

# Joints and Muscles Groups and Functions of Muscles

lecture and seminar from Human Morphology

29. 10. 2020

# JOINTS / ARTICULATIONS

- **arthros** = joint /*gr.*/ – arthrology
- junction of two or more bones
- the joints hold the bones together, allow movement and provide mechanical support

## 1) FUNCTIONAL CLASSIFICATION

- synarthrotic joints (synarthroses) – immovable, rigid joints (sutures of skull)
- amphiarthrotic joints (amphiarthroses) – slightly movable (intervertebral discs, ribs to sternum)
- diarthrotic joints (diarthroses) – freely movable

# JOINTS / ARTICULATIONS

## 2) STRUCTURAL CLASSIFICATION

- fibrous joints
  - ✓ hold bones together with fibrous connective tissue (sutures, tibia+fibula)
- cartilaginous joints
  - ✓ contain cartilage pads holding bone ends together (pubic symphysis, intervertebral joints)
- synovial joints
  - ✓ they are all diarthrotic, have articular cartilage covering the ends of the bones forming the joint
  - ✓ the joint is enclosed by a capsule of fibrous connective tissue and this is lined with synovial membrane which secretes synovial fluid
  - ✓ there is a joint cavity and reinforcing ligaments that stabilize the joint

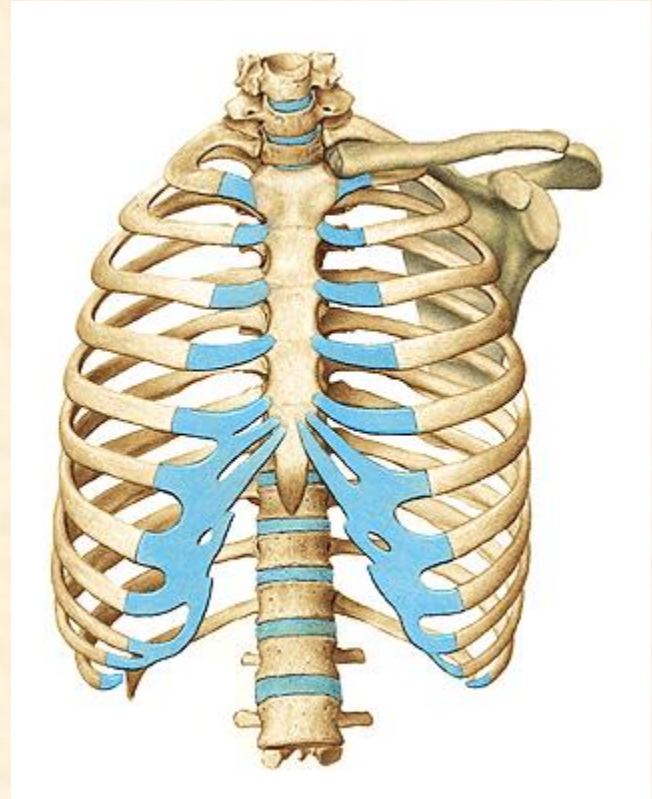
# SYNARTHROSIS

fibrous joint (skull suture)



# AMPHIARTHROSIS

cartilaginous joint (ribs+sternum)



