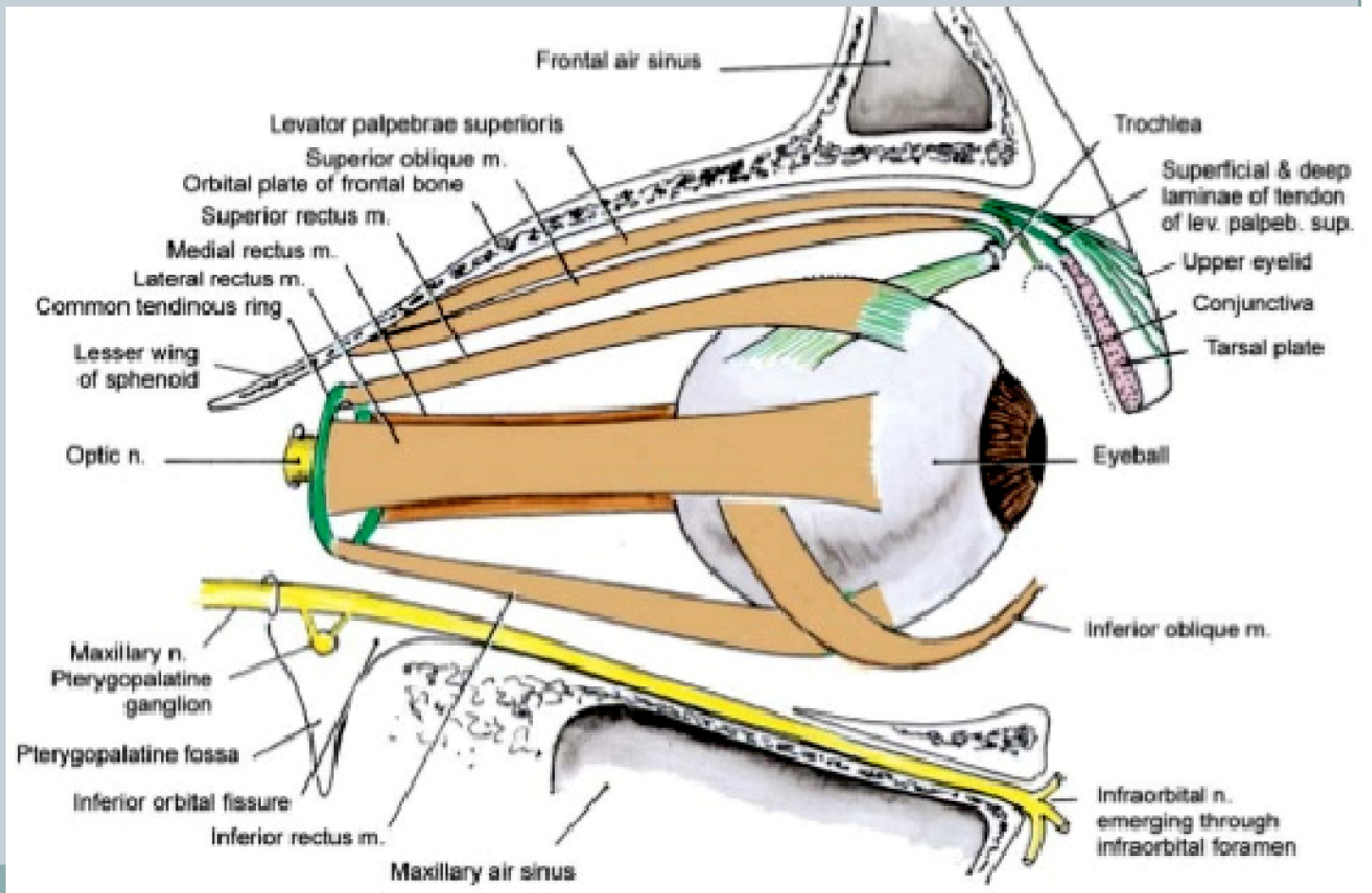
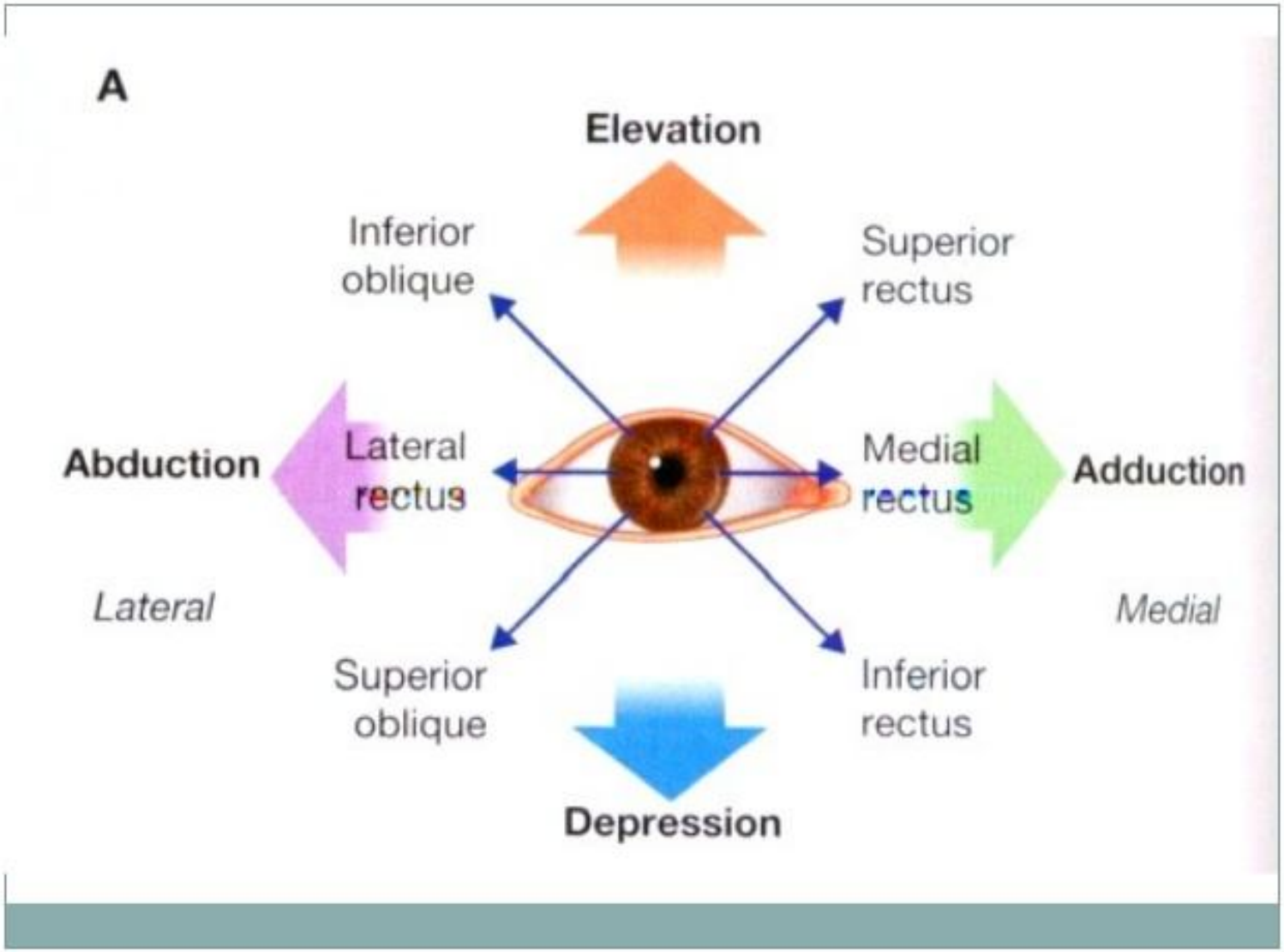


Fig. 43.2. Extraocular muscles seen from the lateral side.

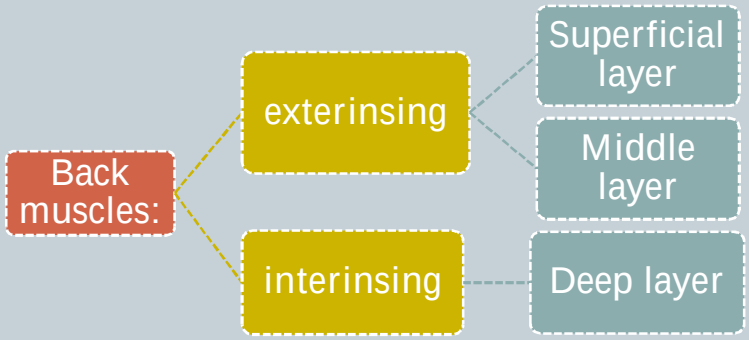
Extrinsic ocular muscle function

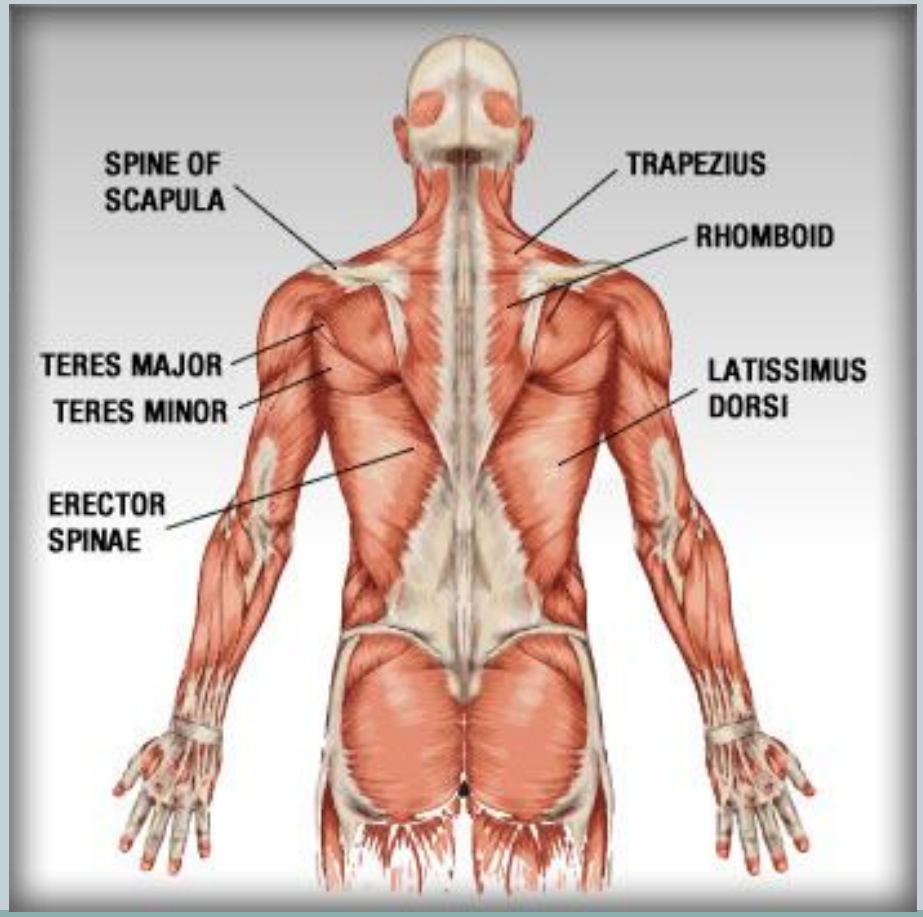


Muscles of the Back

- Support & movement of vertebral column

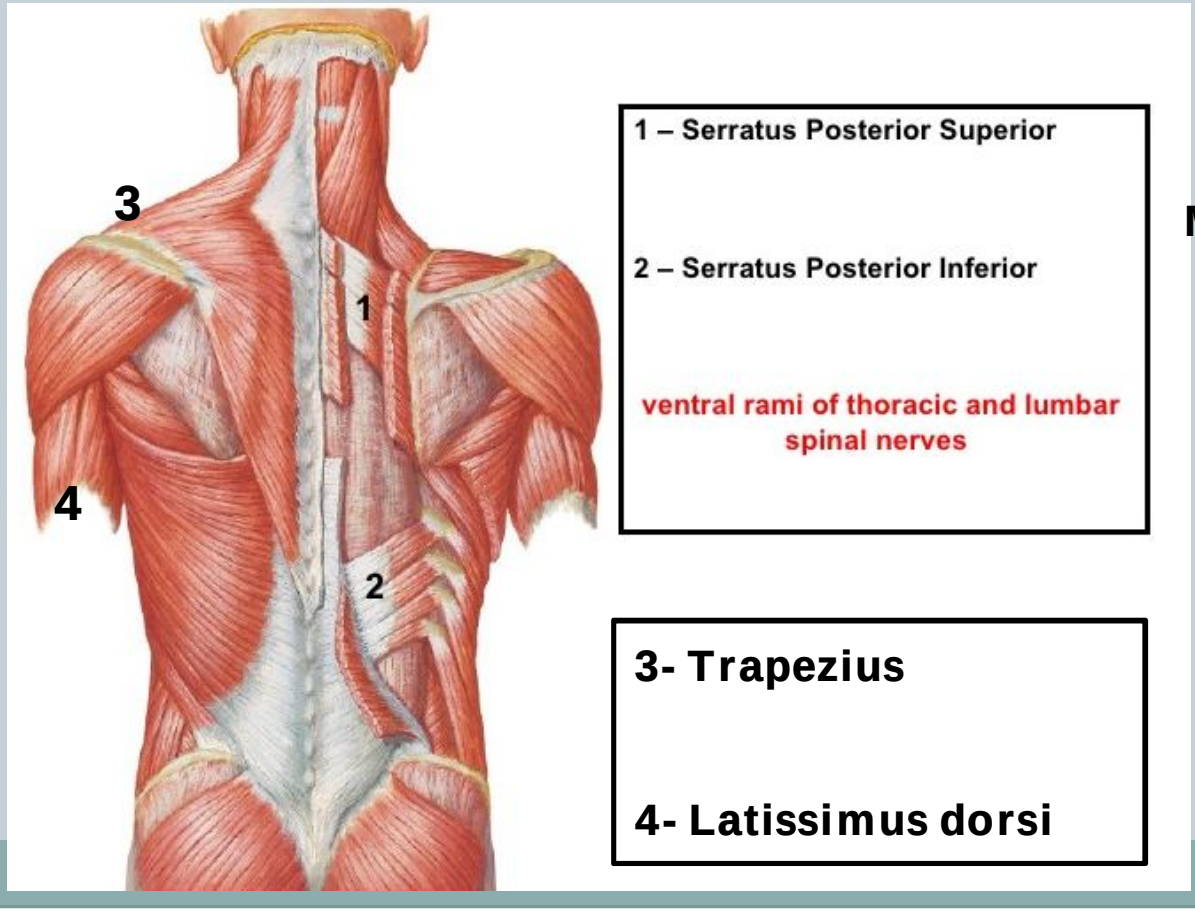
1. Superficial m.
2. Middle m.
3. Deep m.





Superficial layer

1. Latissmus Dorsi (humerus add. & med. Rot.)
2. Trapezius (scapula add. & elevator & inf. rotation)



Trapezius

- O:

Ext. occipital protobrance

Nuchal lig.

Transverse proc. T1-T12

- I:

spinus proc. Scapula

Acromion

1/3 external part of clavicle

F: scapula adduction & elevation & inf. Rotation scapula

Latissmus Dorsi

- O: Spinus Proc.

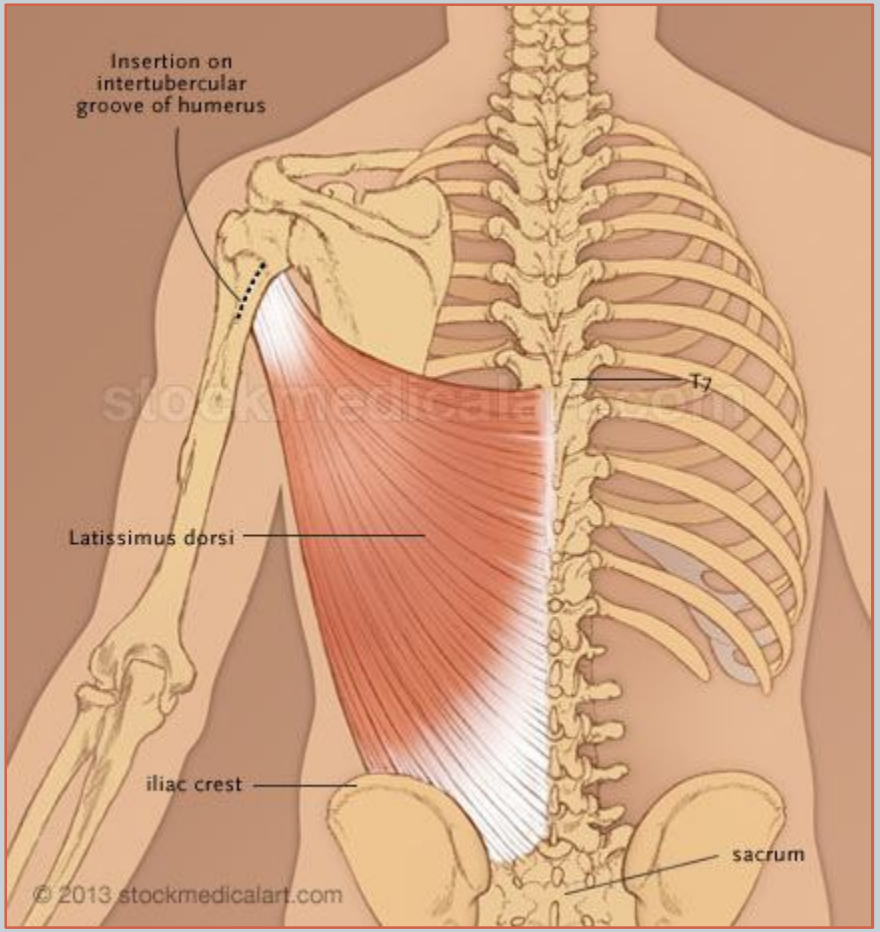
T7- T12

L1-L5

Iliac crest

I: floor of intertubercular groove of humerus

F: humerus adduction & med. rotation

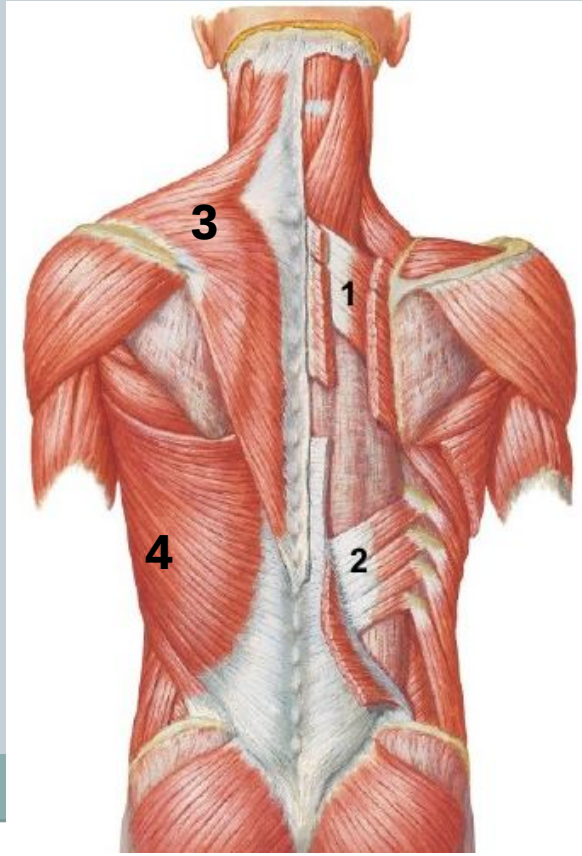


Middle layer

1. Serratus posterior superior (O: spinous pro. C7-t2 / I: post. surface R2-R5 / F: deep inspiration)

2. Serratus posterior inferior (O: spinous pro. T12-L3/ I: post. surface R9-R512/ F: deep inspiration)

Accessory role in respiration



Middle layer

1 – Serratus Posterior Superior

2 – Serratus Posterior Inferior

ventral rami of thoracic and lumbar spinal nerves

Superficial layer

3- Trapezius

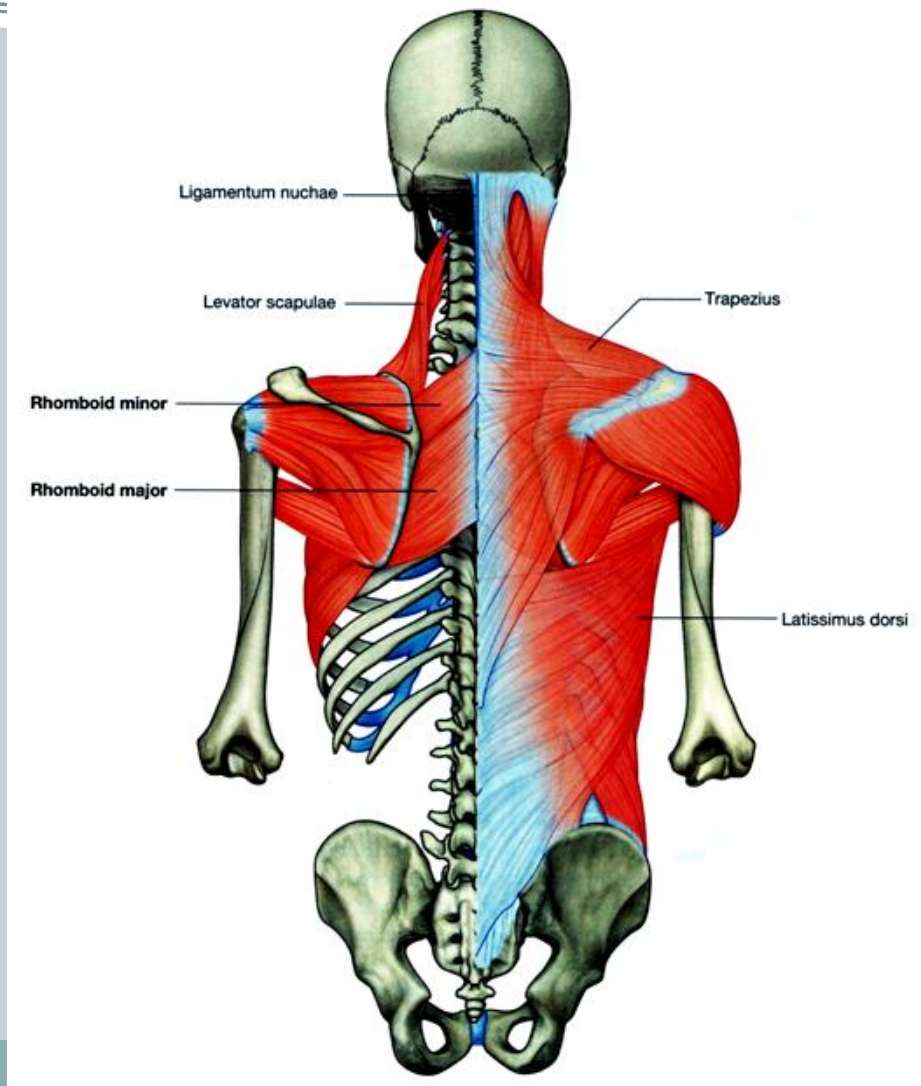
4- Latissimus dorsi

Middle layer

3. Levator scapulae(O: transverse pro. Sup. Cervical vertebrae / I: sup. Scapular angle / F: levator scapula & lat. Flexion neck)

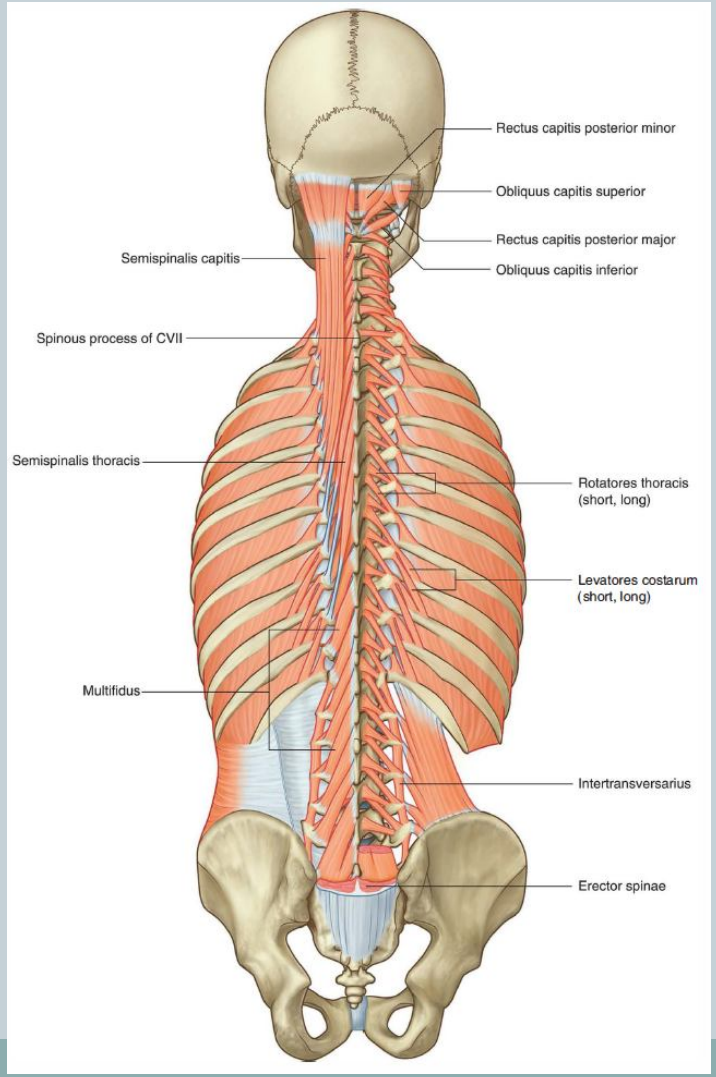
4. Rhomboid minor (O: spinous pro. C7-t1 / I: upper medial border scapula / F: scapula retraction(add.) & humerus add.)