# SYNOVIAL (DIARTHROTIC) JOINT

fibrous joint capsule

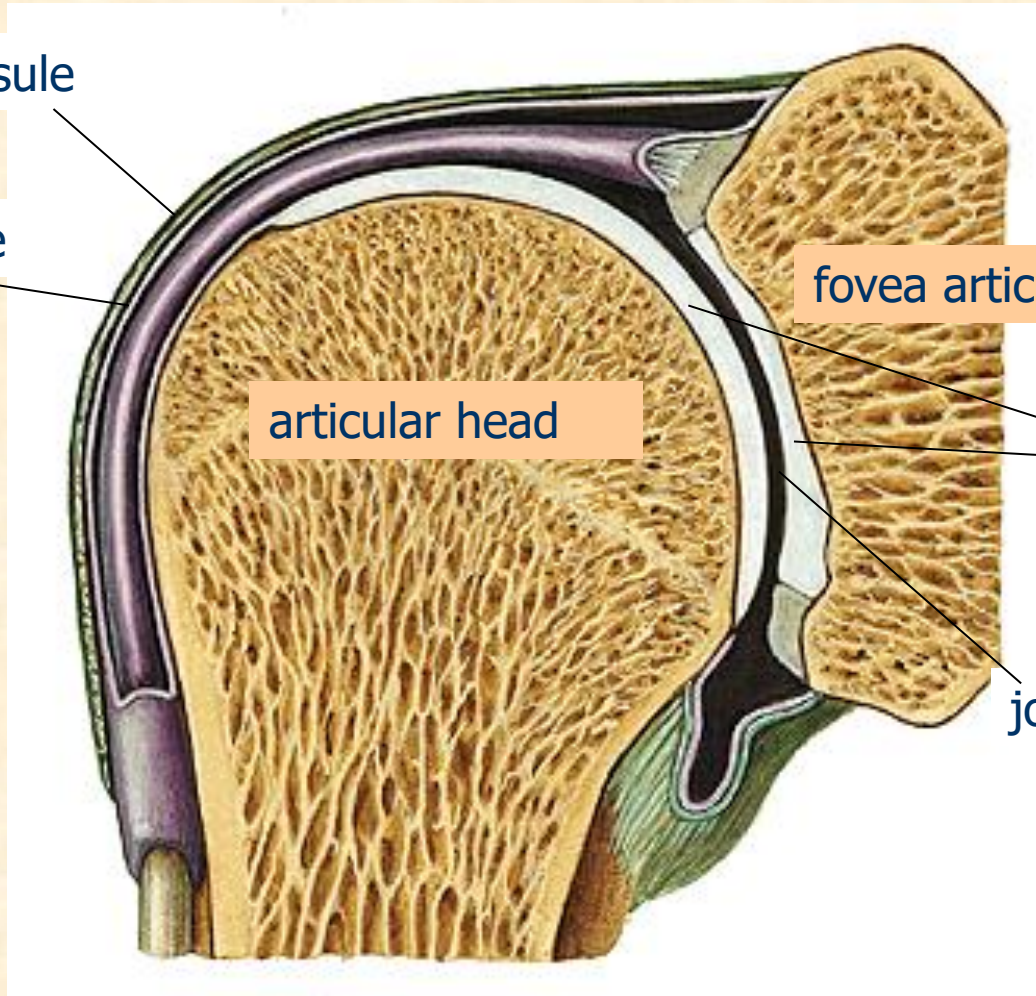
synovial membrane

fovea articularis

articular head

articular cartilage

joint cavity



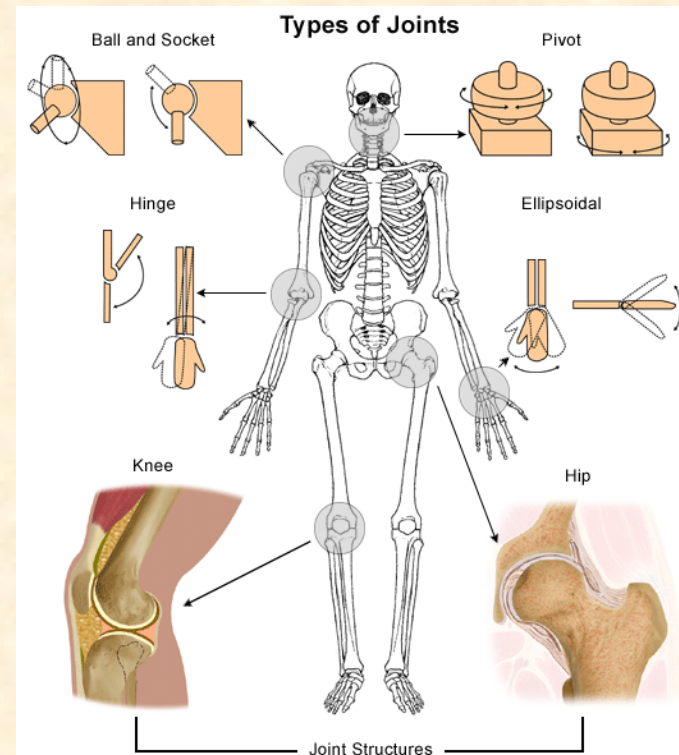
# JOINTS / ARTICULATIONS

## 3) NUMBER OF BONES INVOLVED

- simple joint – 2 articulation surfaces (shoulder joint)
- compound joint – 3 or more articulation surfaces (elbow joint)
- complex joint – 2 or more articulation surfaces + articular disc or meniscus (knee joint)

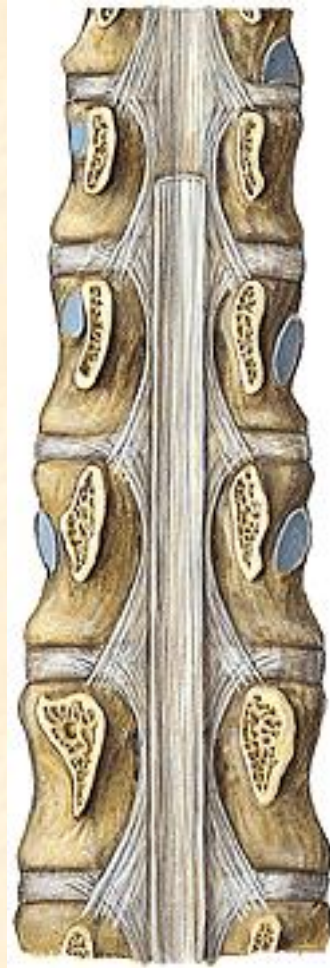
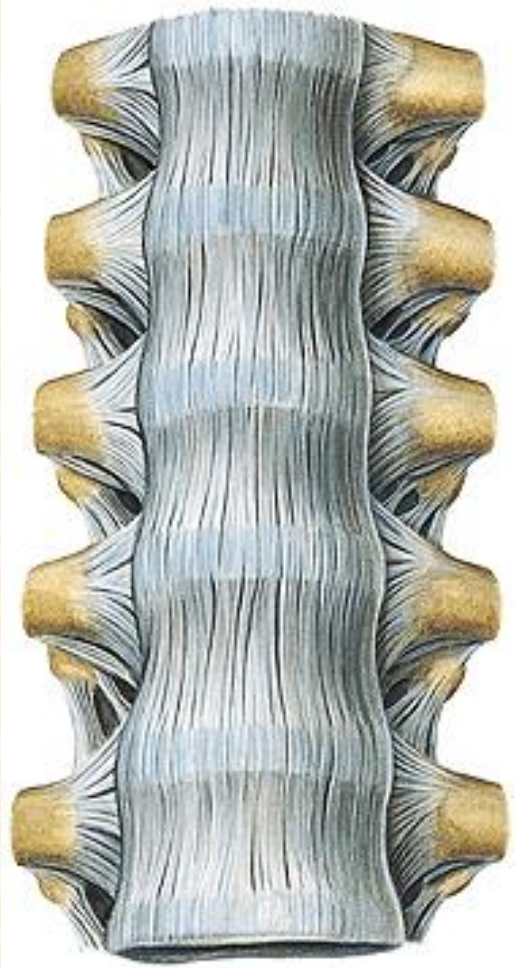
## 4) SHAPE OF JOINT FACES

- ball and socket joint – shoulder joint
- hinge joint – elbow joint
- condyloid joint – metacarpophalangeal j.
- saddle joint – carpometacarpal joint
- pivot joint – atlantoaxial joint
- plane joint – intervertebral joints
- ellipsoid joint – radiocarpal joint



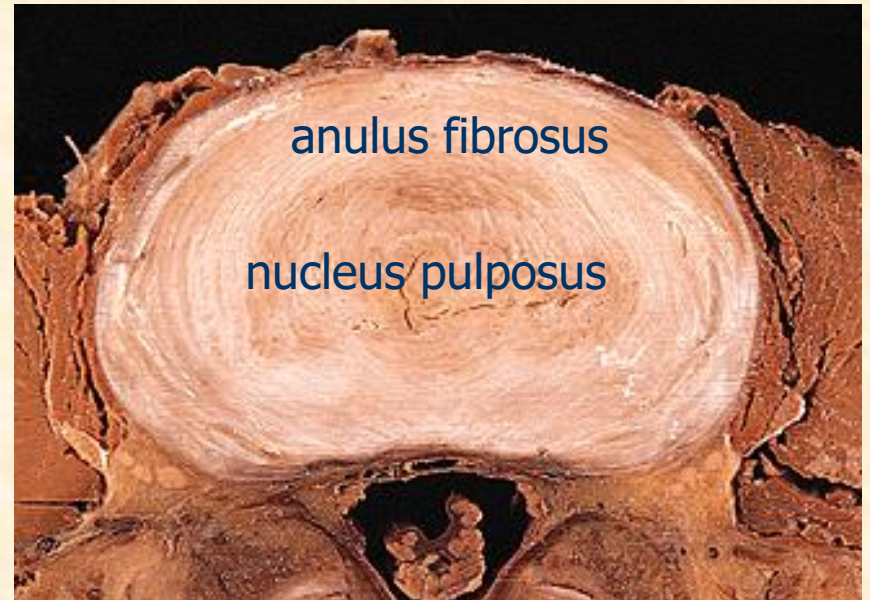
# VERTEBRAL JUNCTIONS

longitudinal ligaments



short ligaments

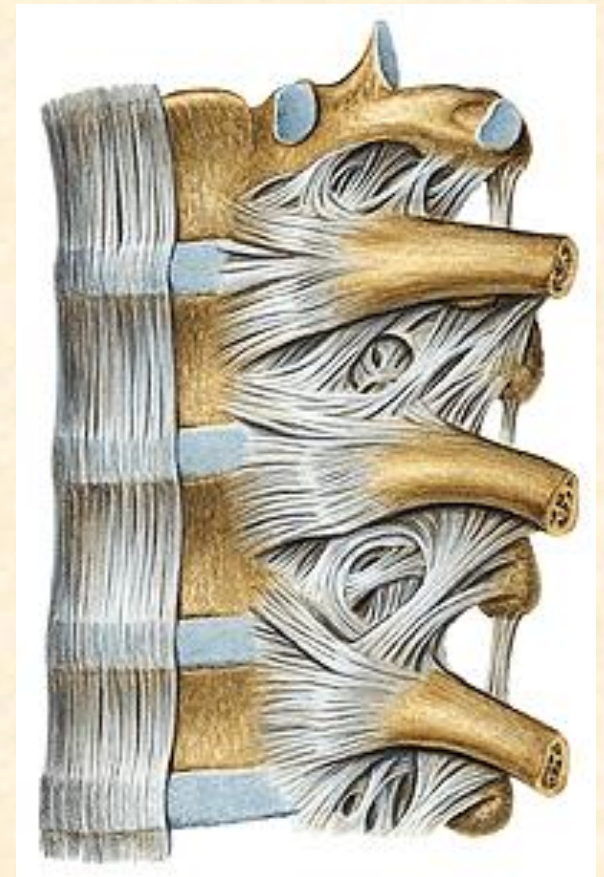
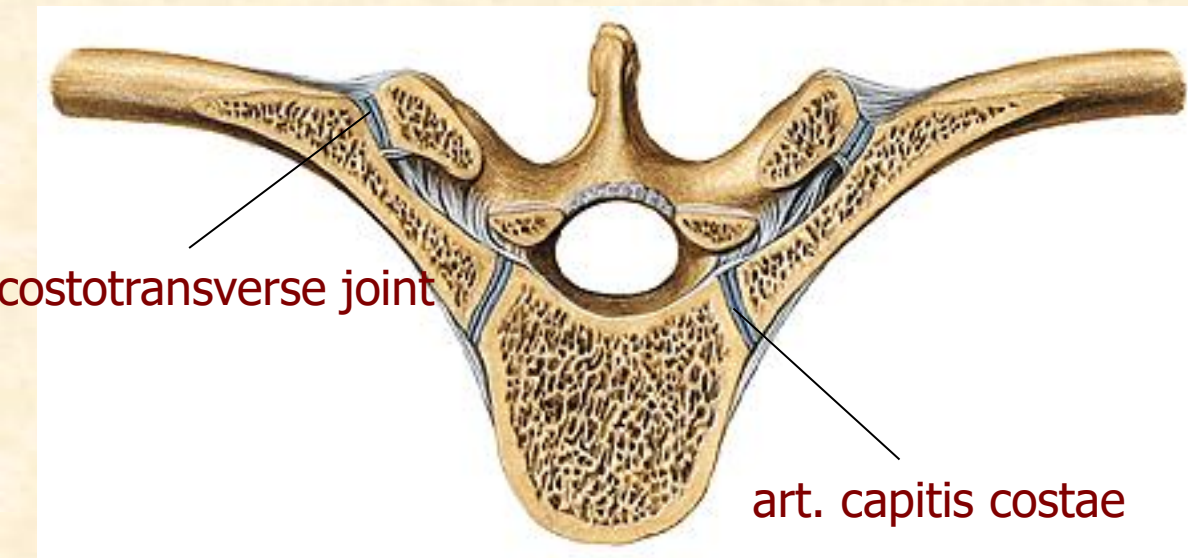
# INTERVERTEBRAL DISCS