5. Rhomboid major (O: spinous pro. T2-T5 / I: lower medial border scapula / F: scapula retraction(add.) .) & humerus add.)



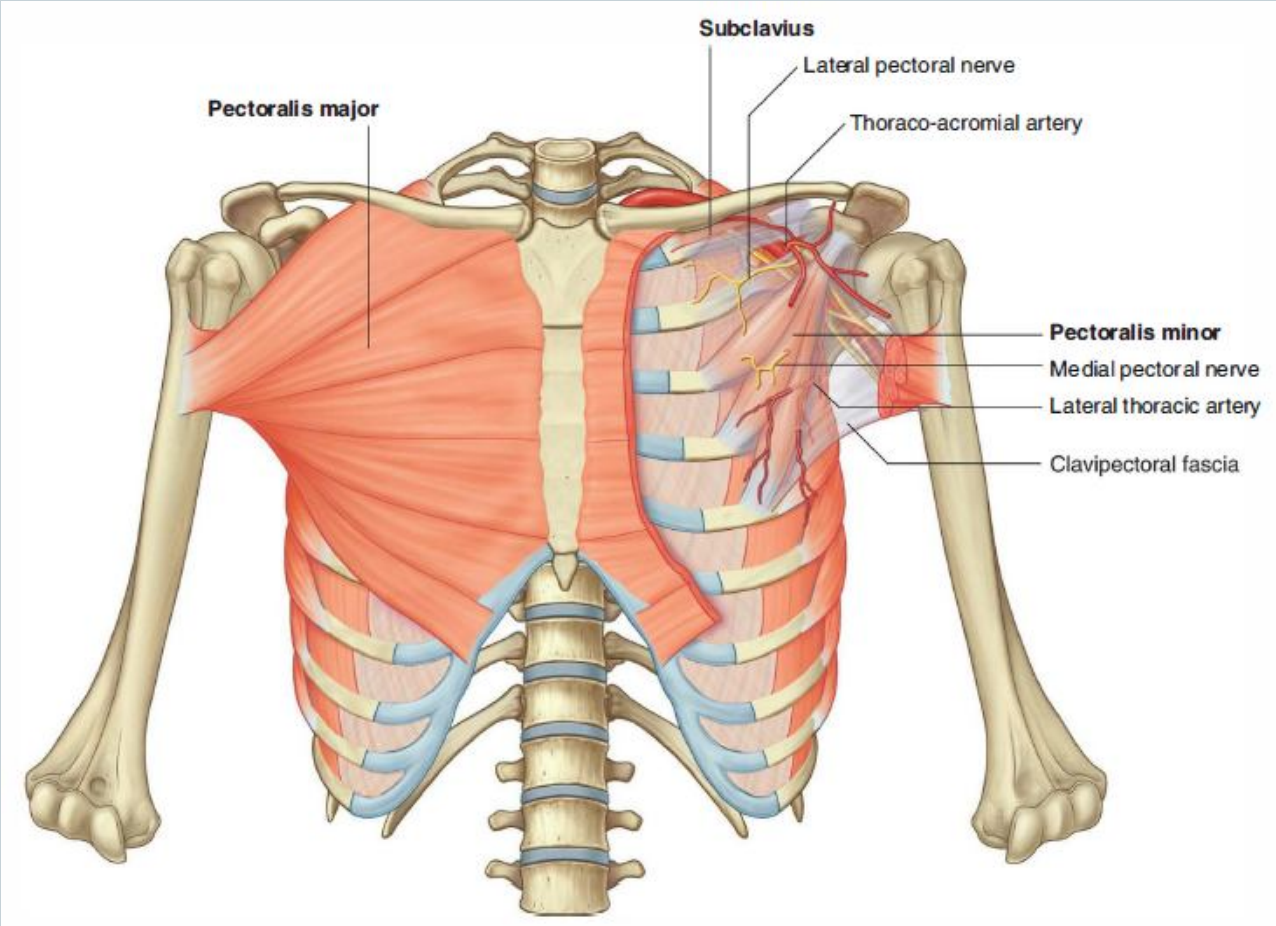
Deep layer

- Vertebral column movement
- Posture
- Vertebral column Lateral rotation
- Vertebral column flexion



Thorax muscles

1. Pectorals
2. Deep m.



Pectorals

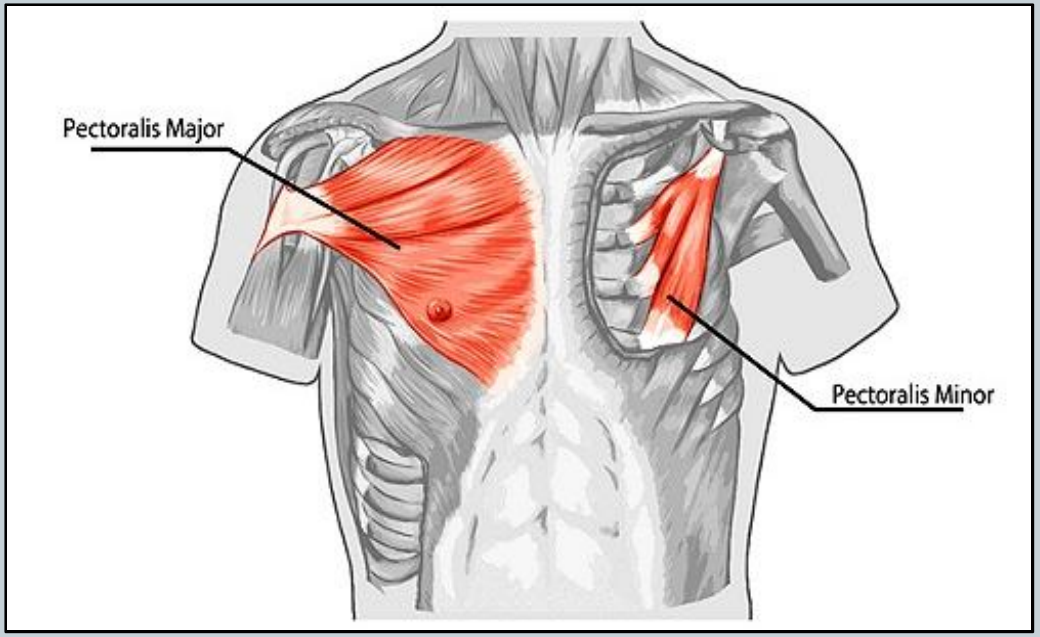
- **Pectoral major**

O: 1/3 med part clavicle, sternum anterior surface, true ribs cartilage
I: bicipital groove (external border)
F: humerus adduction, med. Rotation, flections, down the shoulder & humerus

- **Pectoral mainor**

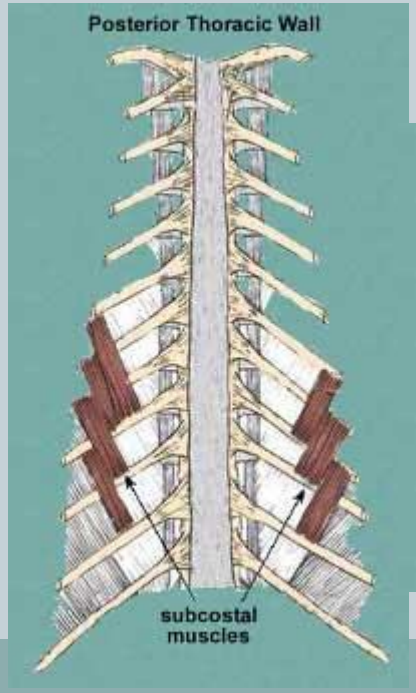
O: external surface 3th-5th ribs
I:coracoid pro. Of scapula
F: down the scapula,

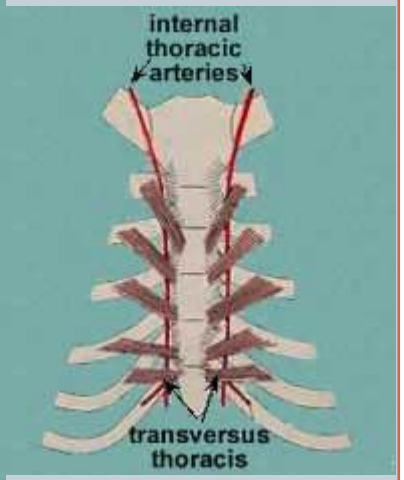
Accessory role in respiration

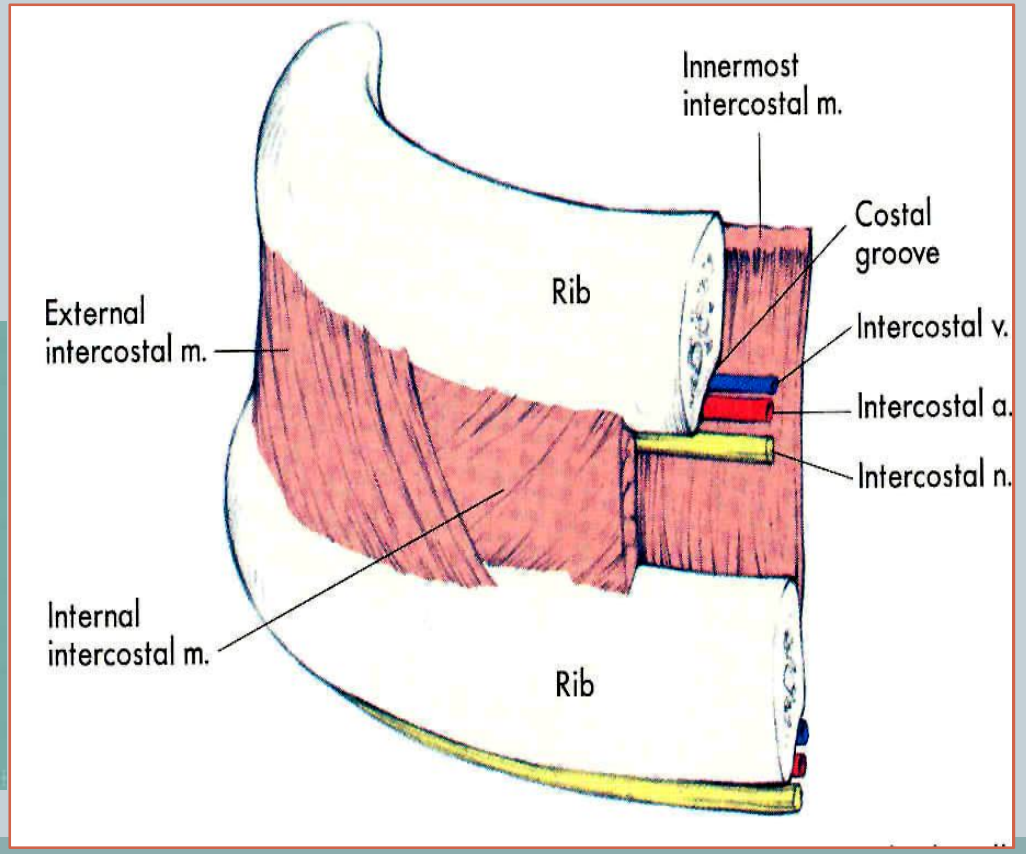


Thorax Deep muscles

1. Ext. Intercostal (inspiration)
2. Int. intercostal (Expiration)
3. Innermost. Intercostal (Expiration)
4. Transverse thoracis (Expiration)
5. Levator costarum (inspiration)
6. Subcostal (Expiration)