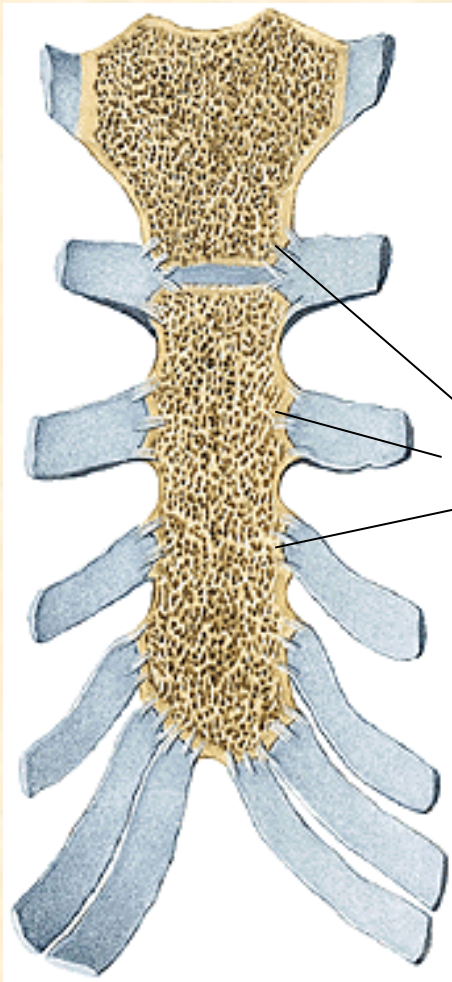


# THORAX JUNCTIONS

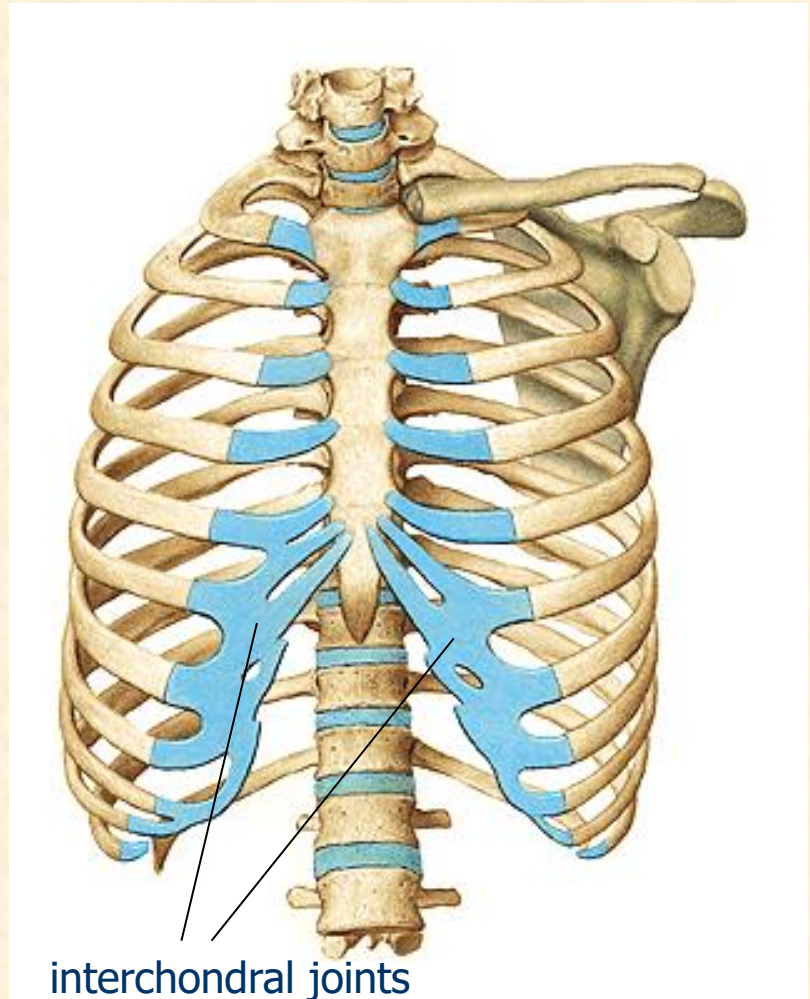
## costovertebral joints



# THORAX JUNCTIONS

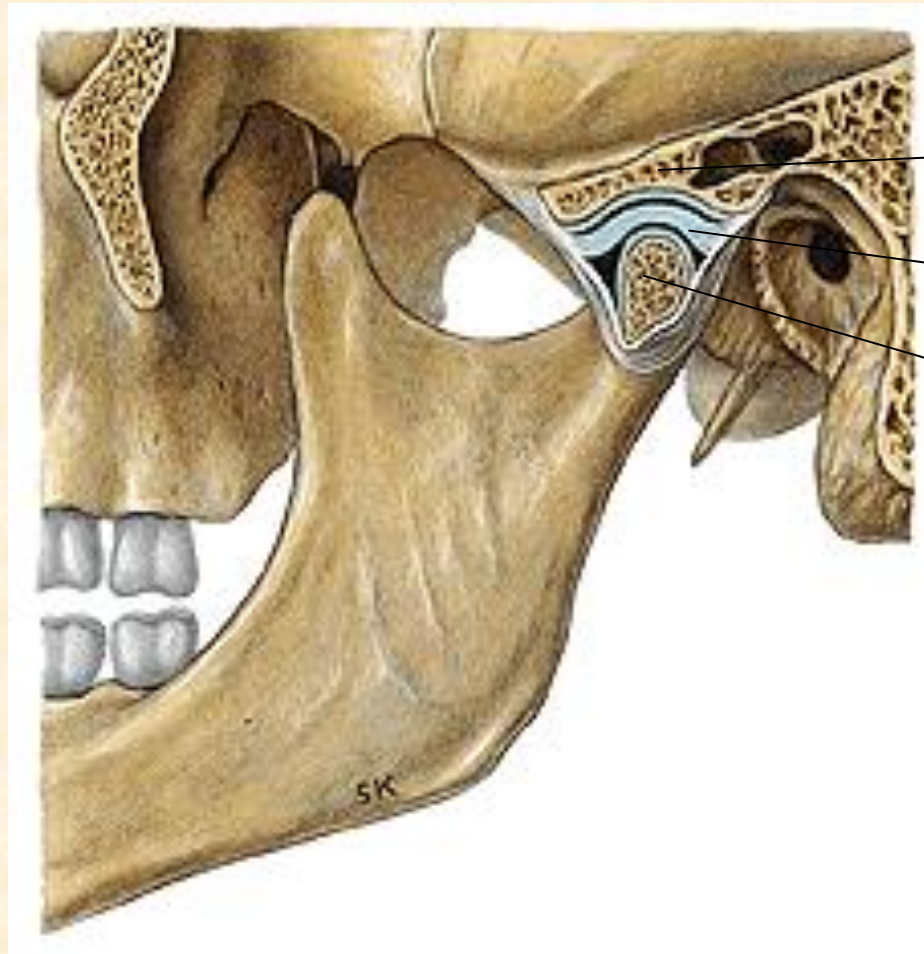


sternocostal joints



interchondral joints

# TEMPOROMANDIBULAR JOINT



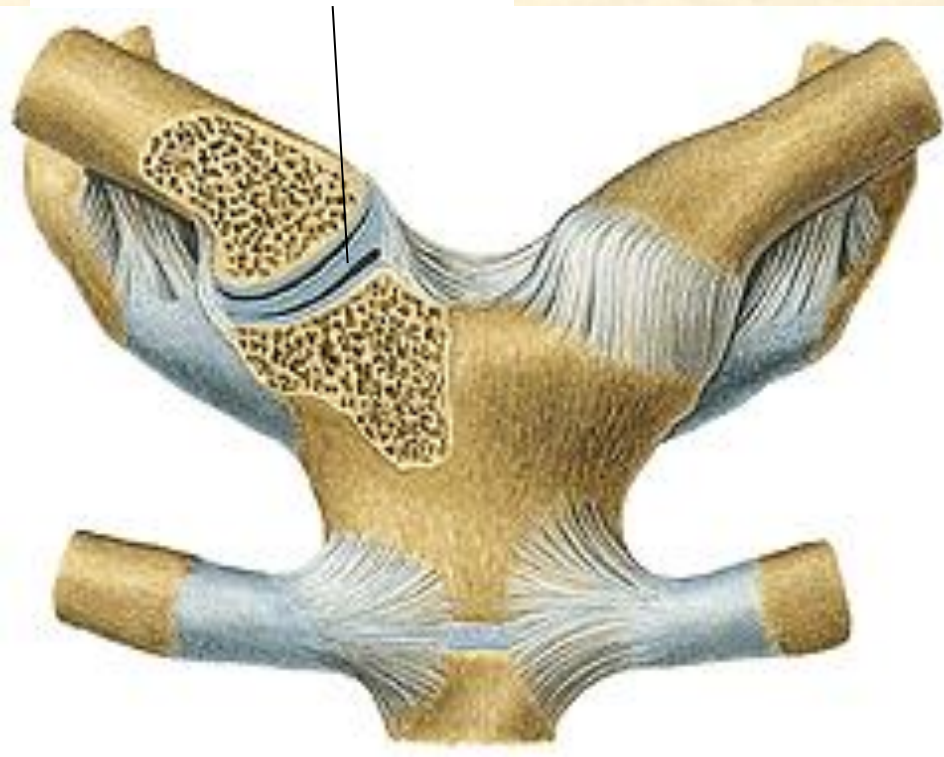
fossa of temporal bone