Thorax Deep muscles

- **Exr. Intercostal (inspiration)**

O: External border of subcostal groove

I:superior border of inferior rib

- **Int. intercostal (Expiration)**

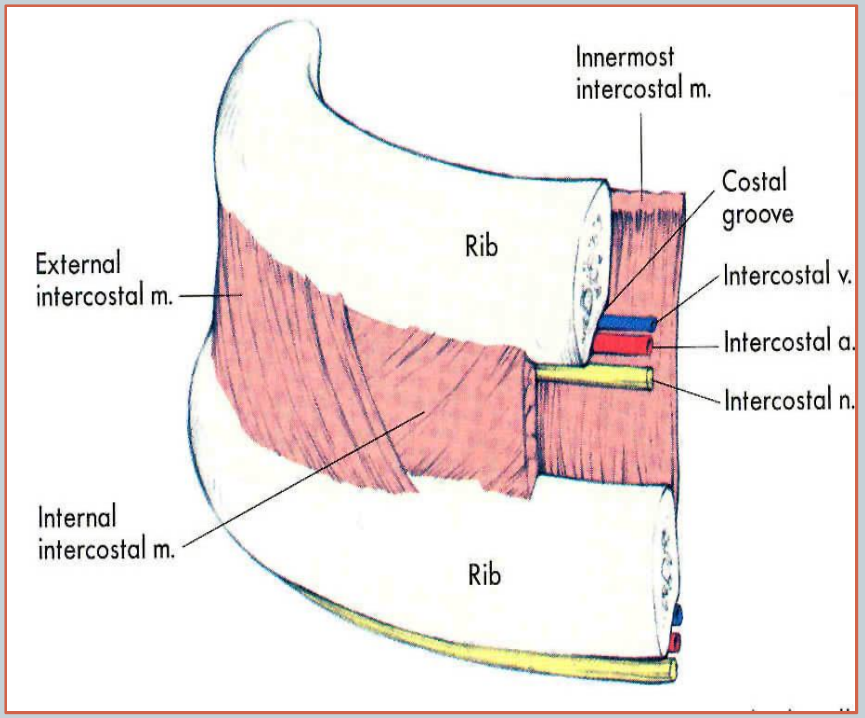
O: internal border of subcostal groove

I:superior border of inferior rib

- **Innermost. Intercostal (Expiration)**

O: internal surface of rib

I: internal surface of inferior rib

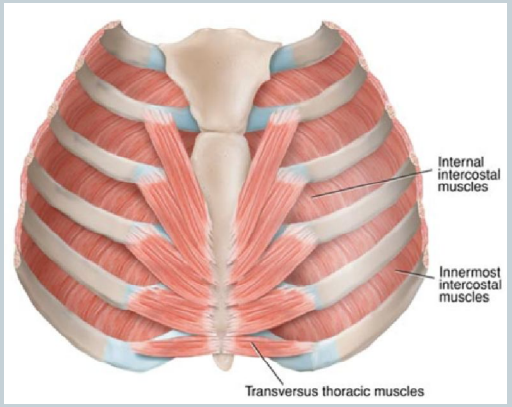


Thorax Deep muscles

- **Transverse thoracic (Expiration)**

O: lateral border of sternum

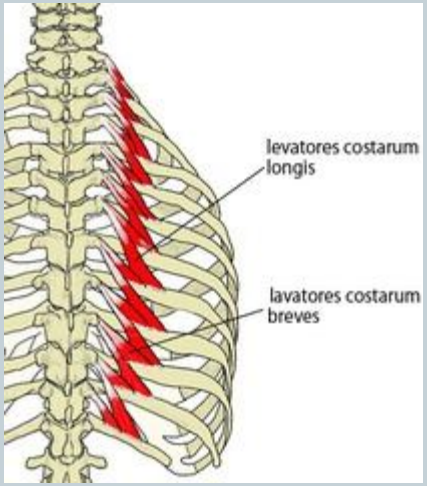
I: cartilage of 2-6th ribs



- **Levator costarum (inspiration)**

O: transverse process of thoracic vertebrae

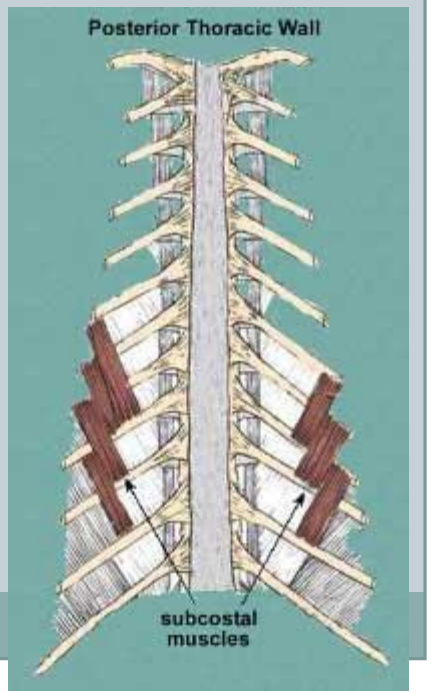
I:superior border of inferior rib

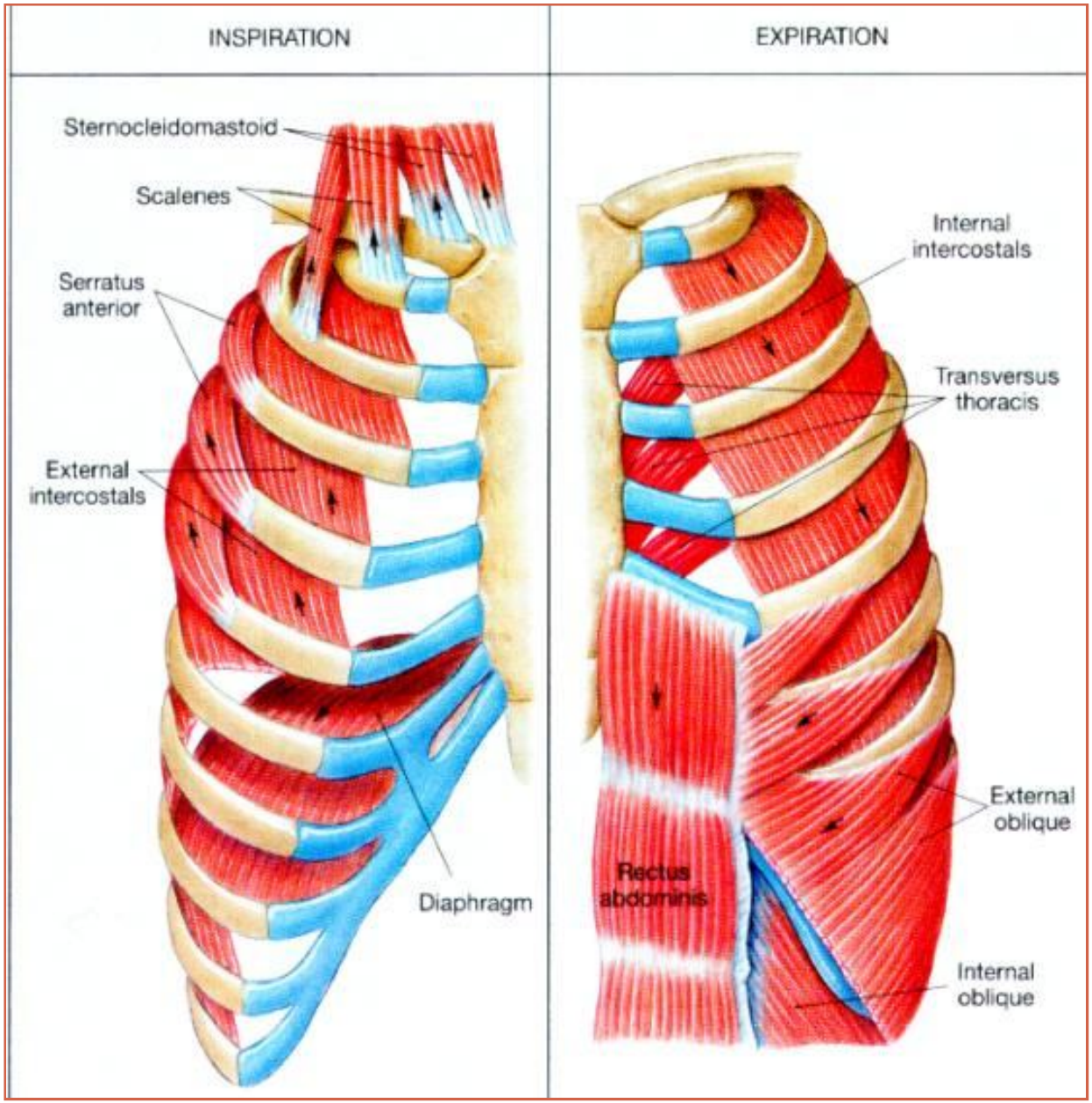


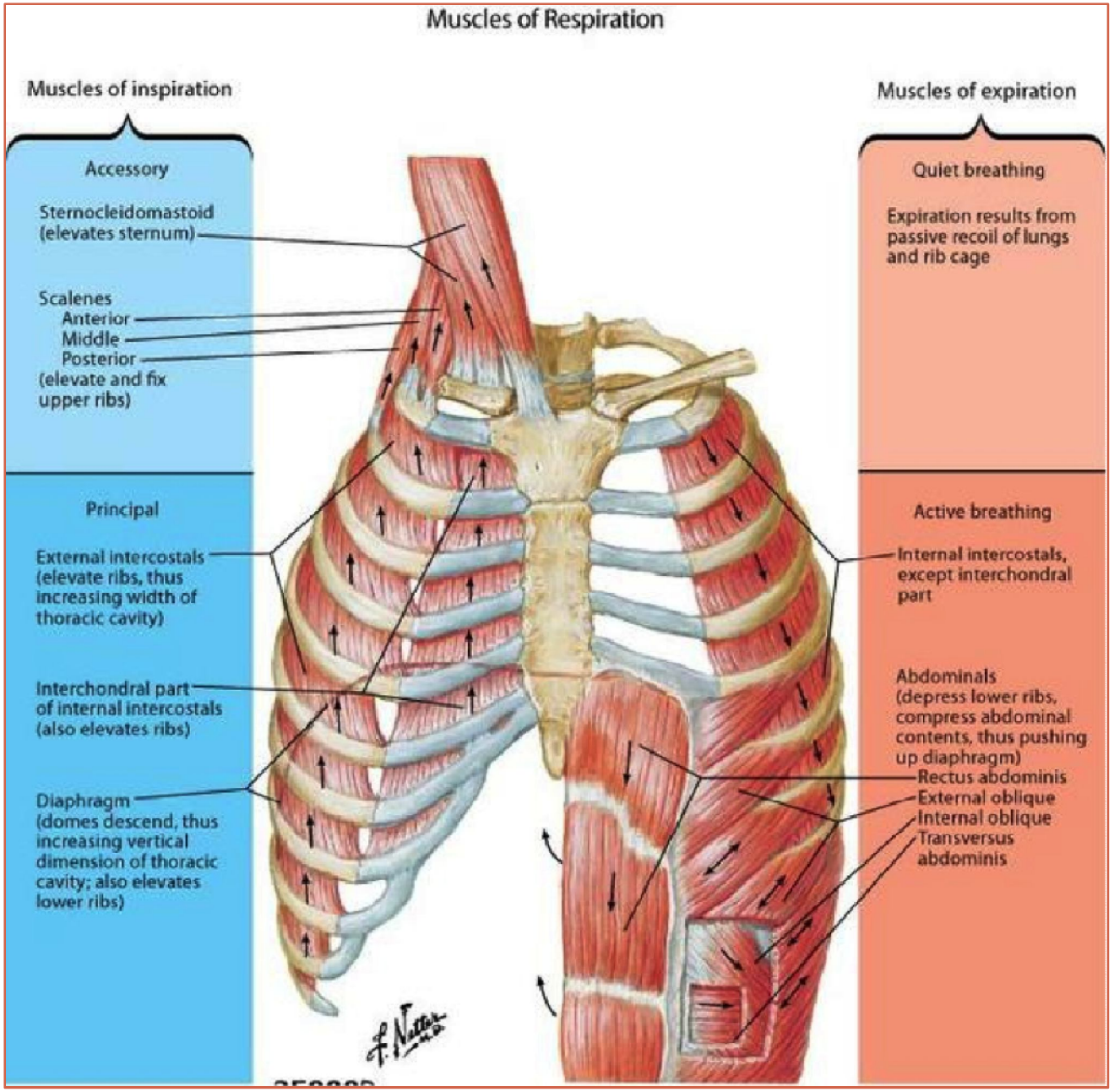
- **Subcostal (Expiration)**

O: inferior border of rib

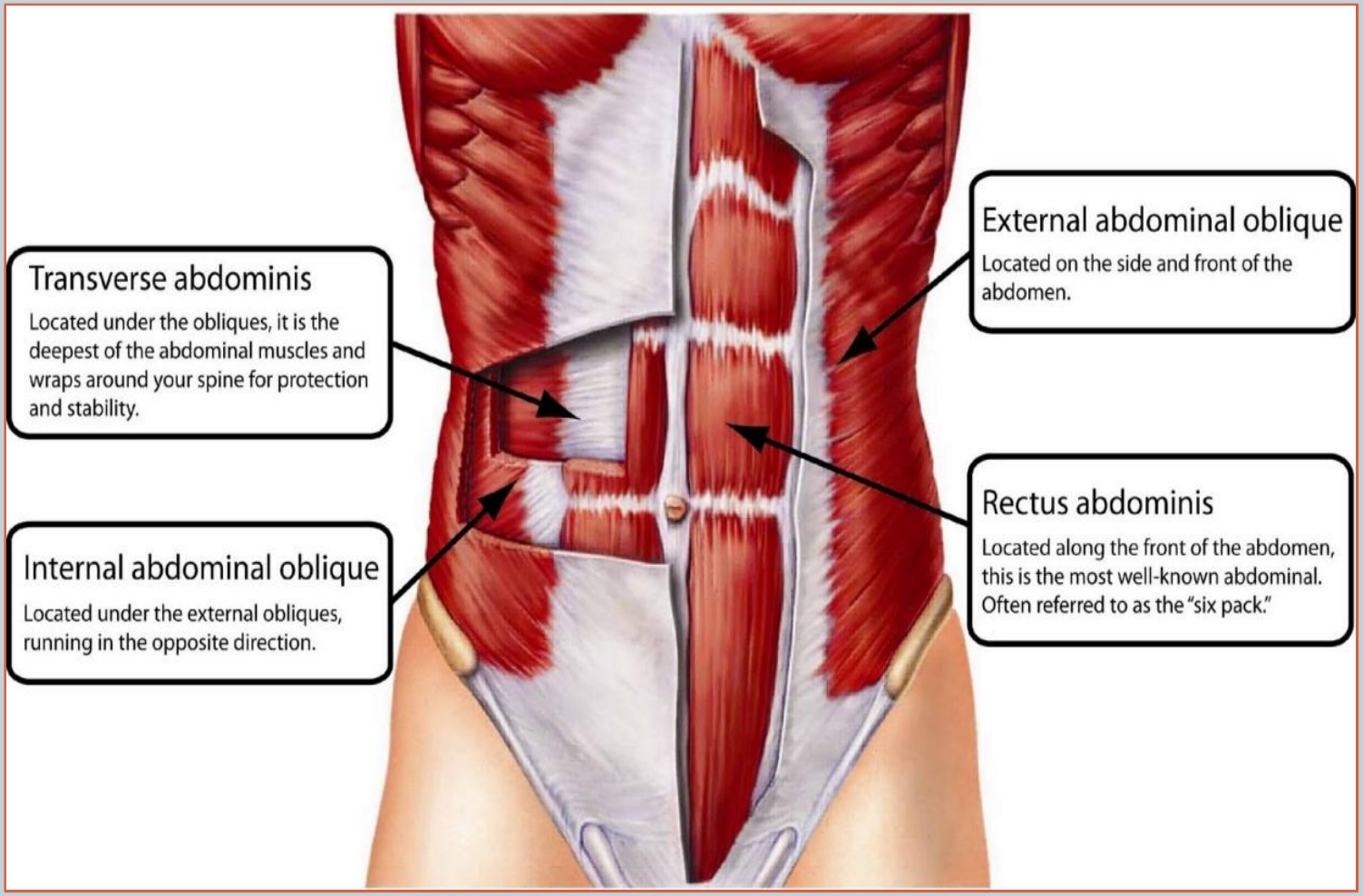
I: superior border of inferior rib




INSPIRATION
EXPIRATION
Sternocleidomastoid
Scalenes
Serratus anterior
External intercostals
Diaphragm
Internal intercostals
Transversus thoracis
External oblique
Rectus abdominis
Internal oblique


Muscles of Respiration
Muscles of inspiration
Muscles of expiration
Accessory
Sternocleidomastoid (elevates sternum)
Scalenes
Anterior
Middle
Posterior
(elevate and fix upper ribs)
Principal
External intercostals (elevate ribs, thus increasing width of thoracic cavity)
Interchondral part of internal intercostals (also elevates ribs)
Diaphragm (domes descend, thus increasing vertical dimension of thoracic cavity; also elevates lower ribs)
Quiet breathing
Expiration results from passive recoil of lungs and rib cage
Active breathing
Internal intercostals, except interchondral part
Abdominals (depress lower ribs, compress abdominal contents, thus pushing up diaphragm)
Rectus abdominis
External oblique
Internal oblique
Transversus abdominis

Abdominal muscles

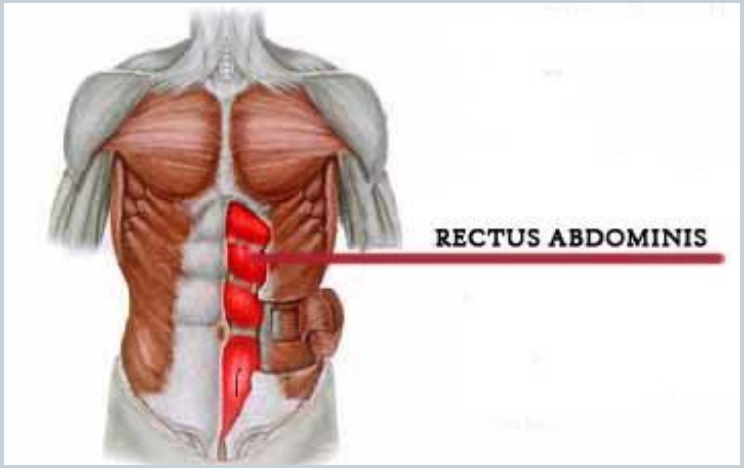


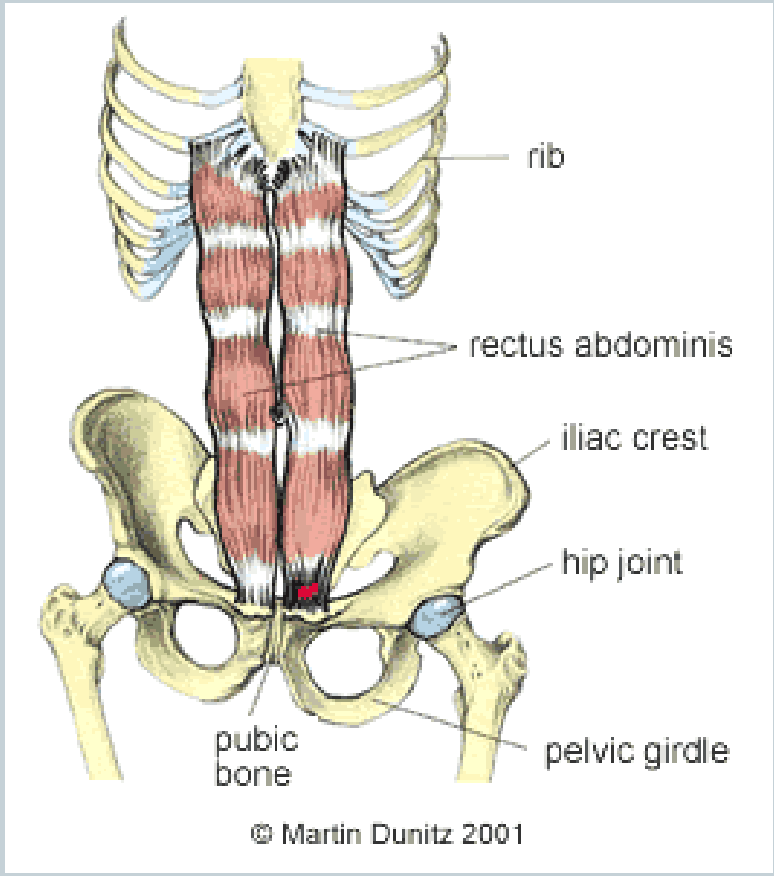
Rectus abdominus muscle

- Near body midline
- Linea alba in medial separate left & right rectus m.
- From xiphoid pro. to pubic symphysis
- O: pubic crest & symphysis
- I: lat. surface of 5^{th}-7^{th} rib
- F:

support visceral organs

Elevate intraabdominal pressure





External oblique muscle

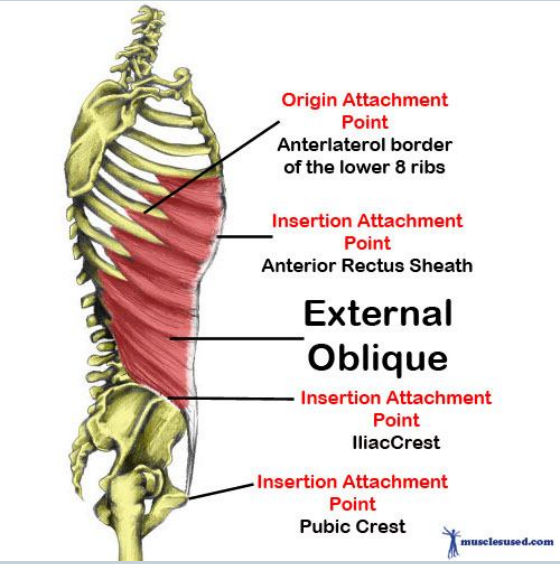
- O: last 8 ribs lat. Surface

Fiber to inferior & medial of body

- I: iliac crest & linea alba
- F:

support visceral organs

Elevate intraabdominal pressure



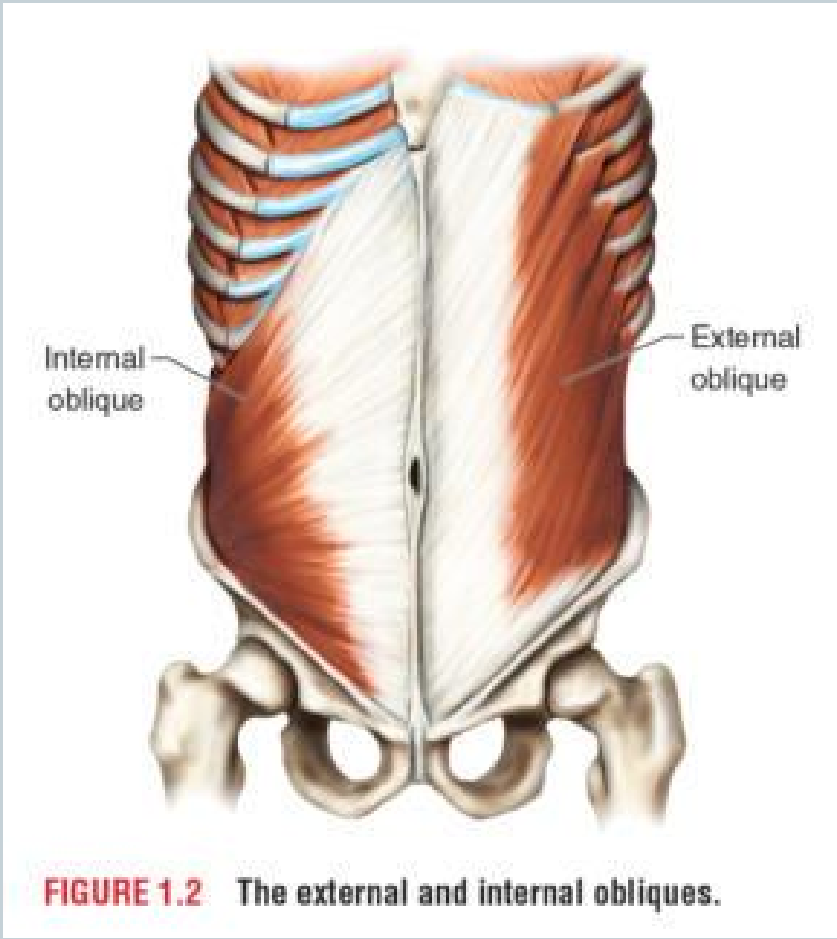


FIGURE 1.2 The external and internal obliques.

Internal oblique muscle

- O: 2/3 lateral part of inguinal ligament

Iliac crest

Fibers to superior & lateral

(opposite of external oblique fibers)

- I: 4 last ribs
- F: support visceral organs

Elevate intraabdominal pressure

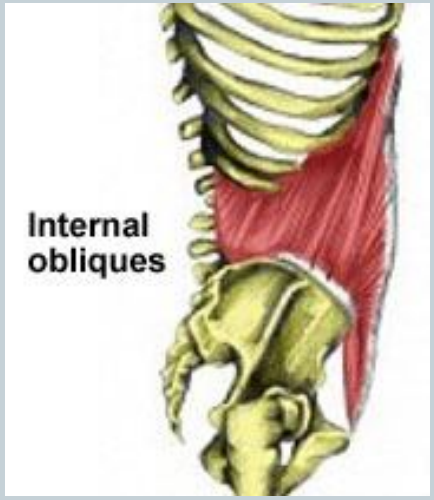


FIGURE 1.2 The external and internal obliques.

Transverse abdominuse muscle

- The most internal muscle of abdomen anterior wall
- O:

1/3 lateral part of inguinal ligament

Iliac crest

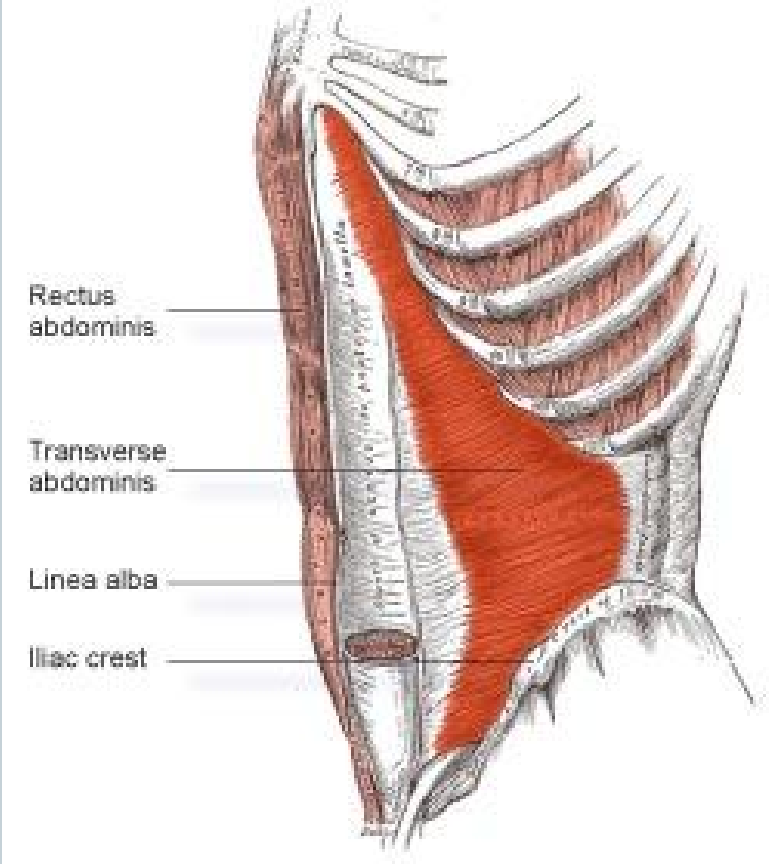
Transverse pro. Lumbar vertebrae

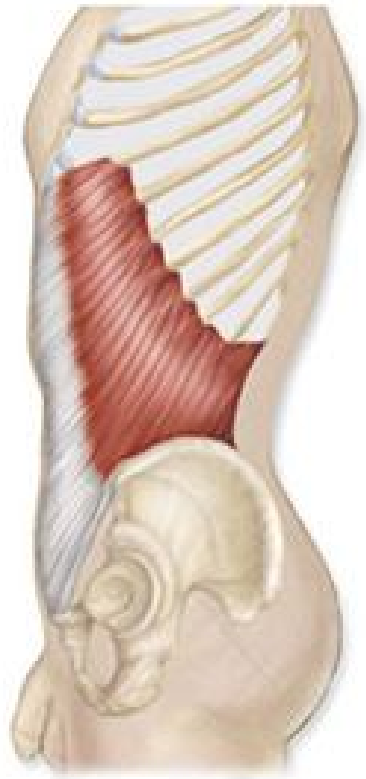
6 last ribs

- I: linea alba
- F:

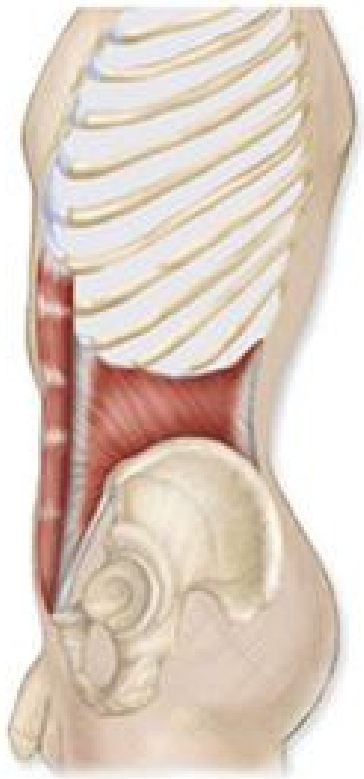
support visceral organs

increase intra abdominal pressure

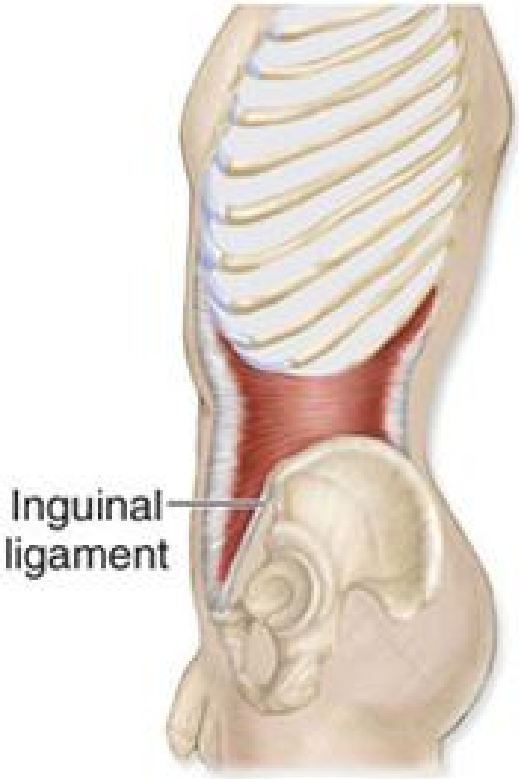




External oblique



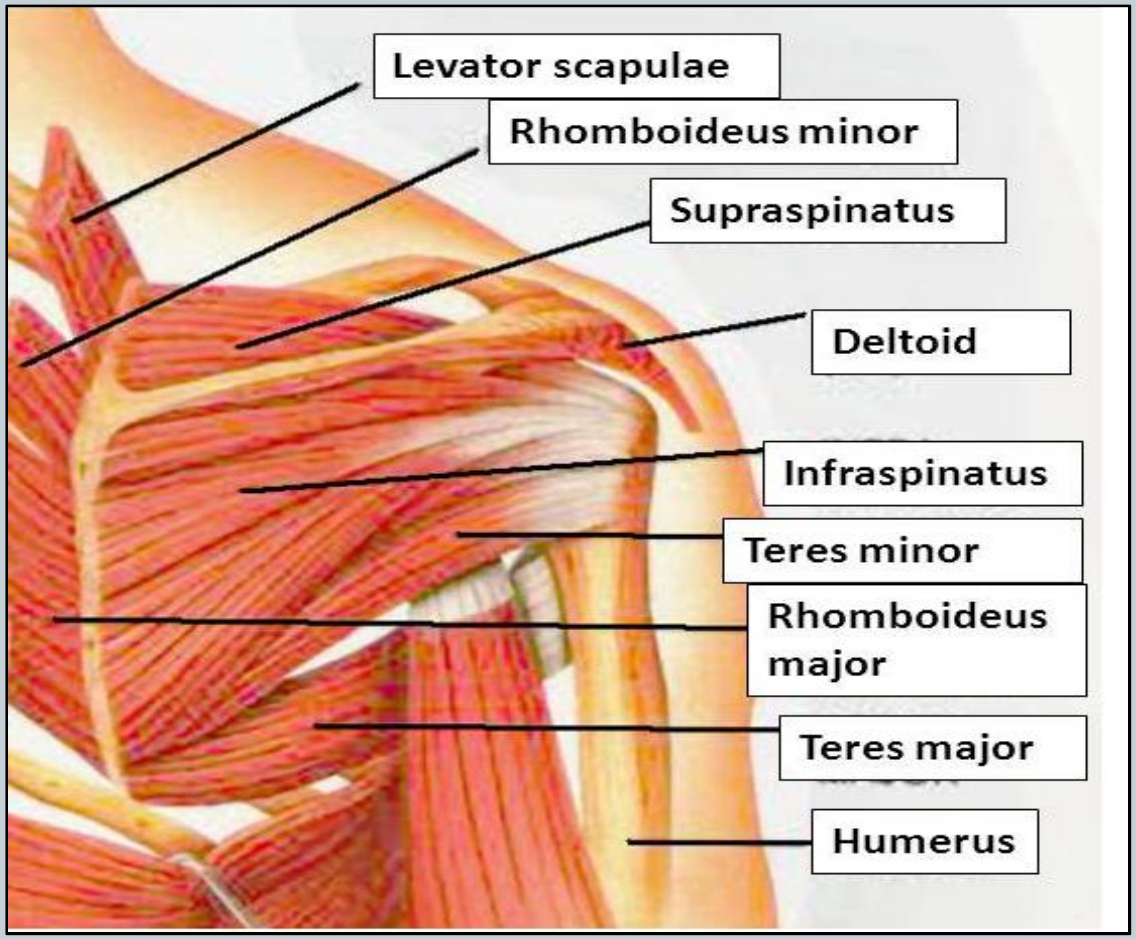
Internal oblique
and
rectus abdominis

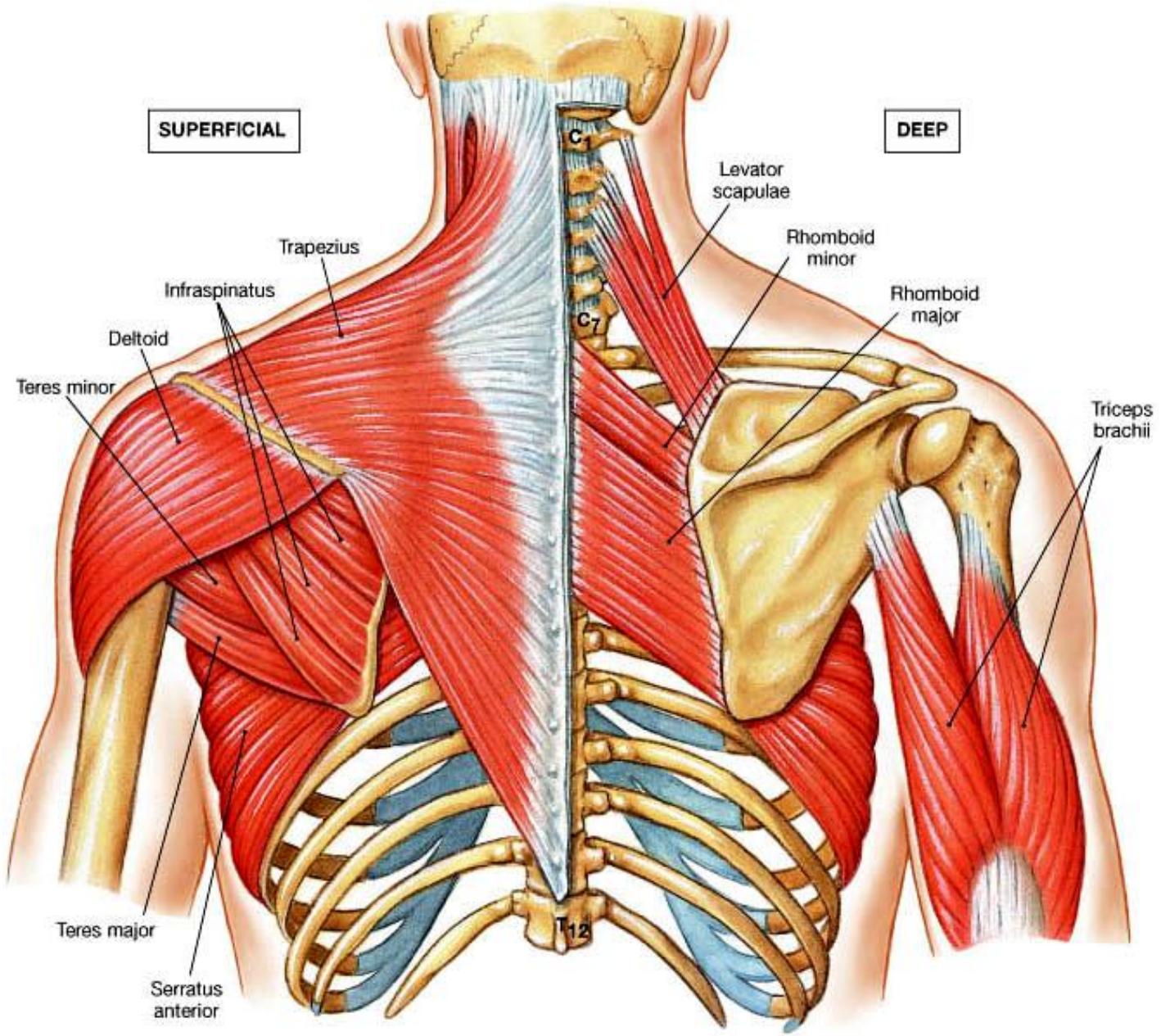


Transversus
abdominis

Pectoral girdle muscles

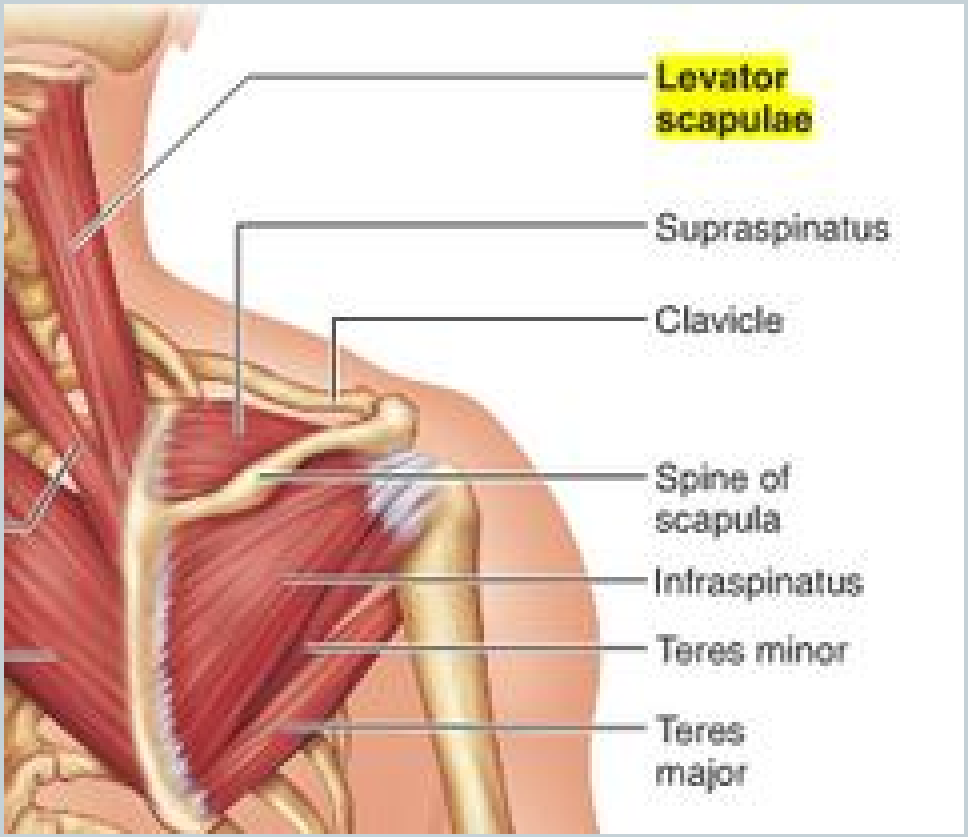
- Levator scapula
- Deltoid
- Supra spinatus
- Infra spinatus
- Teres minor
- Teres major
- Subscapularis




SUPERFICIAL
DEEP
C1
C7
T12
Levator scapulae
Rhomboid minor
Rhomboid major
Trapezius
Infraspinatus
Deltoid
Teres minor
Triceps brachii
Teres major
Serratus anterior

Levator scapula m.

- O: transverse process C1-C4
- I: superior angle of scapula
- F: scapula elevation
- Lateral flexion & extension of neck



Deltoid m.

- O:

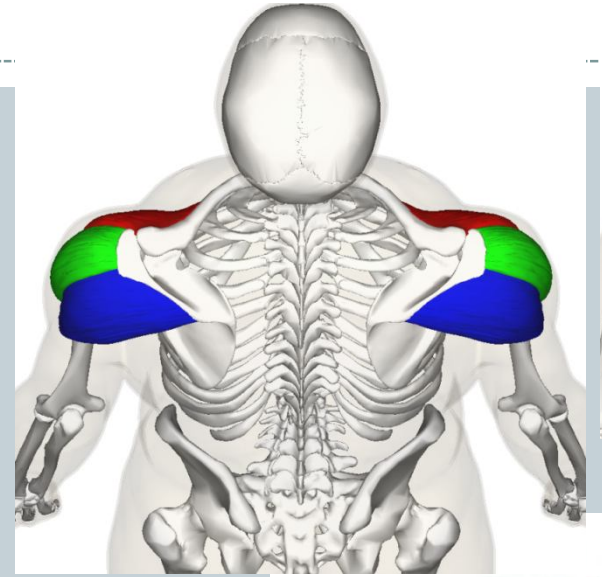
1/3 lateral end of clavicle
Acromion process
Spine of scapula

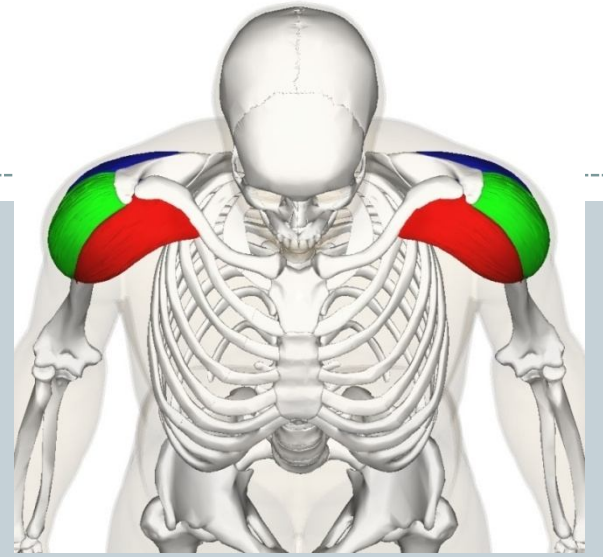
- I: deltoid tuberosity on

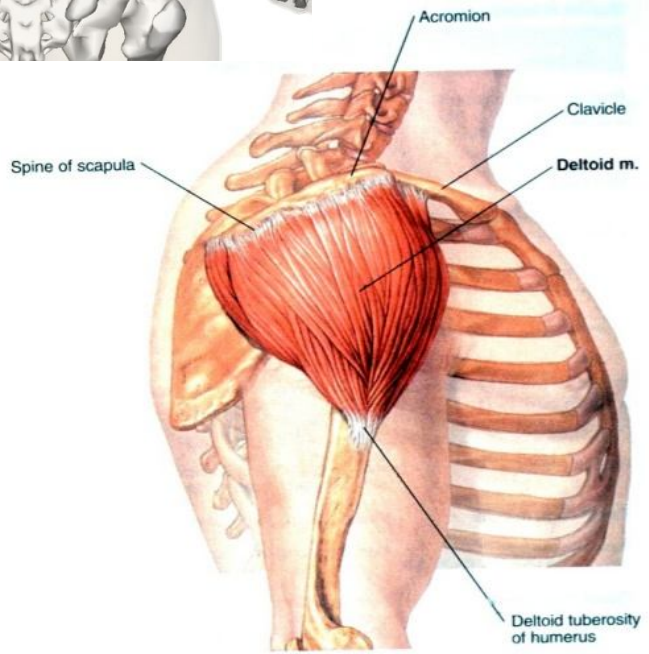
lateral surface of humerus body

- F:

Humerus Flection & medial rotation
Humerus abduction
Humerus extension & lateral rotation







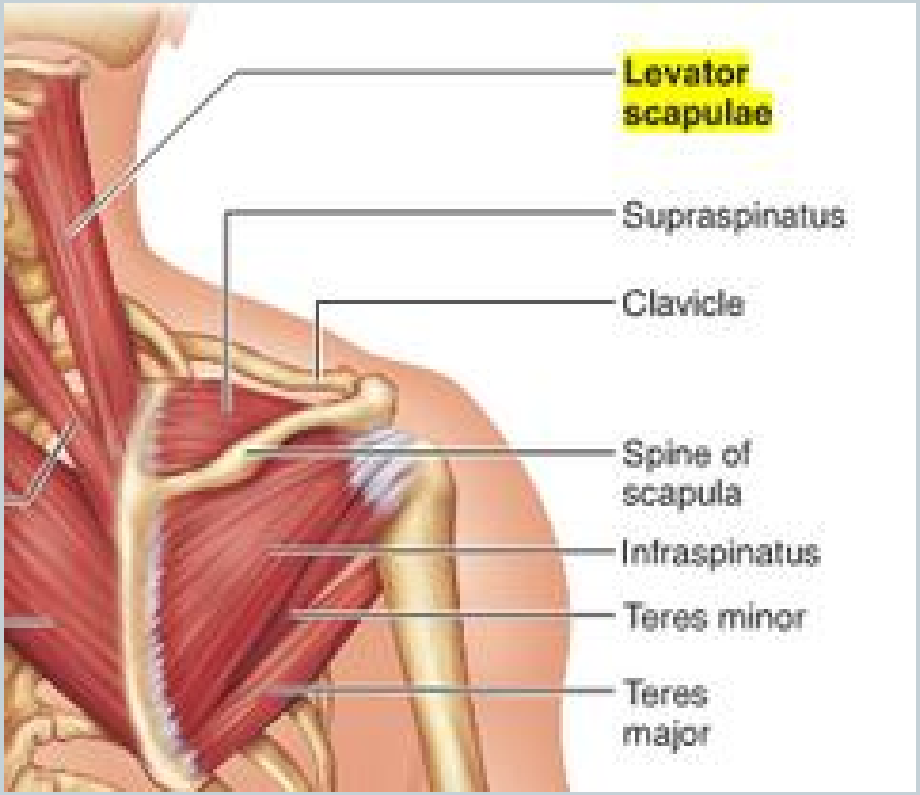
The **deltoid muscle** abducts the arm, rotates the arm, and extends the humerus at the glenohumeral joint. It inserts on the deltoid tuberosity on the lateral midregion of the humerus

Supra spinatus

- O: supra spinous fossa
- I: upper part of greater tubercle of humerus
- F:

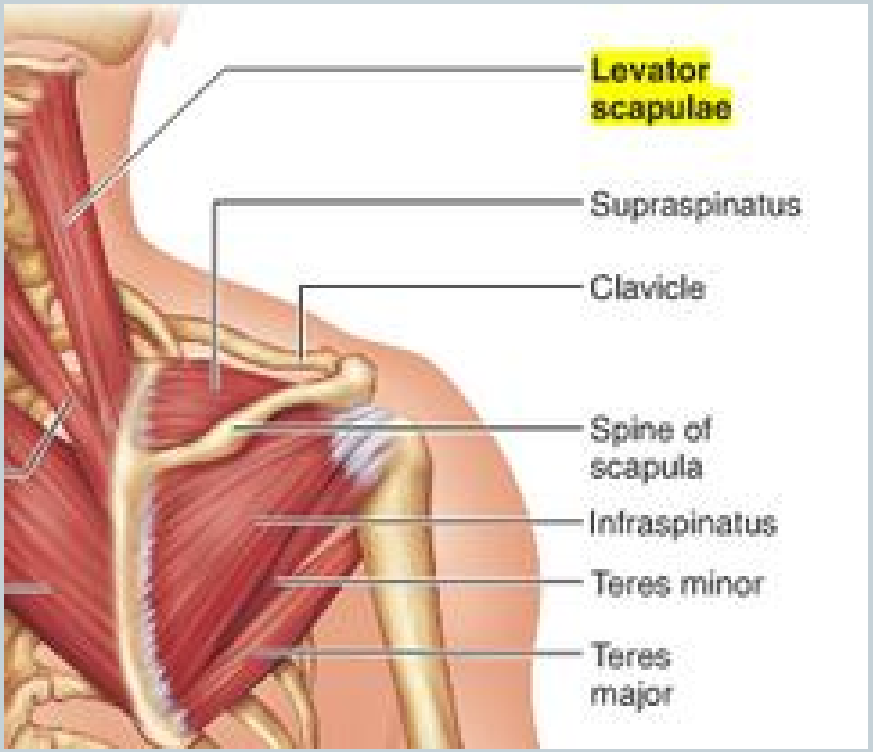
Humerus abduction initiation(30°)

Shoulder joint maintenance & support



Infraspinatus m.

- O: infra spinous fossa
- I: humerus greater tubercle & shoulder joint capsule
- F:
- Humerus lateral rotation
- Shoulder joint maintenance & support

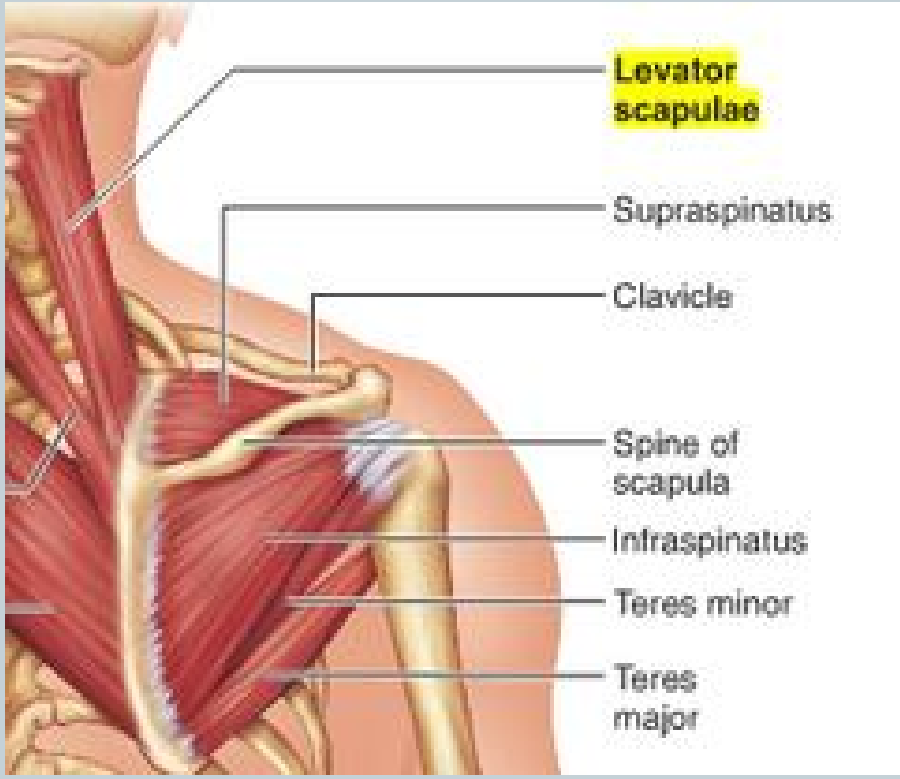


Teres minor m.

- O: 1/3 middle of scapula lateral border
- I: inferior part of humerus greater tubercle & shoulder joint capsule
- F:

Humerus lateral rotation

Shoulder joint maintenance & support

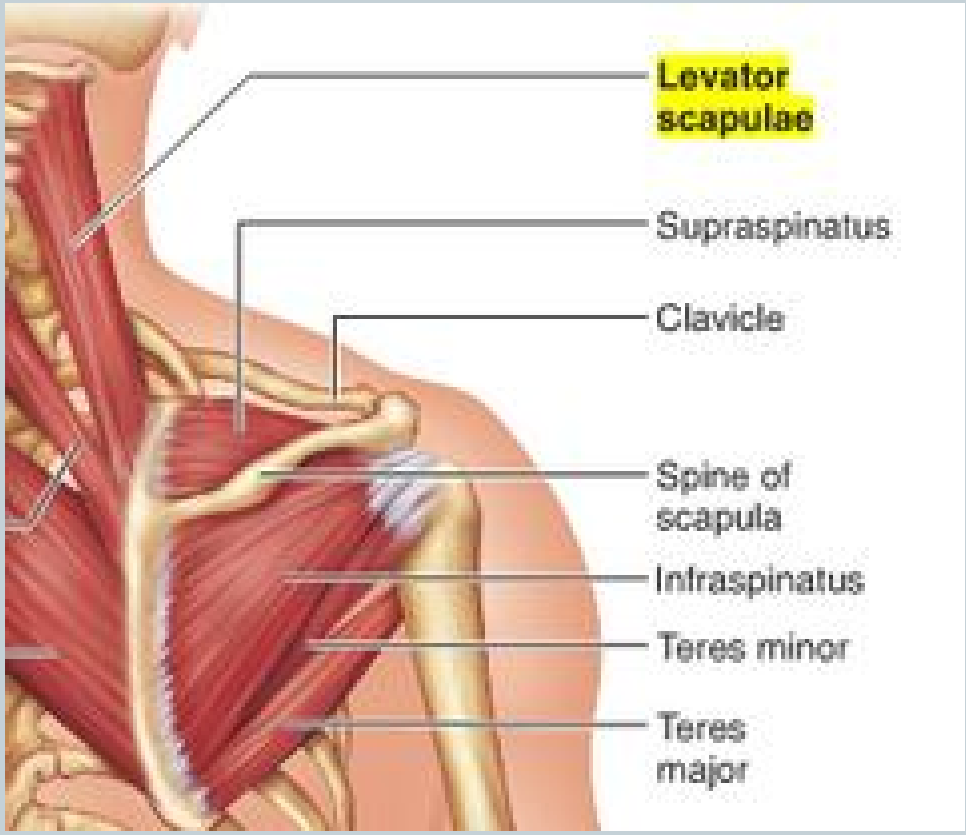


Teres major m.

- O: 1/3 inferior of scapula lateral border
- I: medial border of intertubercular groove
- F:

Humerus medial rotation

Humerus addaction & extension

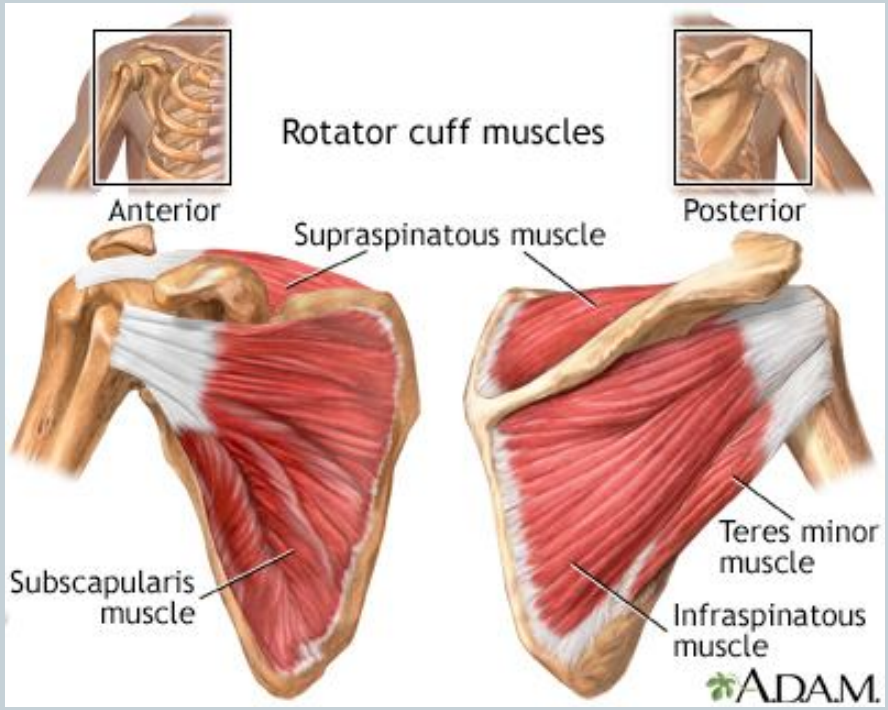


Subscapularis m.

- O: subscapularis fossa (scapula anterior surface)
- I: humerus lesser tubercle
- F:

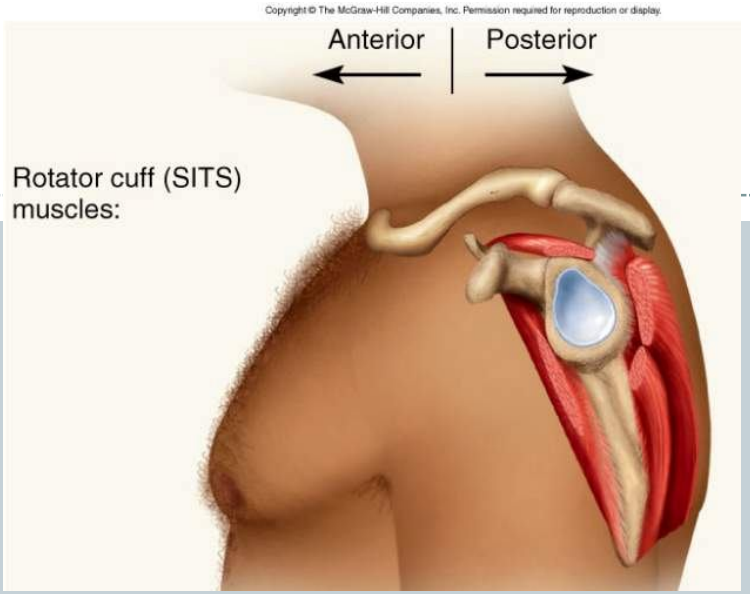
humerus medial rotation

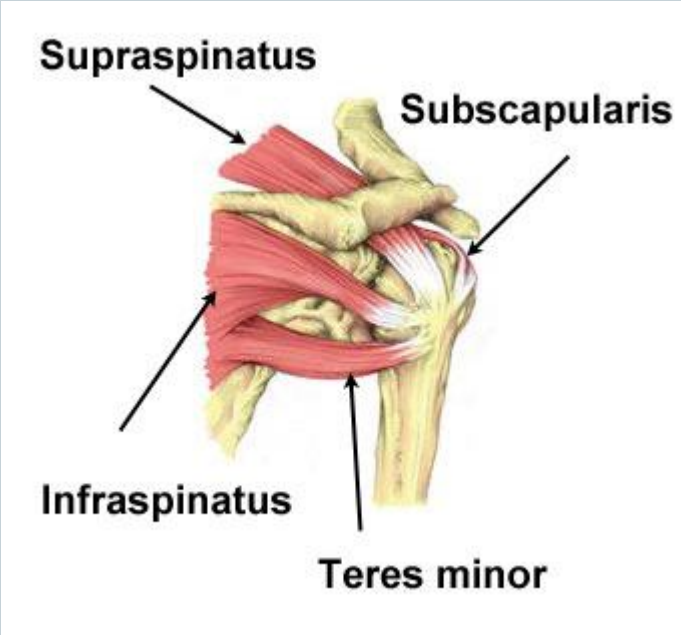
Shoulder joint maintenance & support

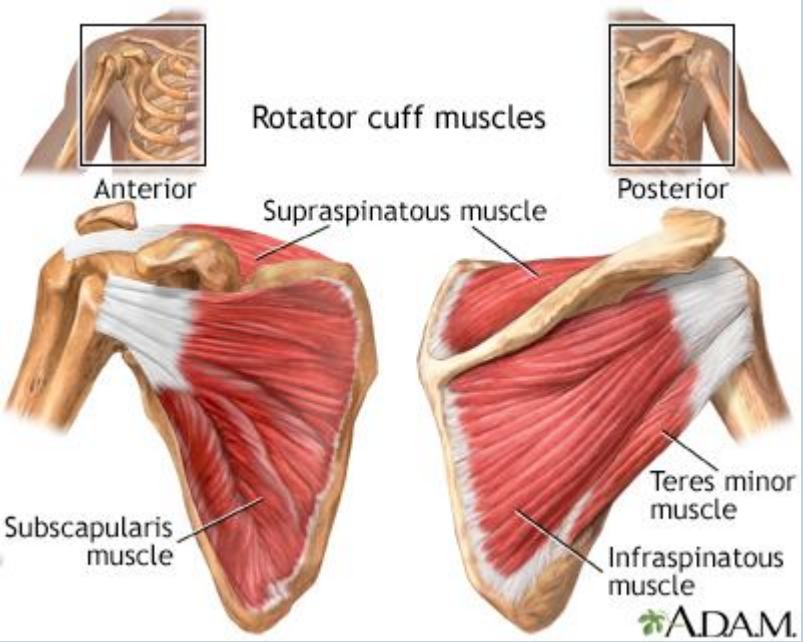


Rotator cuff

1. Supra spinatus
2. Infra spinatus
3. Teres minor
4. Subscapularis

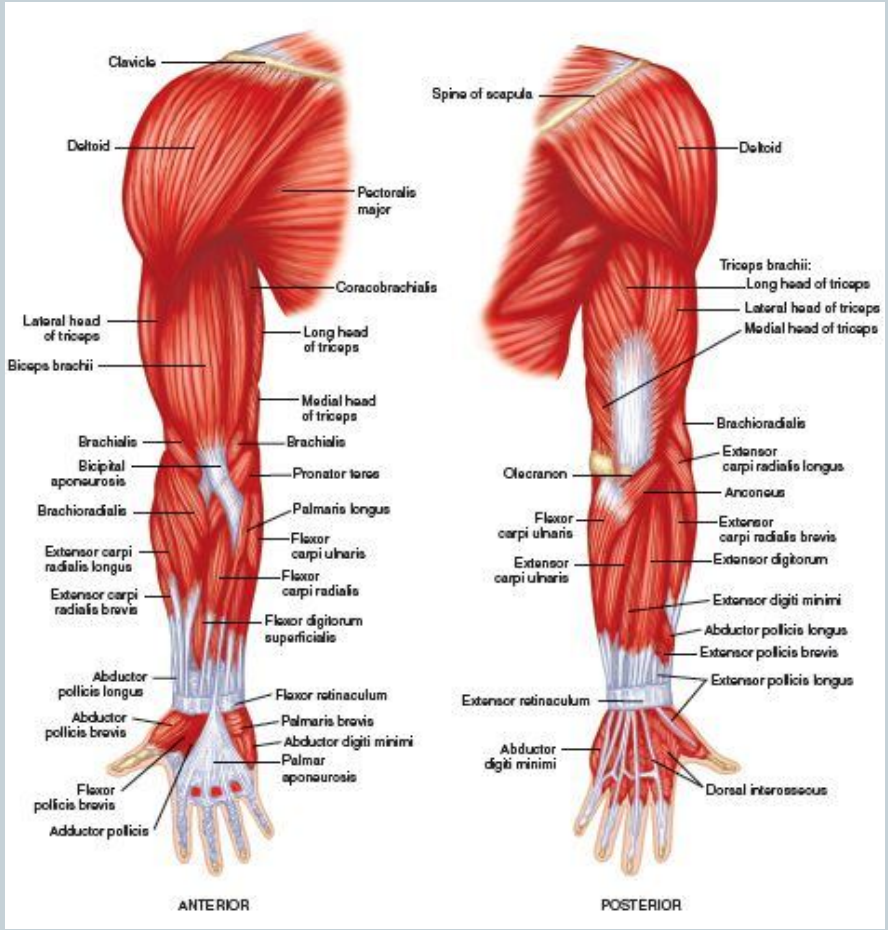






Upper limb muscles

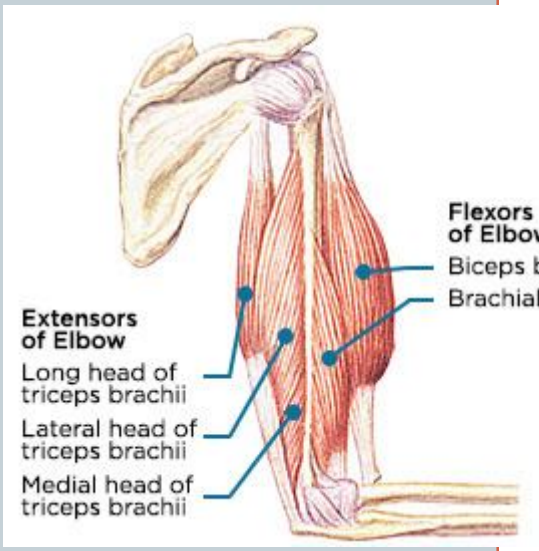
1. Arm
2. Forearm
3. Hand

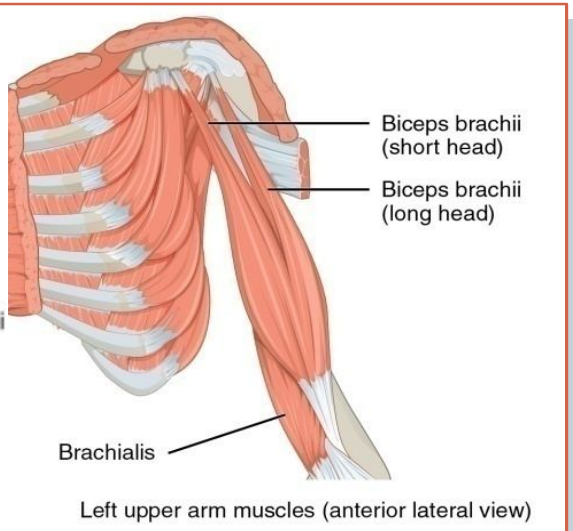


Arm

Anterior surface:

1. Biceps bracheii
2. Brachialis
3. Corachobrachialis

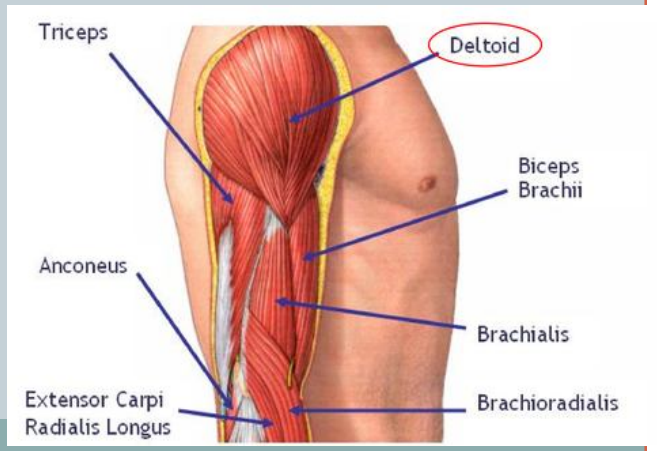


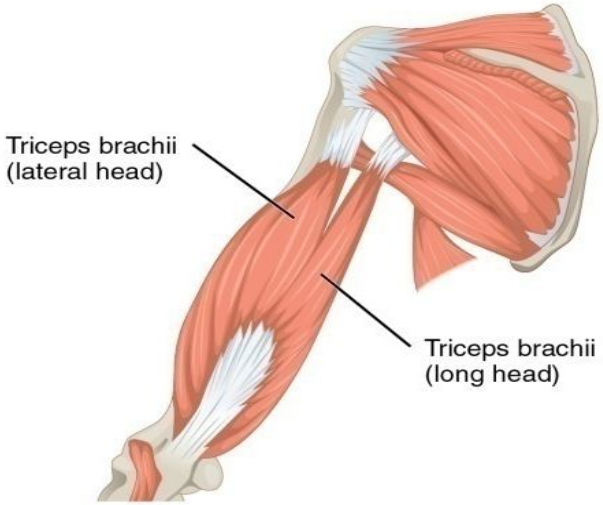


Left upper arm muscles (anterior lateral view)

Posterior surface:

1. Triceps bracheii
2. anconeus





Left upper arm muscles (posterior view)

Anterior surface of Arm

- **Biceps bracheii**

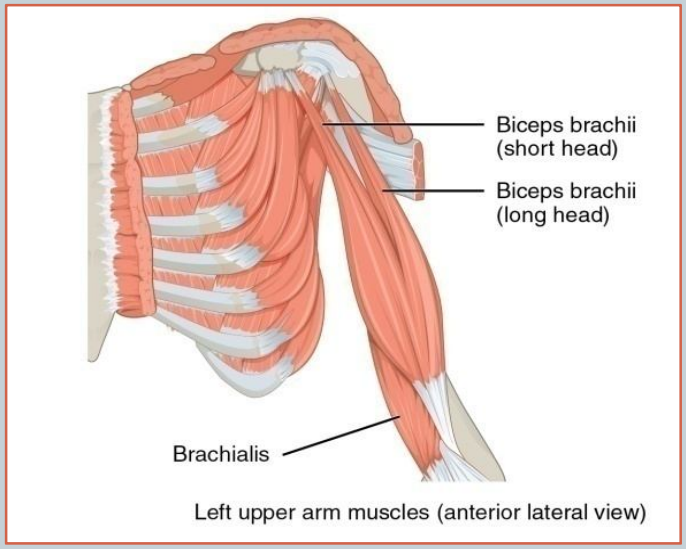
Origin:

Long head: supra glenoid tubercle of scapula

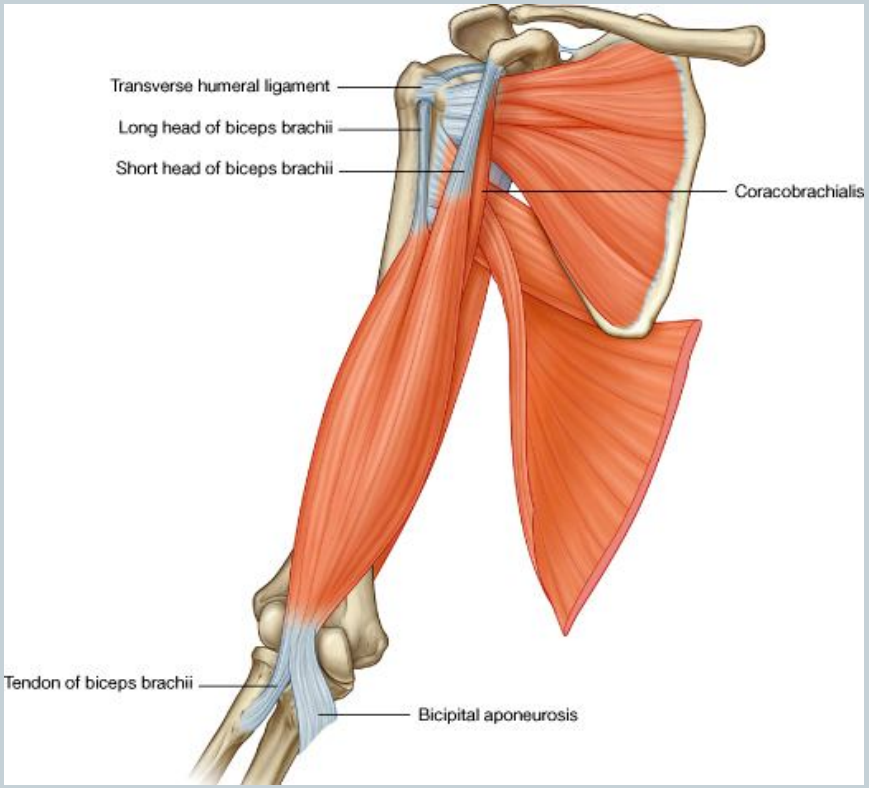
Short head: coracoid process of scapula

Insertion: radius

Action: forearm flexion



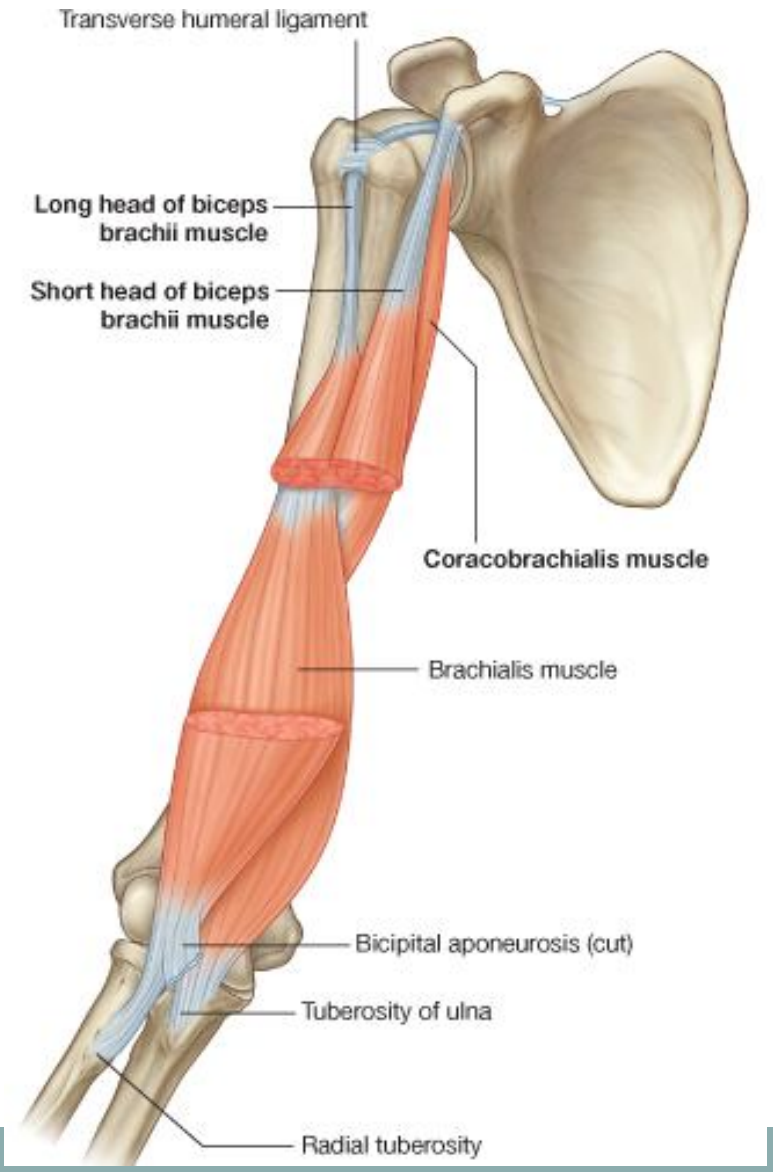
Left upper arm muscles (anterior lateral view)



Anterior surface of Arm

Brachialis

Origin: ½ inferior part of humerus anterior surface
Insertion: ulnar tuberosity & coronoid process
Action: elbow flexion



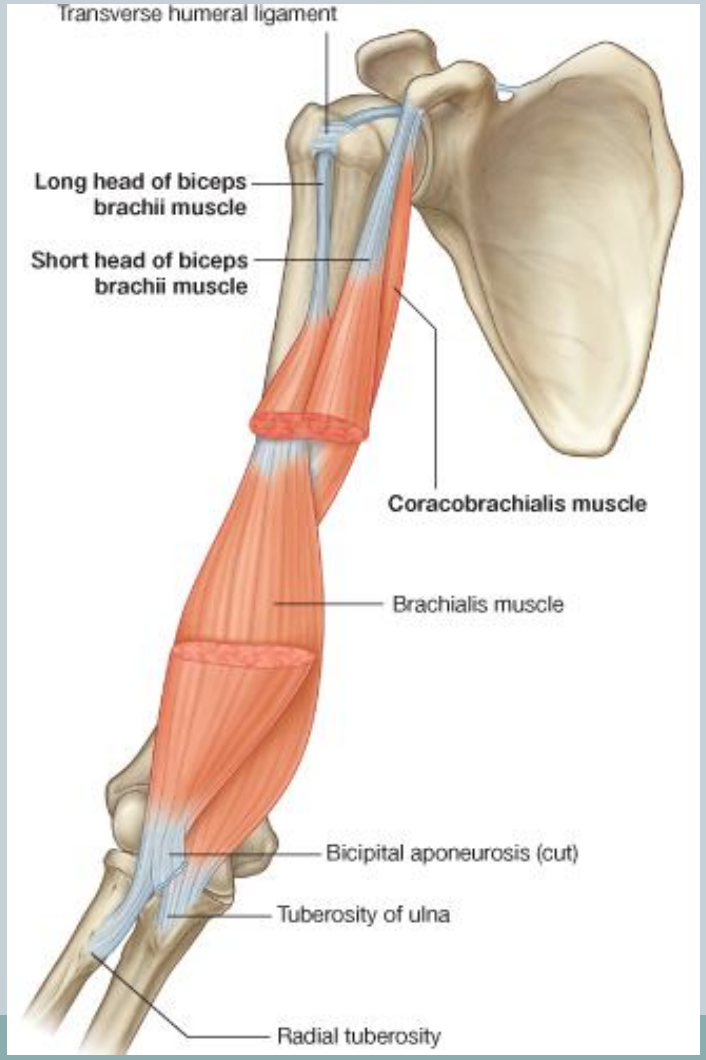
Anterior surface of Arm

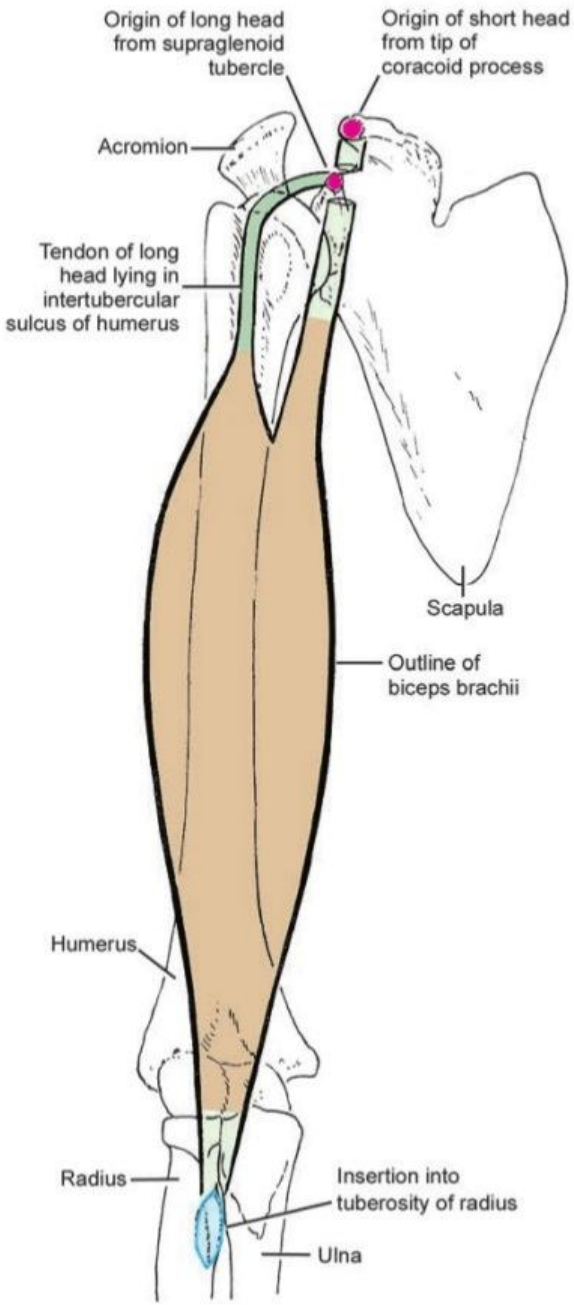
Corachobrachialis

Origin: corachoid process of scapula

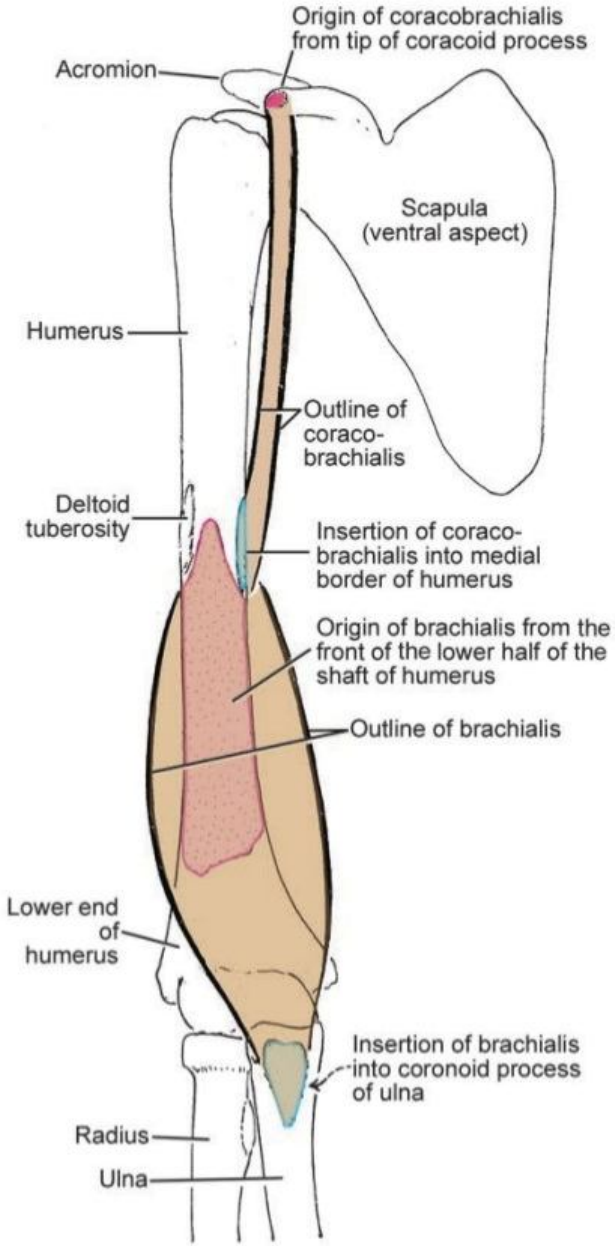
Insertion: humerus medial surface

Action: humerus flection





5.8: Scheme to show the attachments of the biceps brachii



5.9: Scheme to show the attachments of the coracobrachialis and brachialis muscles

Posterior surface of Arm

- **Triceps bracheii**

Origin:

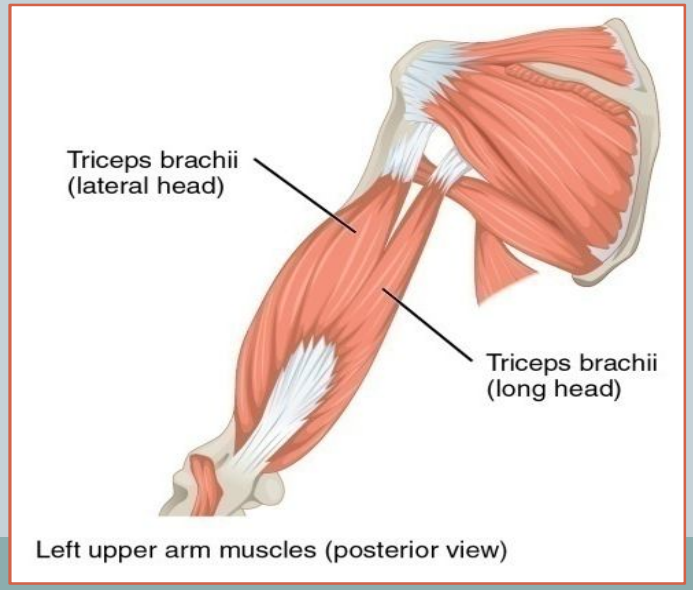
Long head: infra glenoid tubercle of scapula