articular disc

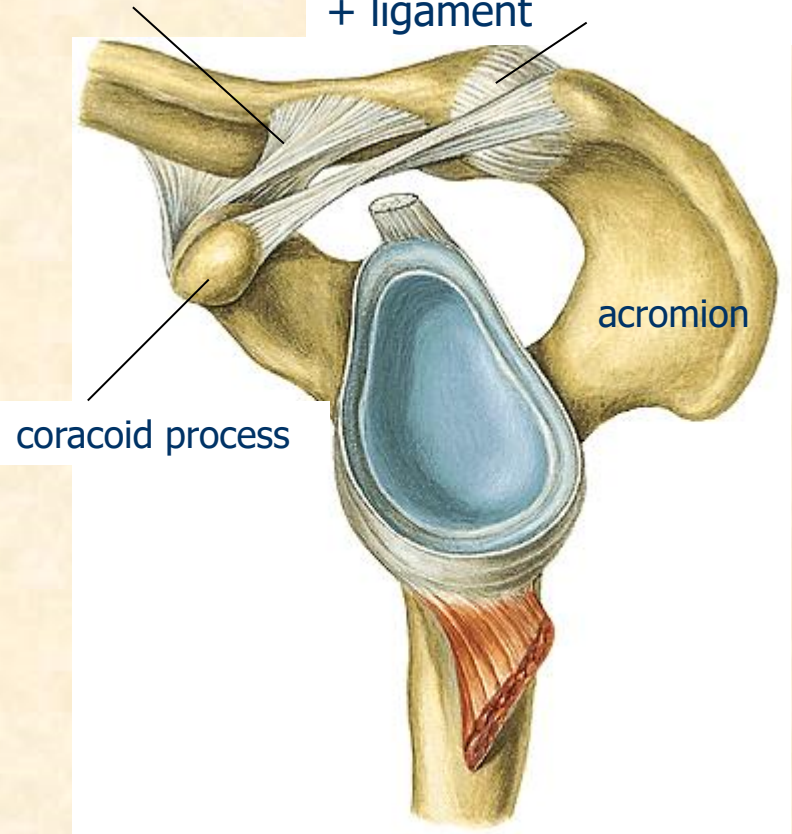
head of mandible

# PECTORAL GIRDLE JUNCTIONS

sternoclavicular joint



acromioclavicular joint + ligament



# UPPER LIMB JUNCTIONS

1) SHOULDER JOINT

2) ELBOW JOINT

3) WRIST (CARPAL) JOINT

4) HAND JOINTS

# SHOULDER JOINT

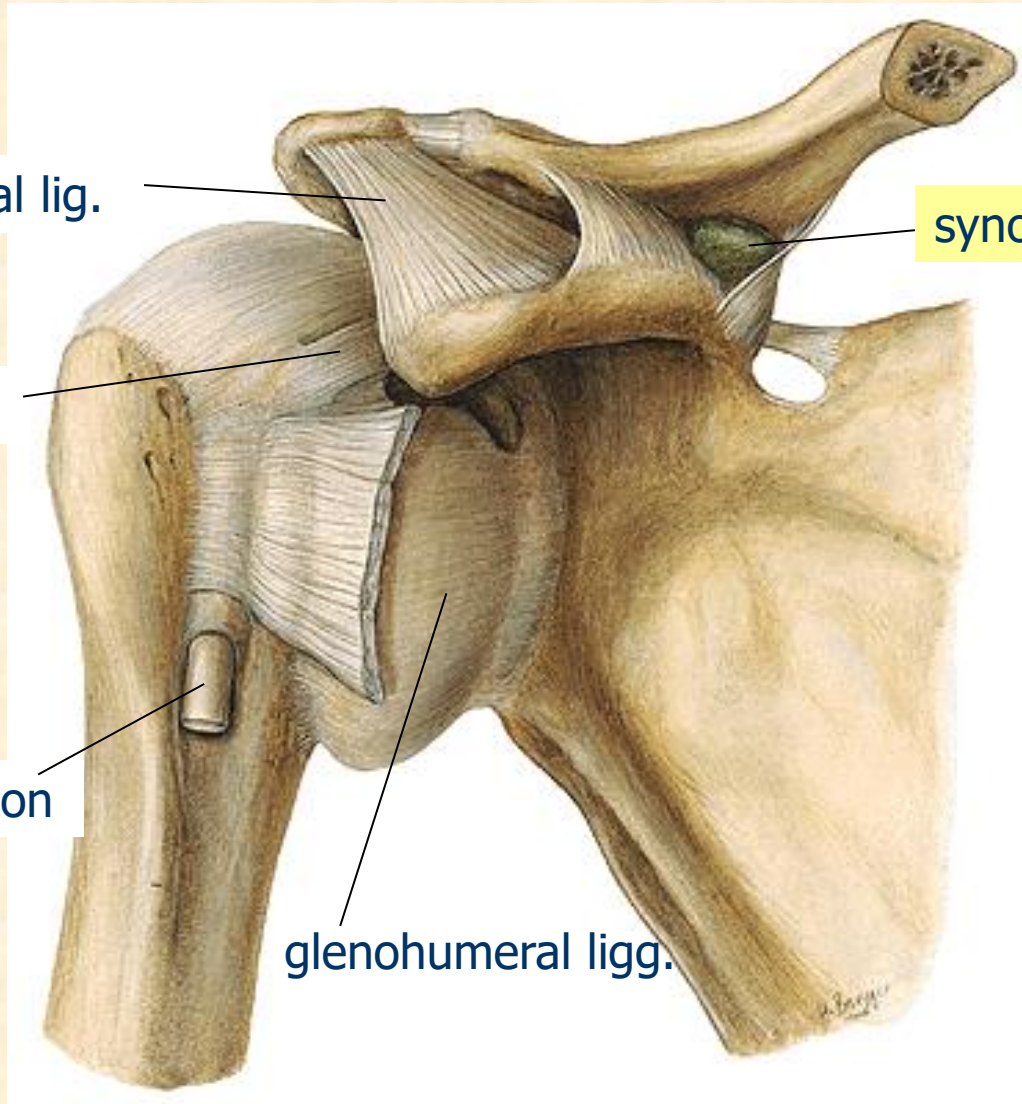
coracoacromial lig.