Medial head: humerus posterior surface

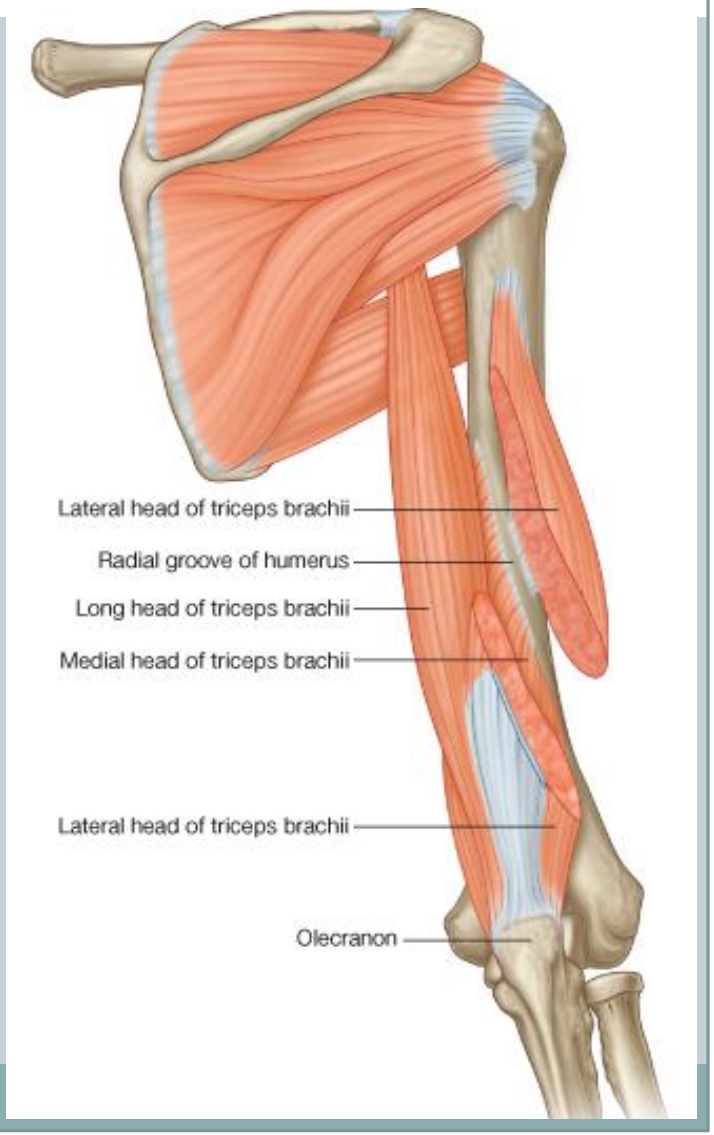
Lateral head: humerus body

Insertion: olecranon process of ulna

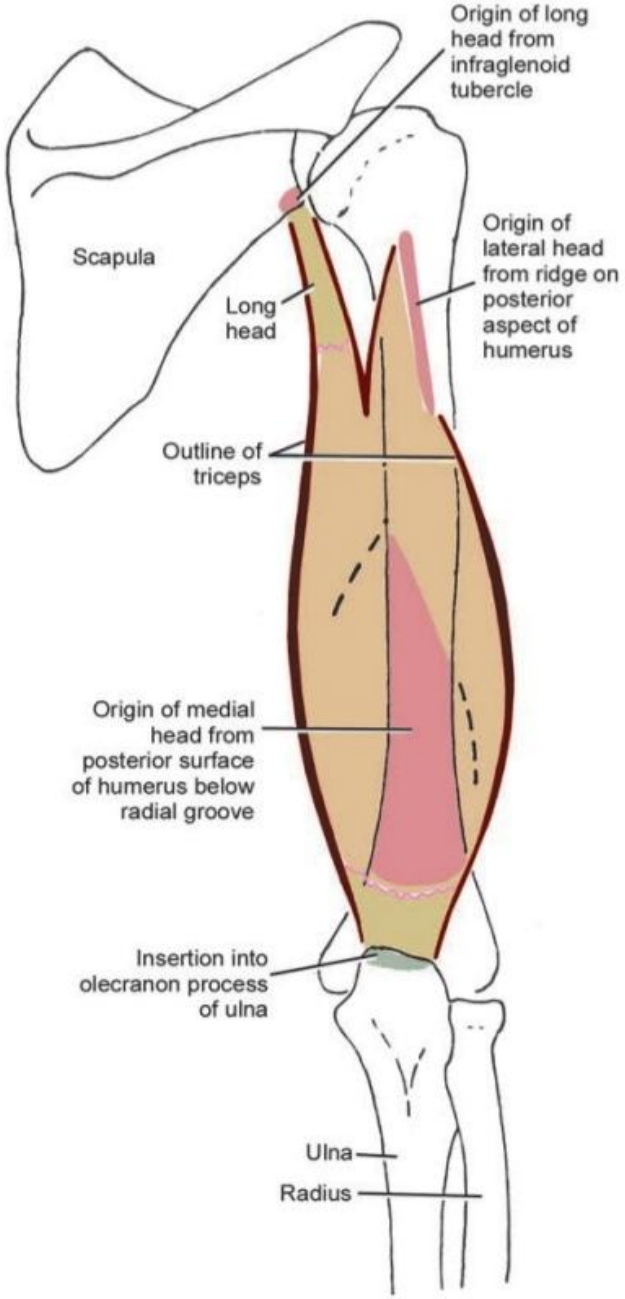
Action: forearm extension



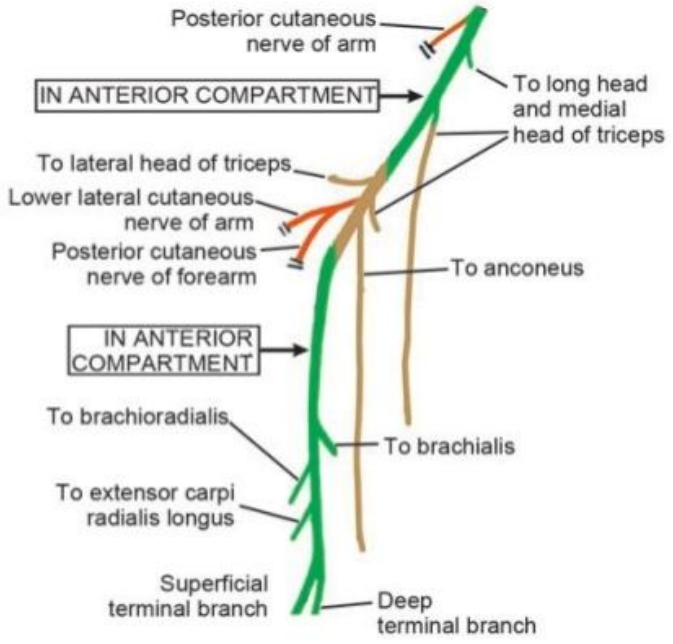
Left upper arm muscles (posterior view)



Triceps



5.17: Scheme to show the attachments of the triceps muscle

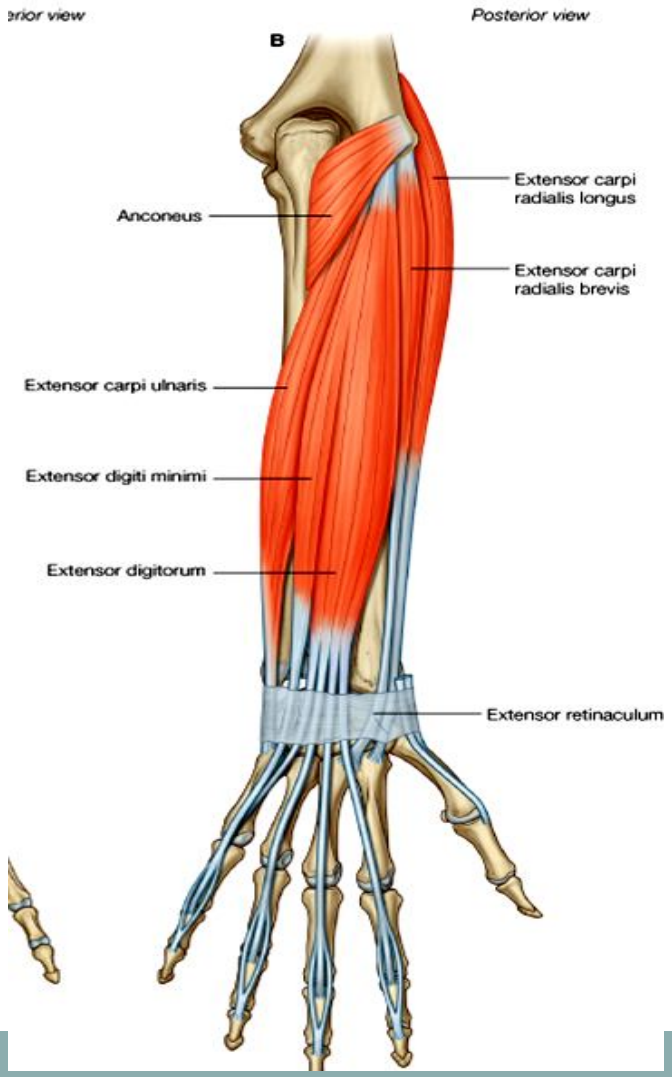


5.18: Branches given off by the radial nerve in the arm

Posterior surface of Arm

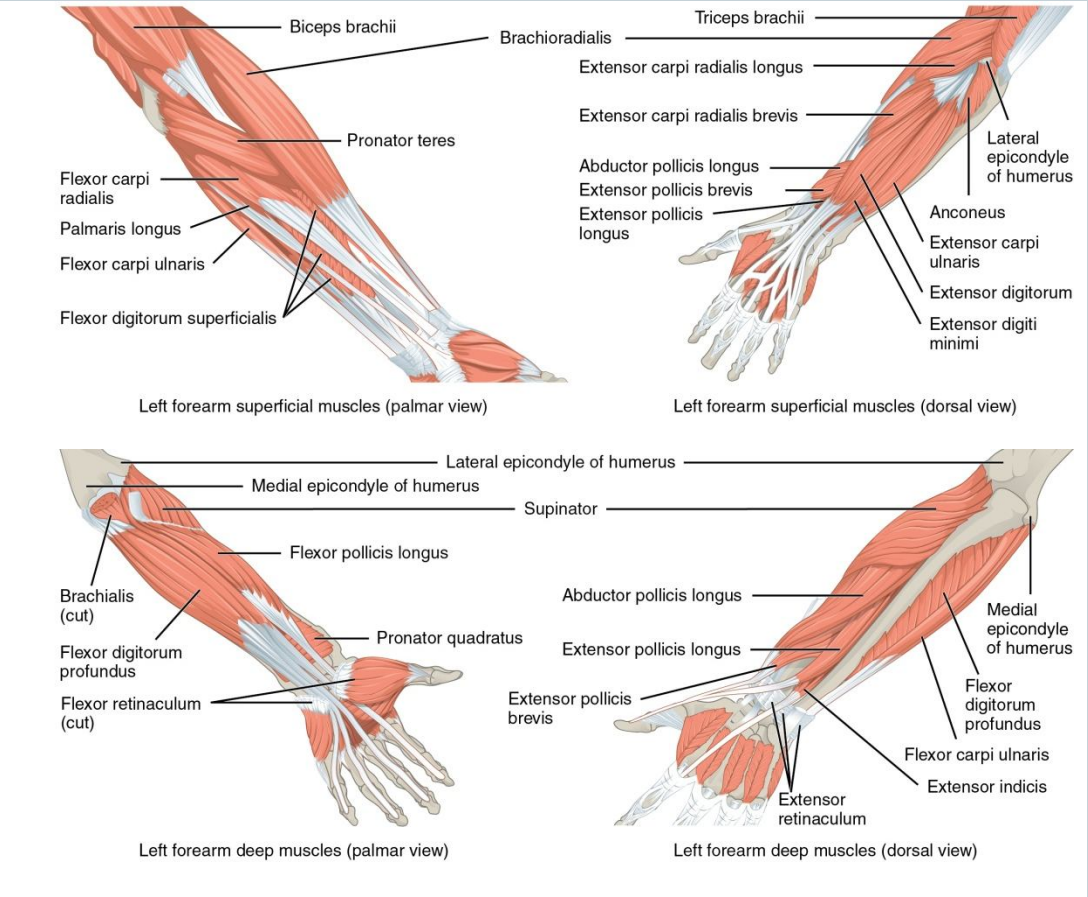
Anconeus

Origin: posterior surface of humerus lateral epicondyle
Insertion: olecranon process & ulnar body
Action: forearm extension



Forearm

- Anterior muscles
- Posterior muscles



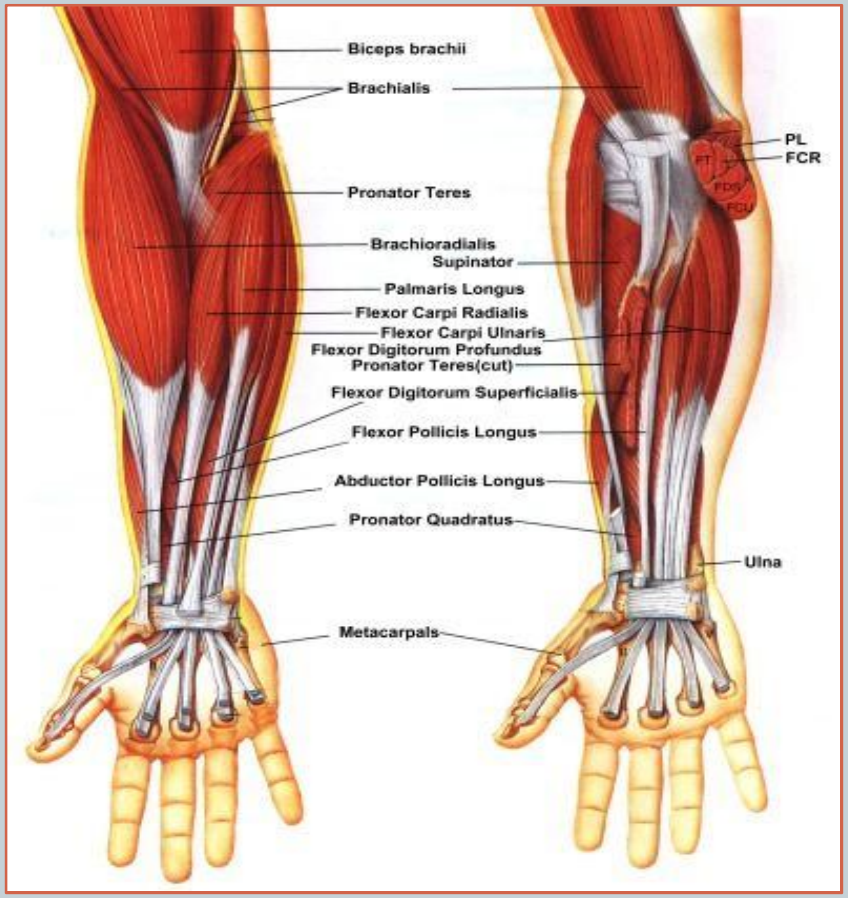
Anterior muscles

- Origin: humerus medial epicondyle
- Action:

Forearm pronation

Hand flexion

Digits flexion



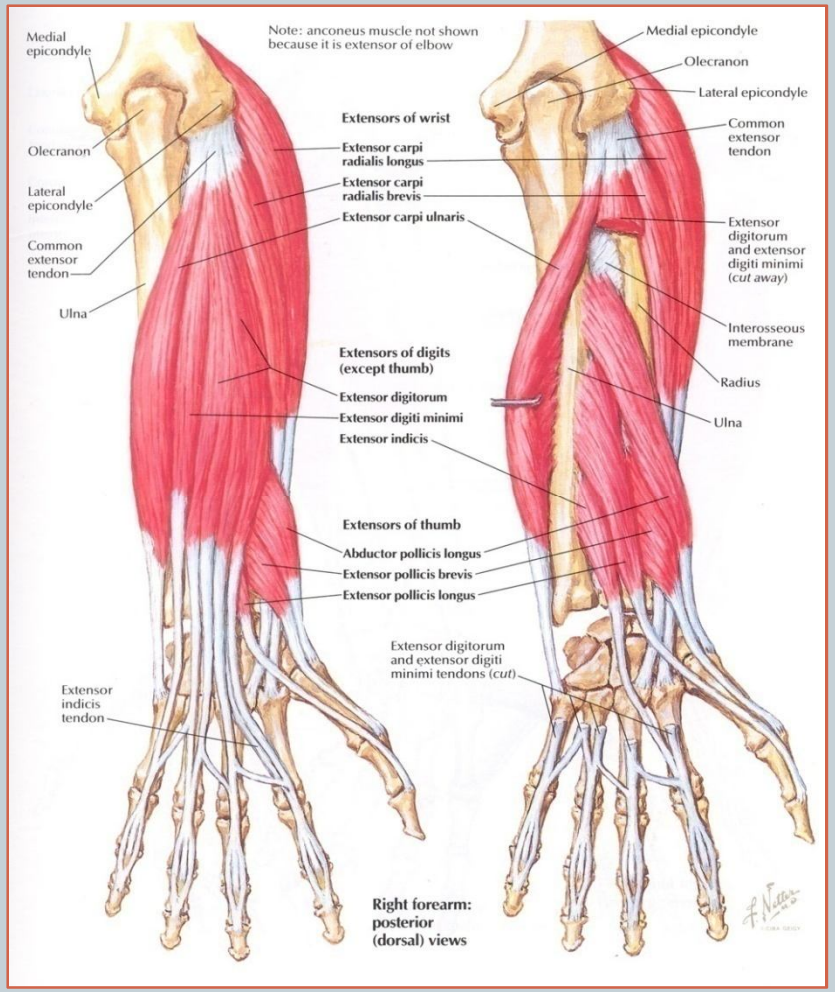
Posterior muscles

- Origin: humerus lateral epicondyle
- Action:

Forearm supination

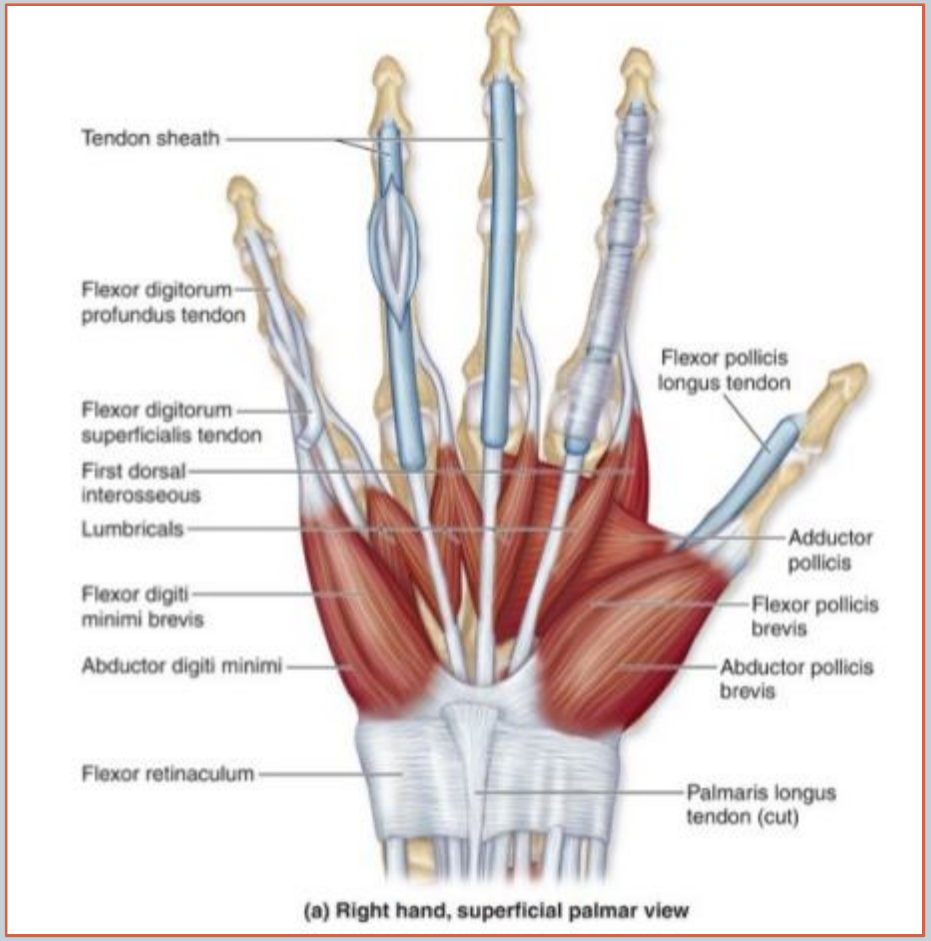
Hand extension

Digits extension



Hand & carp muscle

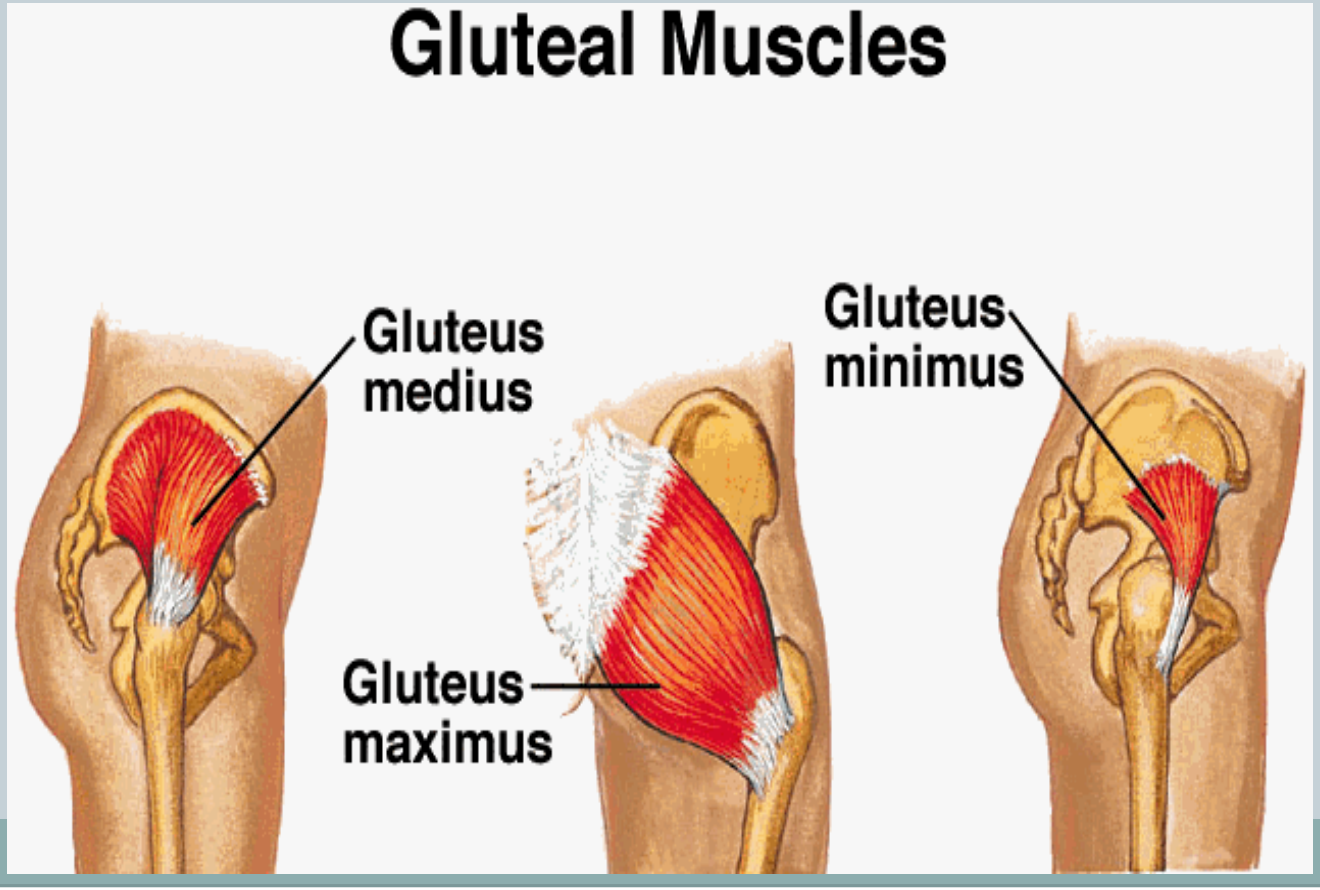
- Tenar muscles
- Hypotenar muscles
- Lumbricals
- Palmar interosseus
- Dorsal interosseus