synovial bursa

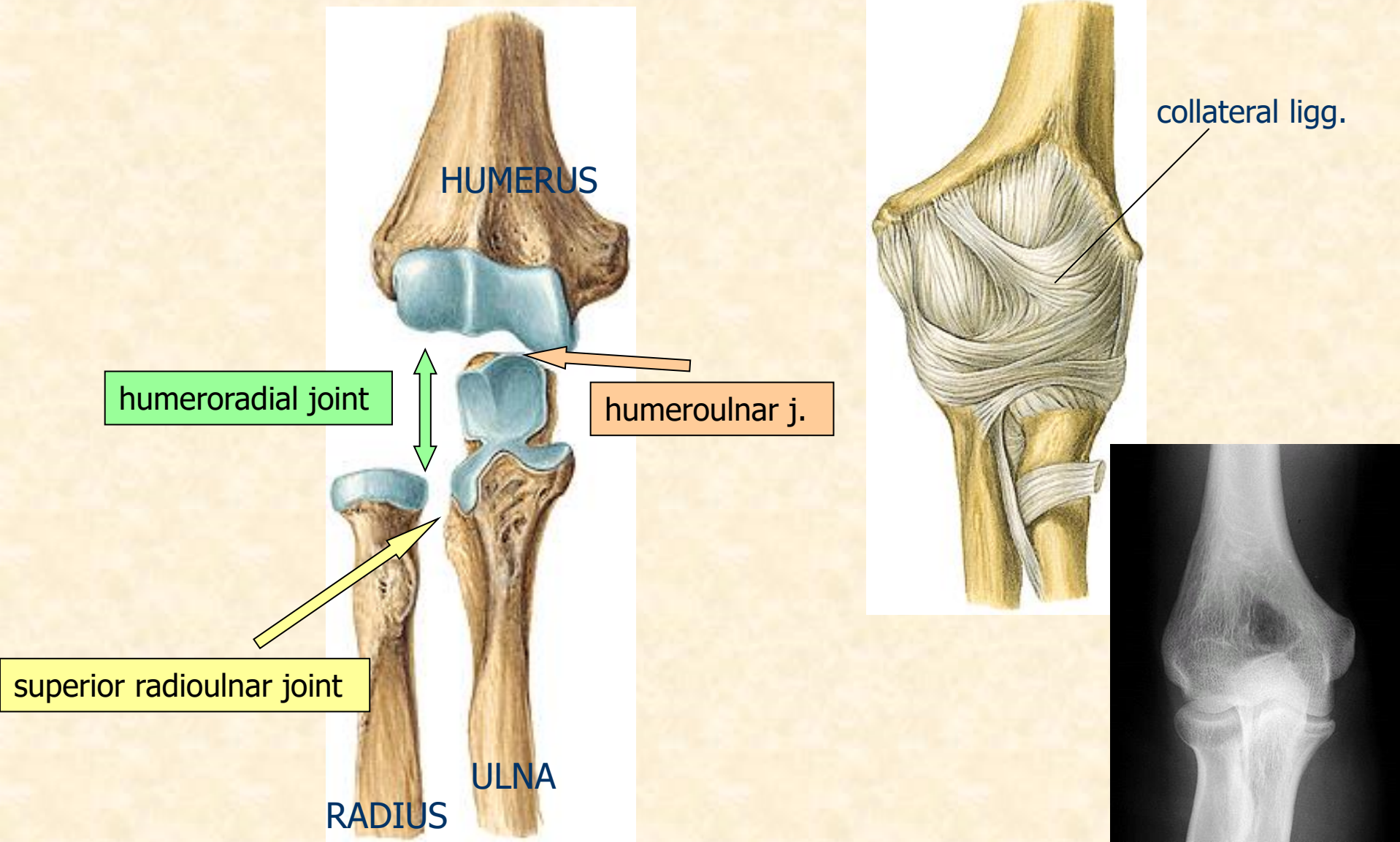
coracohumeral lig.

biceps muscle tendon

glenohumeral ligg.