(a) Right hand, superficial palmar view

Gluteal musculatore

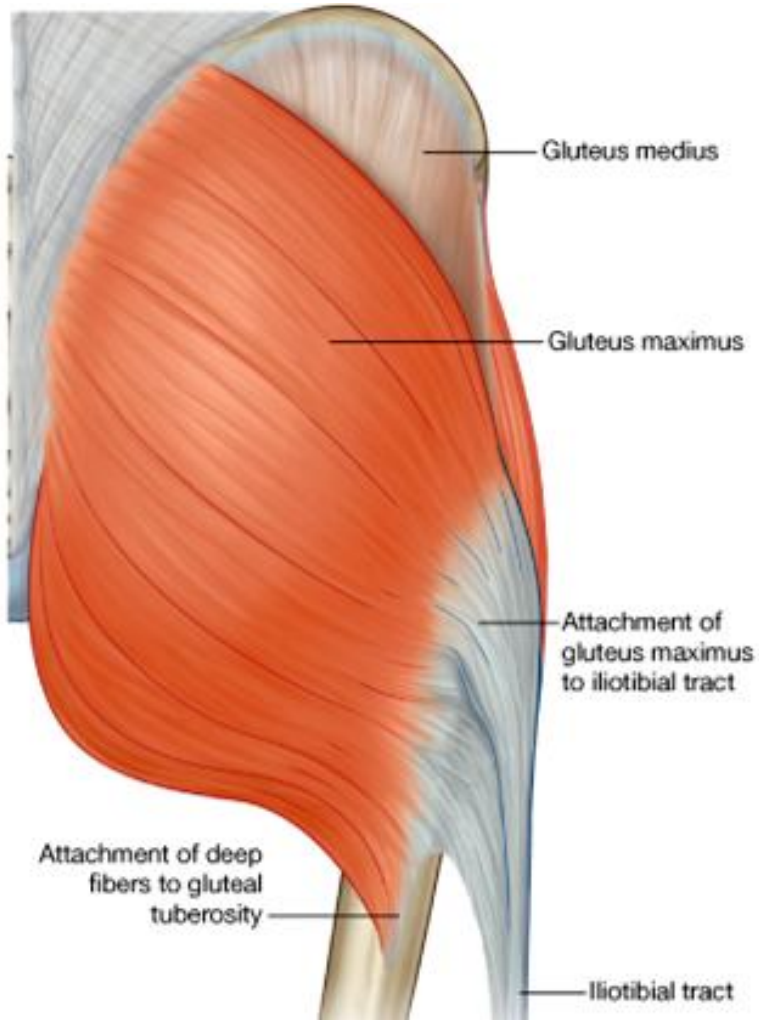
- Gluteus maximus
- Gluteus medius
- Gluteus minimus



Gluteal musculatore

Gluteus maximus

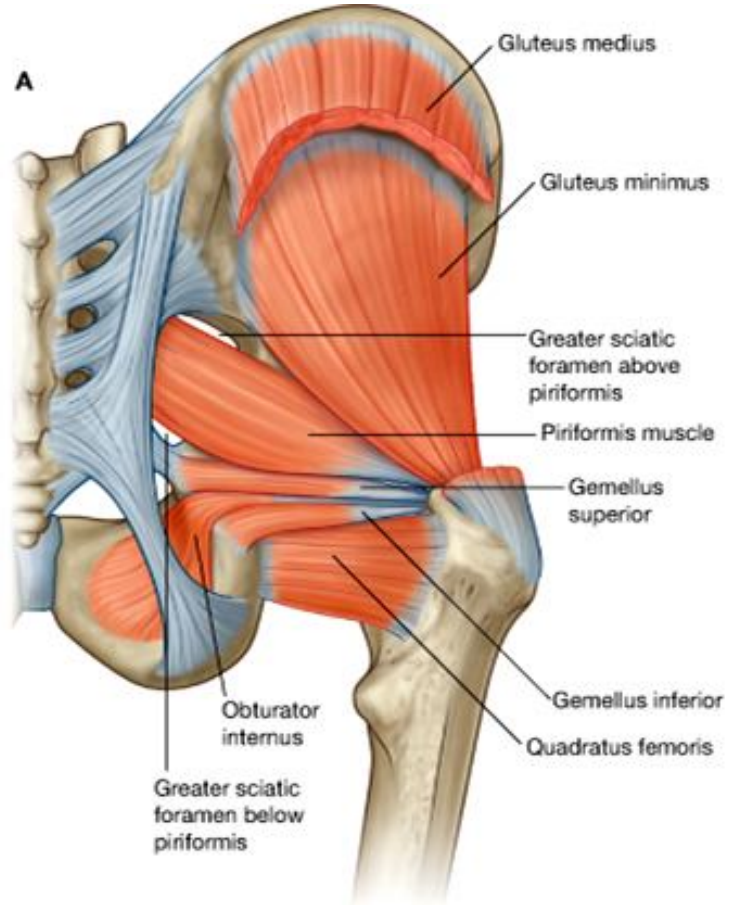
Origine: external surface of ileum
Insertion: gluteal tuberosity
Function:
Powerful extention of femur
lateral rotation



Gluteal musculatore

Gluteus medius

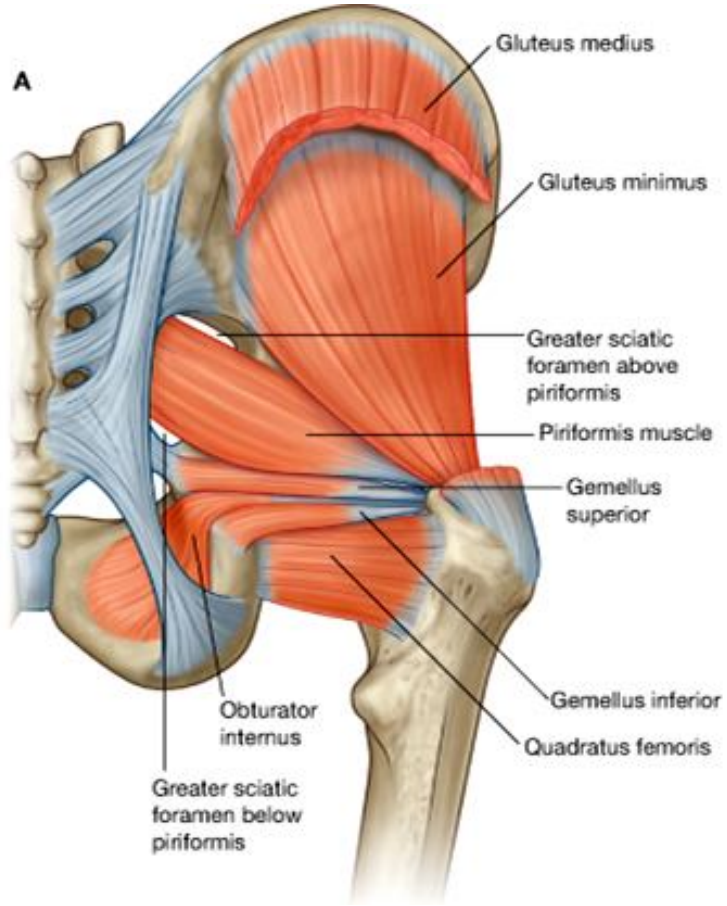
Origine: external surface of ileum
Insertion : greater trouchanter
Function: Femur abduction
Femur medial rotation

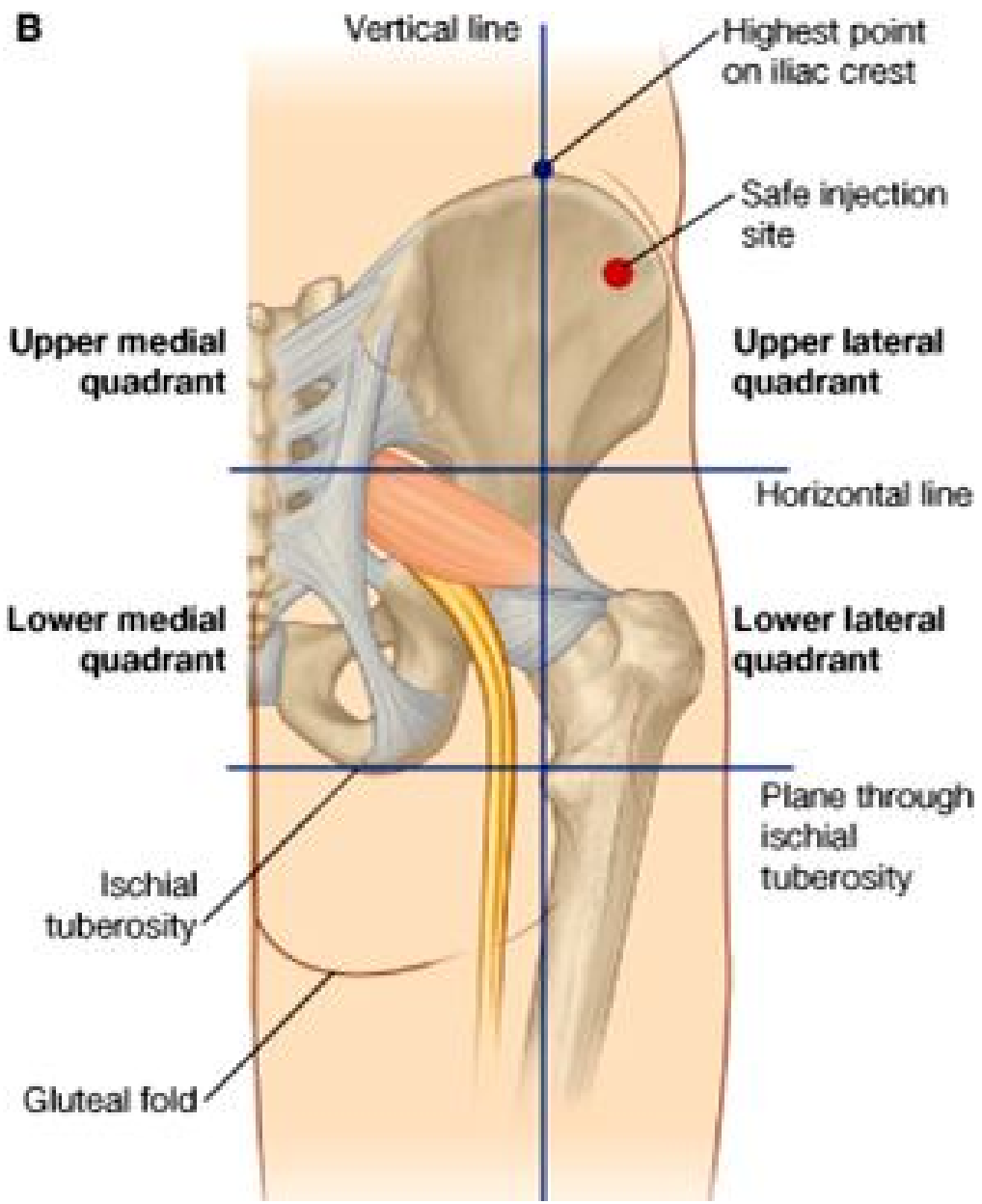


Gluteal musculatore

Gluteus minimus

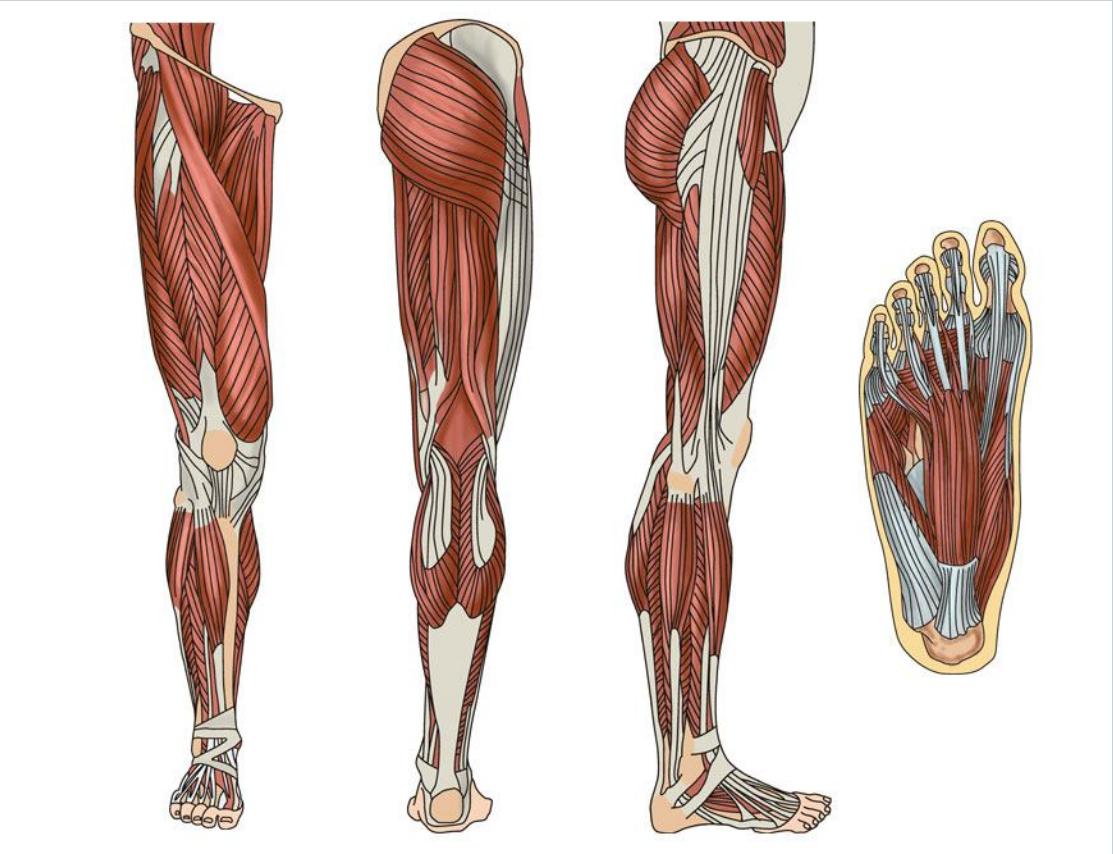
Origine: external surface of ileum
Insertion: greater trouchanter
Function: Femur abduction
Femur medial rotation




B
Vertical line
Highest point on iliac crest
Safe injection site
Upper medial quadrant
Upper lateral quadrant
Horizontal line
Lower medial quadrant
Lower lateral quadrant
Plane through ischial tuberosity
Ischial tuberosity
Gluteal fold

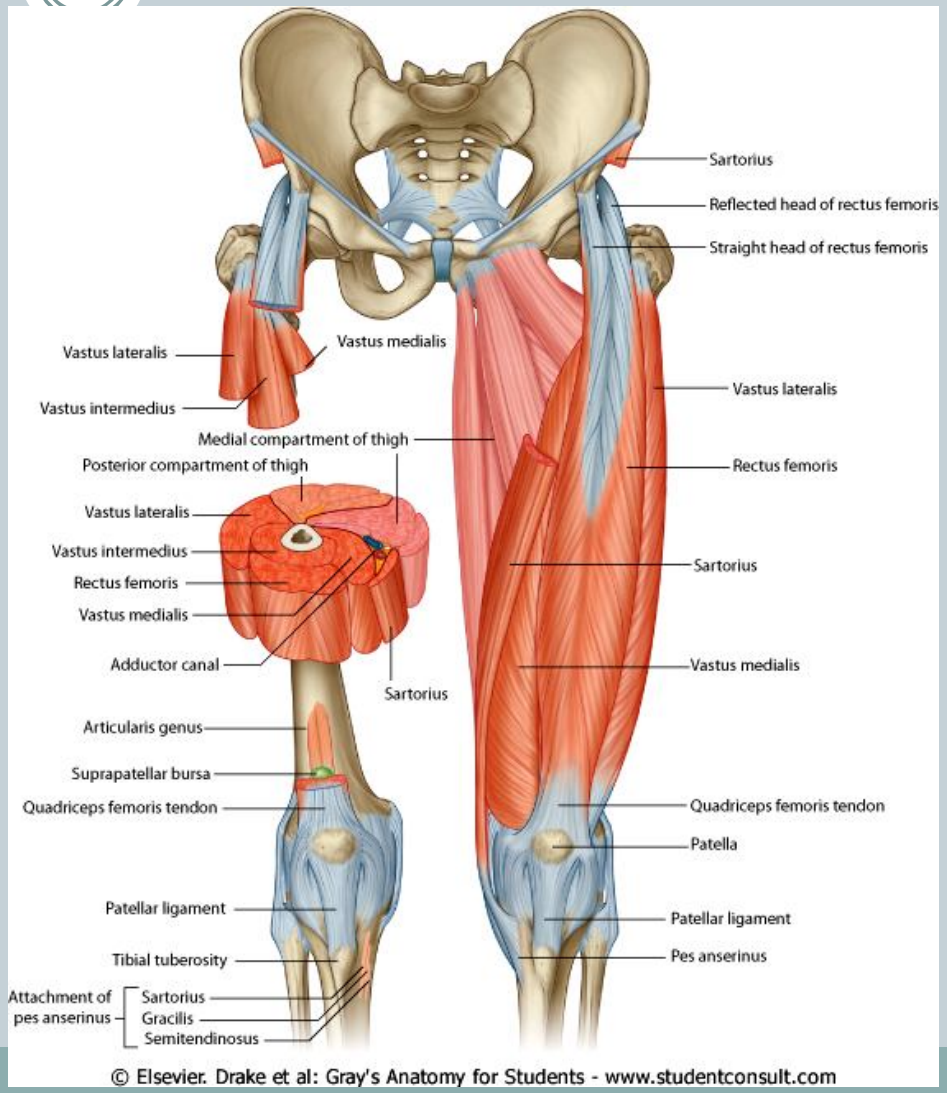
Lower limb muscles

- Femur (tight) muscles
- Legg muscles
- Foot muscles



Femur (tight) muscles

- Anterior
- Medial
- Posterior



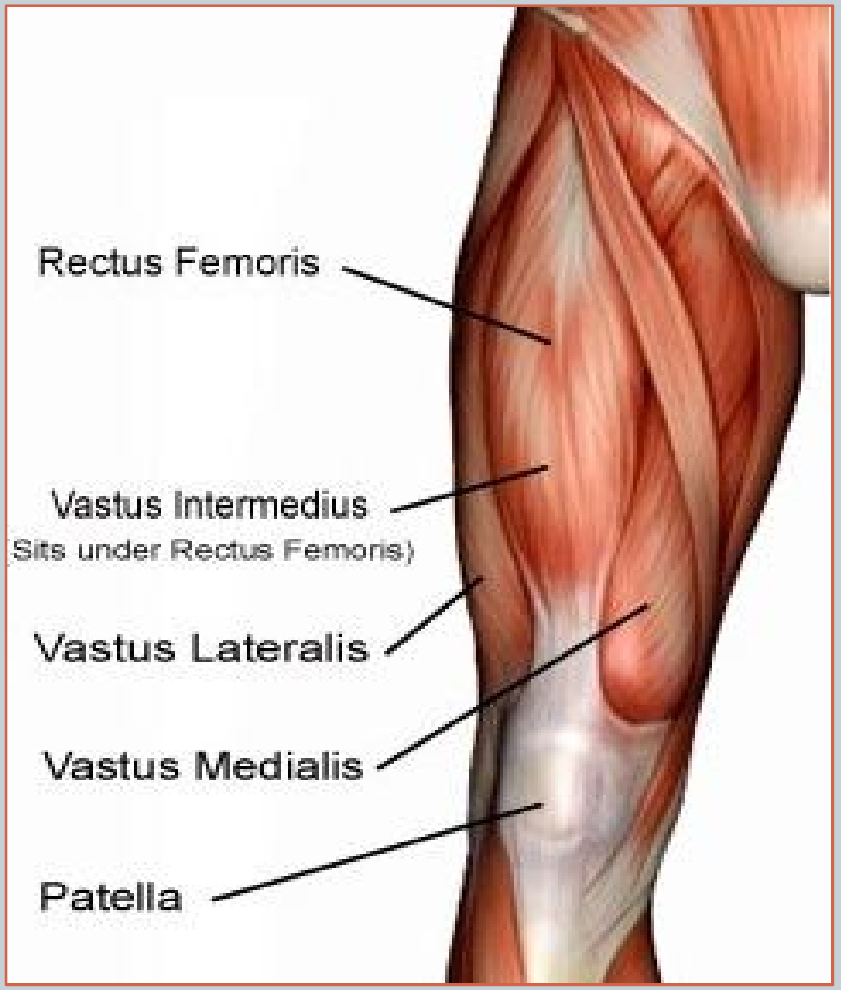
Femur (tight) muscles

- ***Anterior***

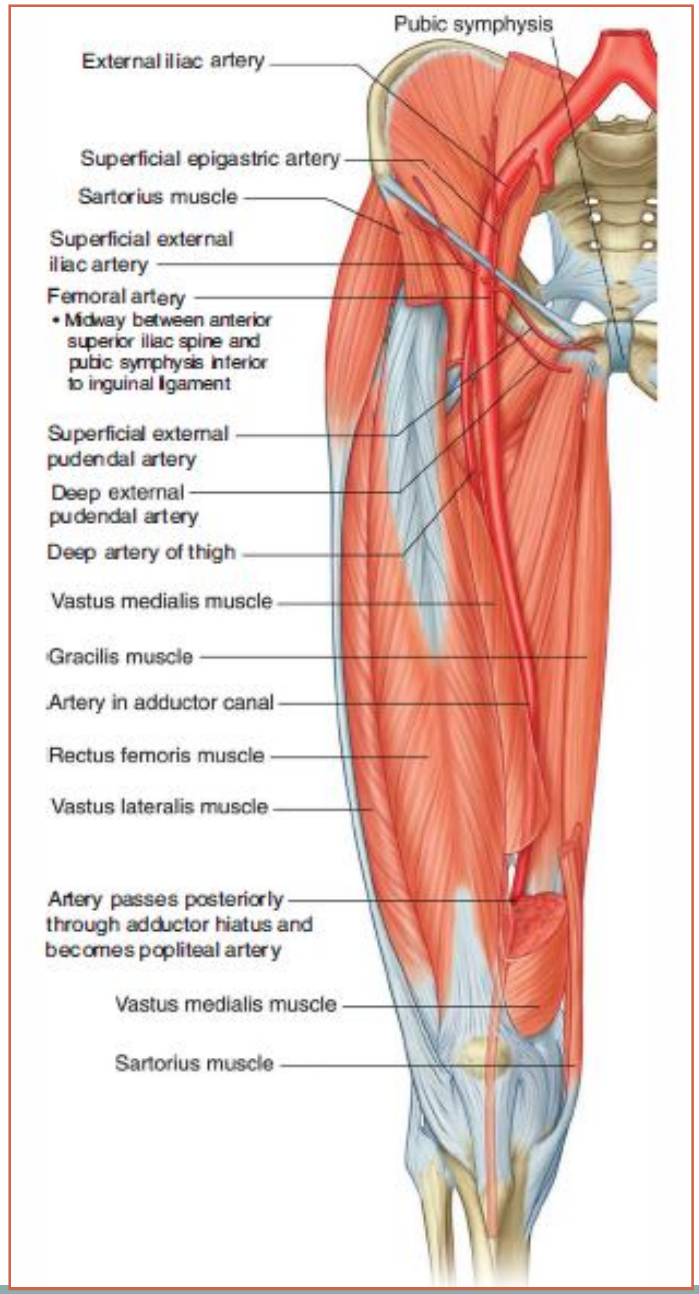
Quardratus femuris

1. **Vastu**s medialis
2. Vastus intermedius
3. Vastus lateralis
4. Rectus femoris