# ELBOW JOINT



# WRIST/CARPAL JOINT

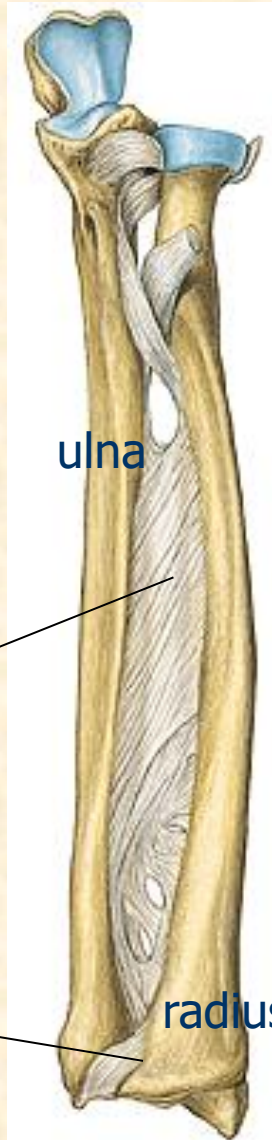
left side

interosseal membrane

ulna

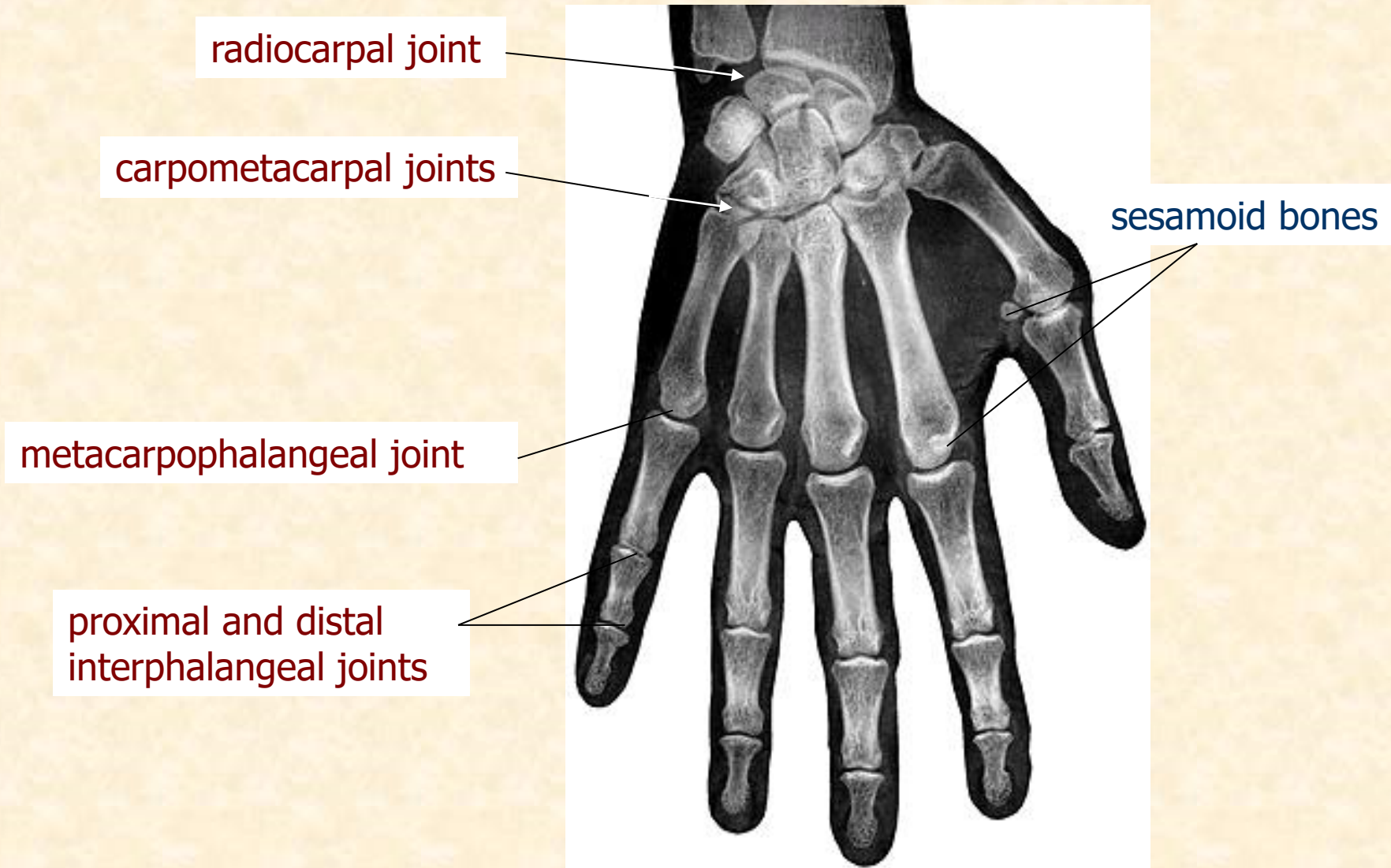
carpal joint

radius





# HAND JOINTS

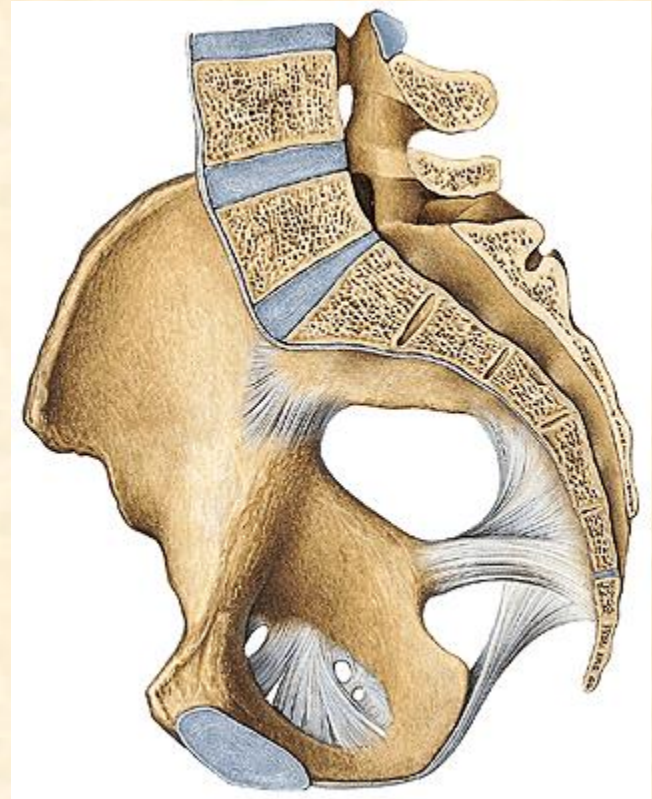