O: Hip & femur
I: Tibia
A: knee extension



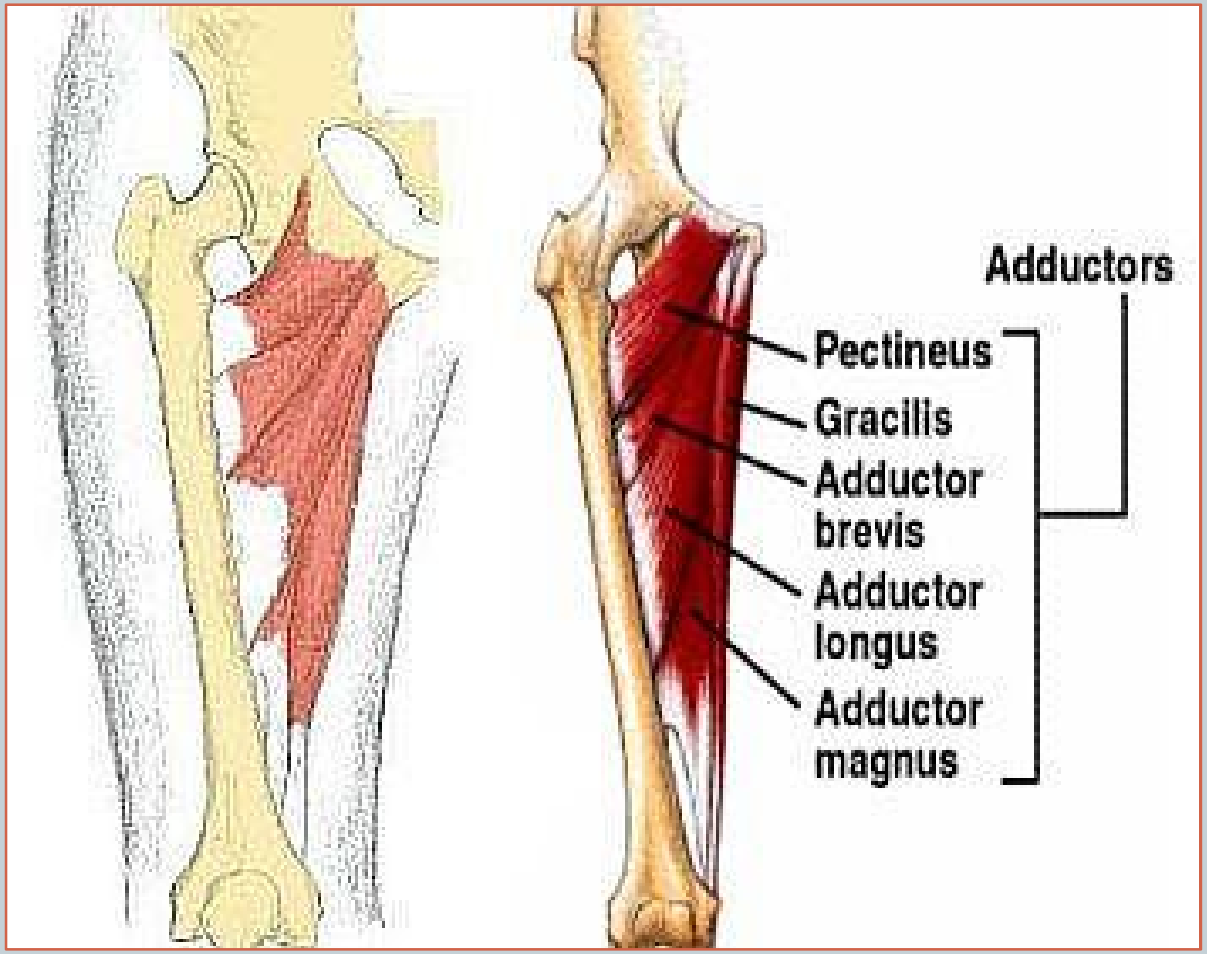
Sartorius:
O: anterior superior iliac spine (ASIS)
I: medial condyle of tibia
F:
Femur flection, lateral rotation & abduction
Legg flexion

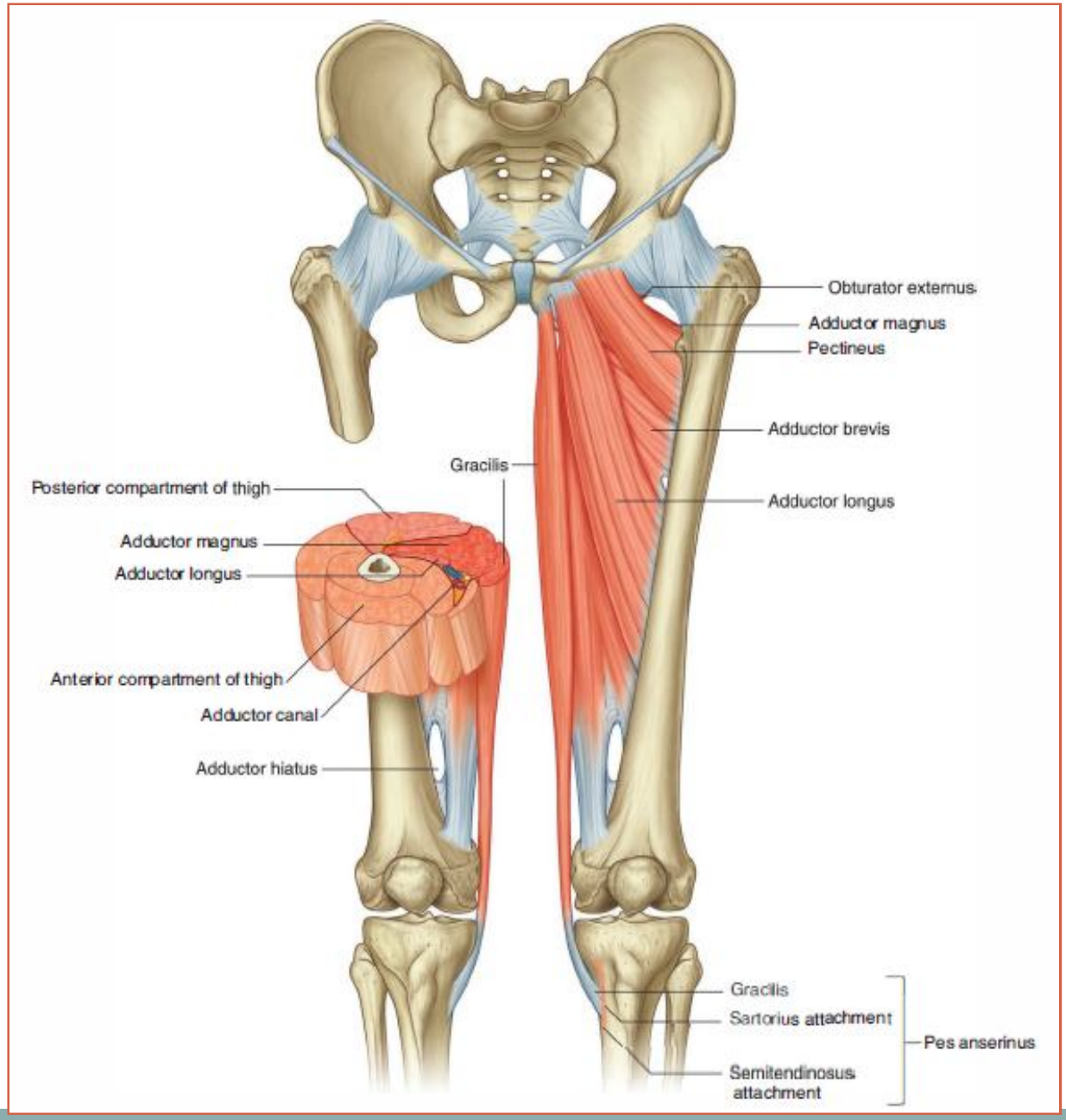

Pubic symphysis
External iliac artery
Superficial epigastric artery
Sartorius muscle
Superficial external iliac artery
Femoral artery
• Midway between anterior superior iliac spine and pubic symphysis inferior to inguinal ligament
Superficial external pudendal artery
Deep external pudendal artery
Deep artery of thigh
Vastus medialis muscle
Gracilis muscle
Artery in adductor canal
Rectus femoris muscle
Vastus lateralis muscle
Artery passes posteriorly through adductor hiatus and becomes popliteal artery
Vastus medialis muscle
Sartorius muscle

Femur (tight) muscles

- ***Medial***

Femur adduction




Obturator externus
Adductor magnus
Pectineus
Adductor brevis
Gracilis
Posterior compartment of thigh
Adductor longus
Adductor magnus
Adductor longus
Anterior compartment of thigh
Adductor canal
Adductor hiatus
Gracilis
Sartorius attachment
Pes anserinus
Semitendinosus attachment

Femur muscles

- ***Posterior***

Semitendinosus

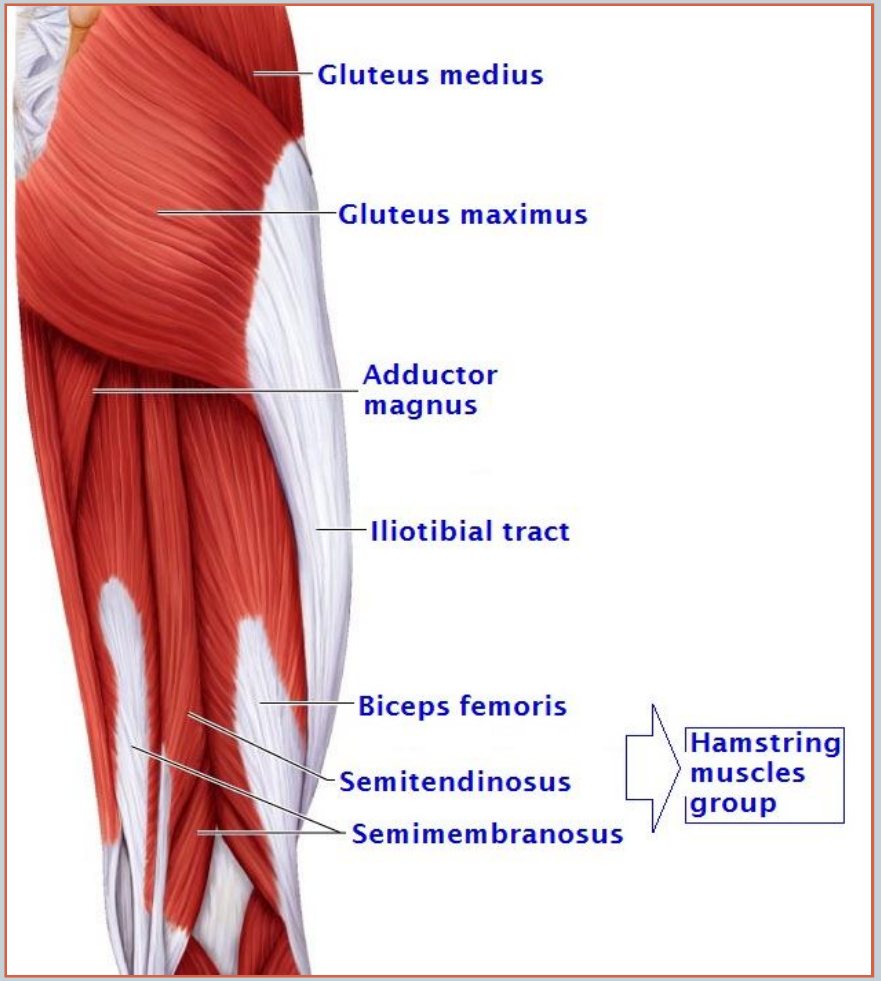
Semimembranosus

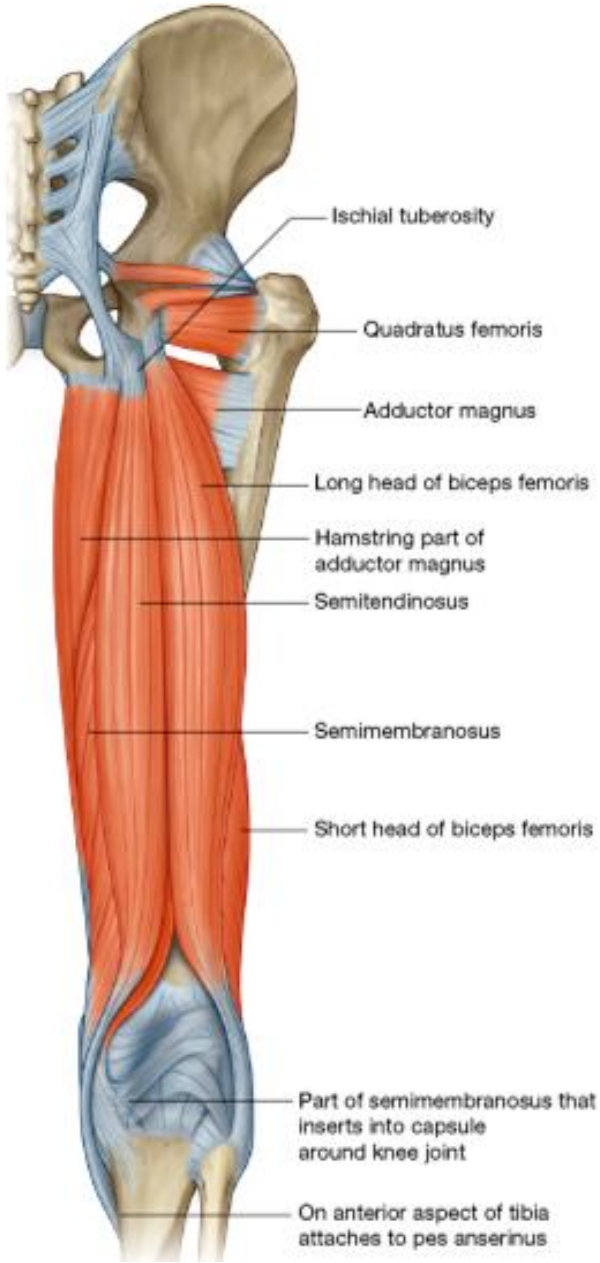
Bicepse femoris

O: hip

I: tibia

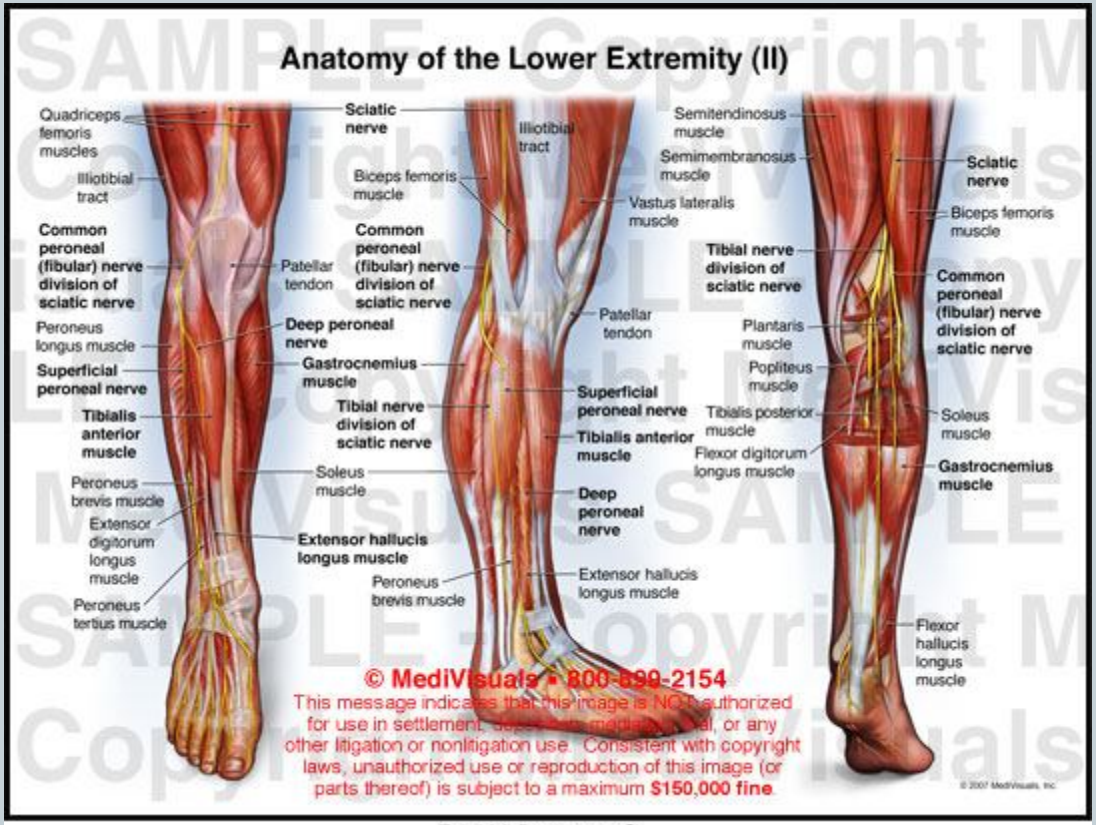
A: hip extension & knee flexion




Ischial tuberosity
Quadratus femoris
Adductor magnus
Long head of biceps femoris
Hamstring part of adductor magnus
Semitendinosus
Semimembranosus
Short head of biceps femoris
Part of semimembranosus that inserts into capsule around knee joint
On anterior aspect of tibia attaches to pes anserinus

Leg Muscles

- Antero lateral muscles
- Posterior muscles



Exhibit# D15083-02G

Antero lateral muscles

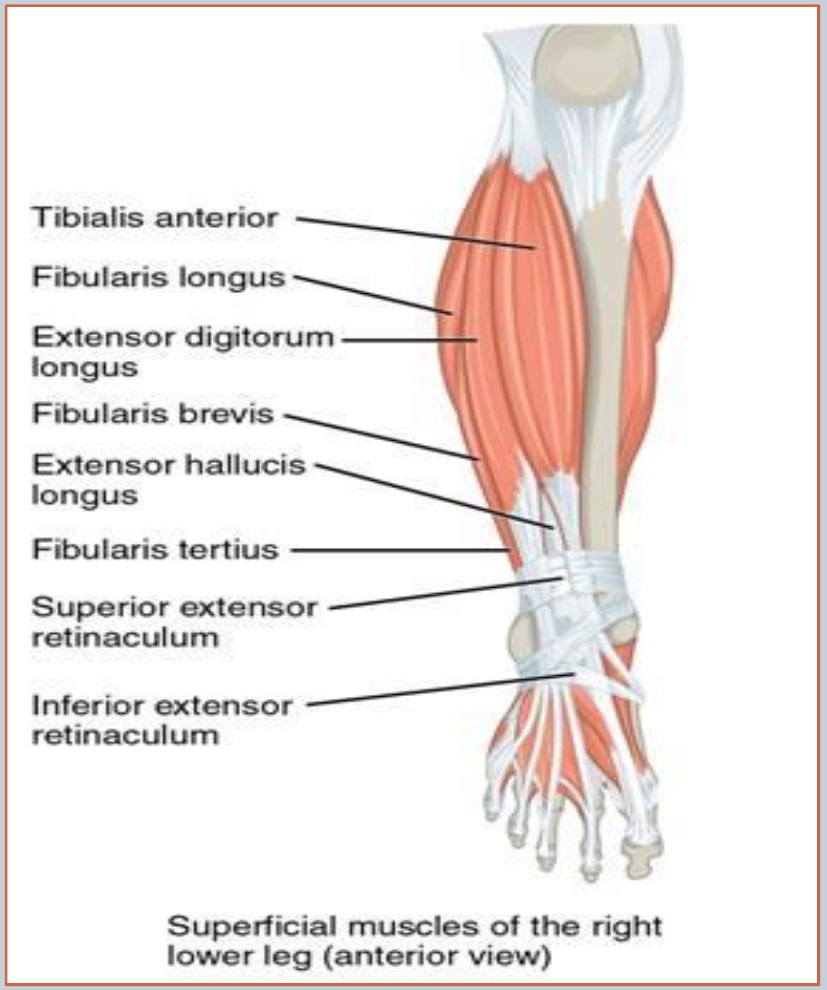
- Superficial muscles
- Deep muscles
- Action:

Foot Eversion

Foot extension

Foot abduction

Digits extension



Superficial muscles of the right lower leg (anterior view)

Posterior muscles

- Superficial muscles

Gastrocnemius

Soleus

O: femur

I: calcaneus

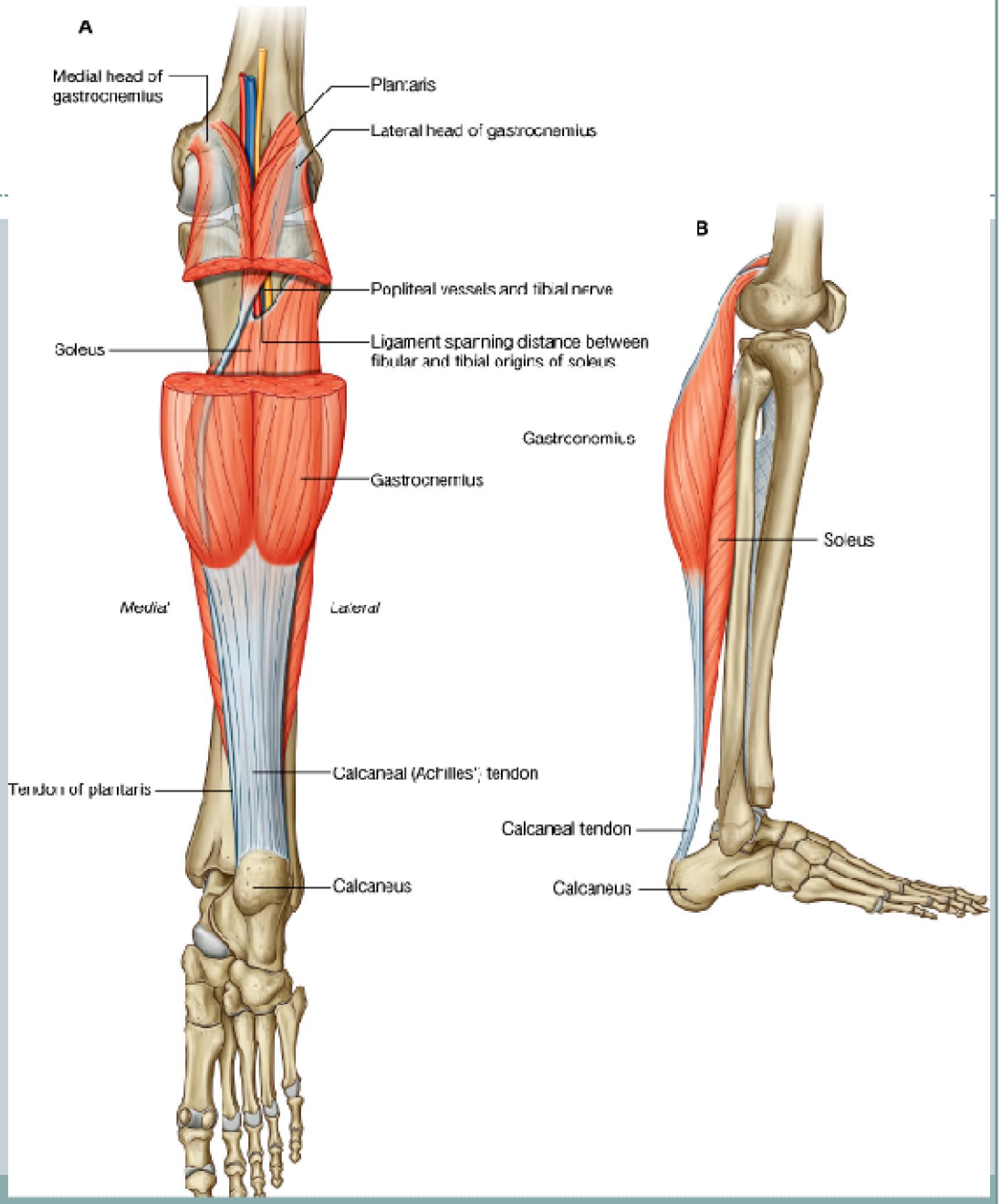
A: plantar & knee flexion

- Deep muscles

Digits flexion

Plantar flexion

inversion



Foot muscles

- 4 layers