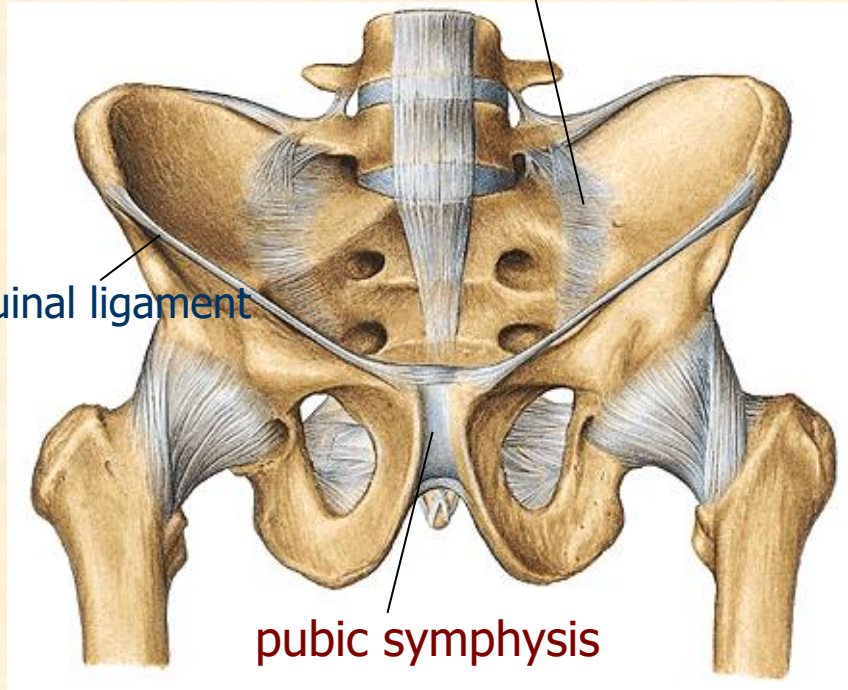


# PELVIC GIRDLE JUNCTIONS

sacroiliac joint

inguinal ligament

pubic symphysis



# LOWER LIMB JUNCTIONS

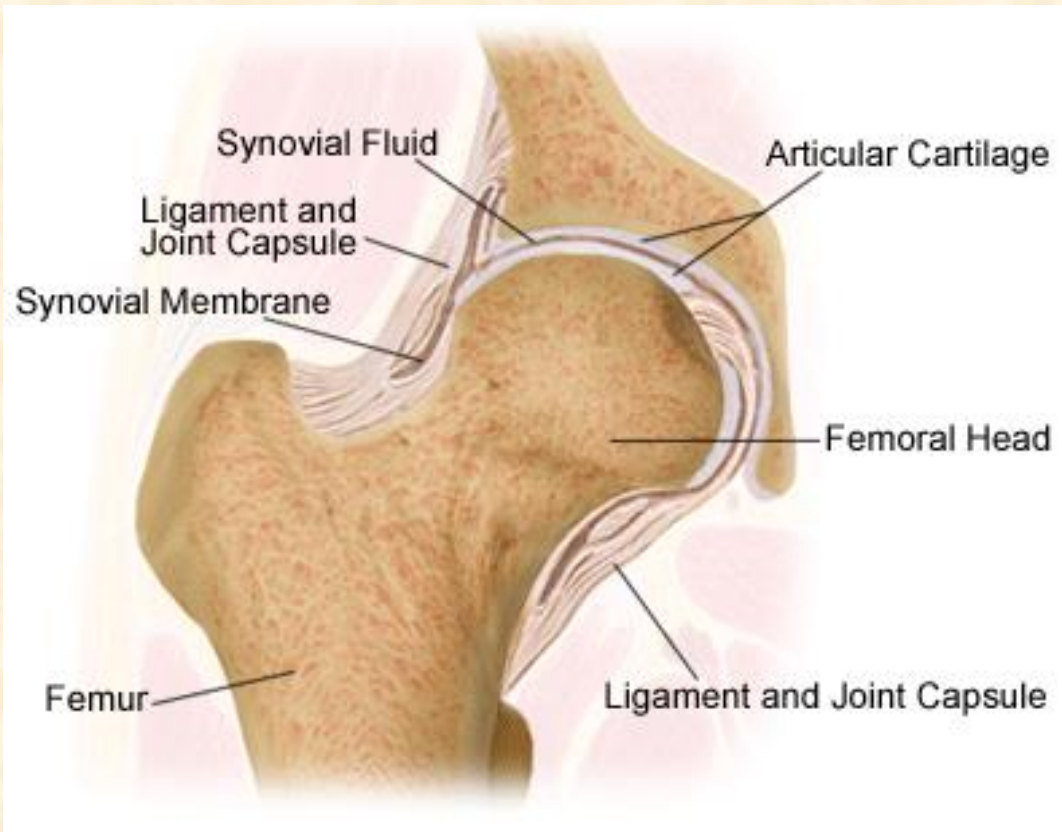
1) HIP JOINT

2) KNEE JOINT

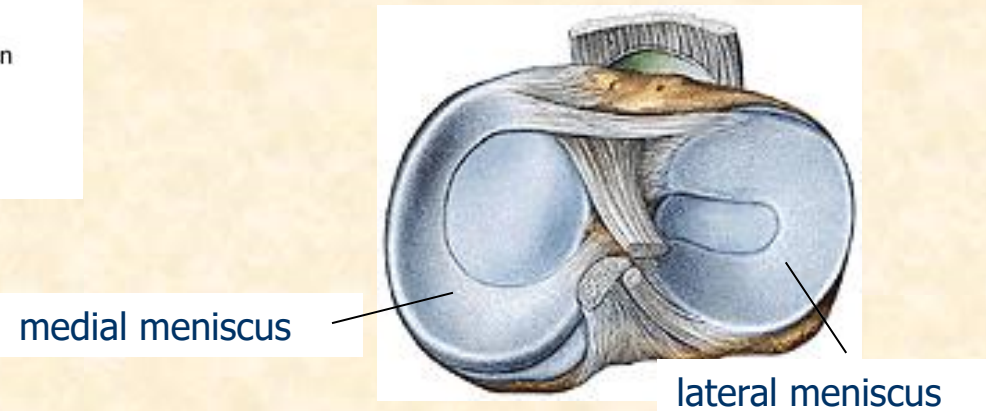
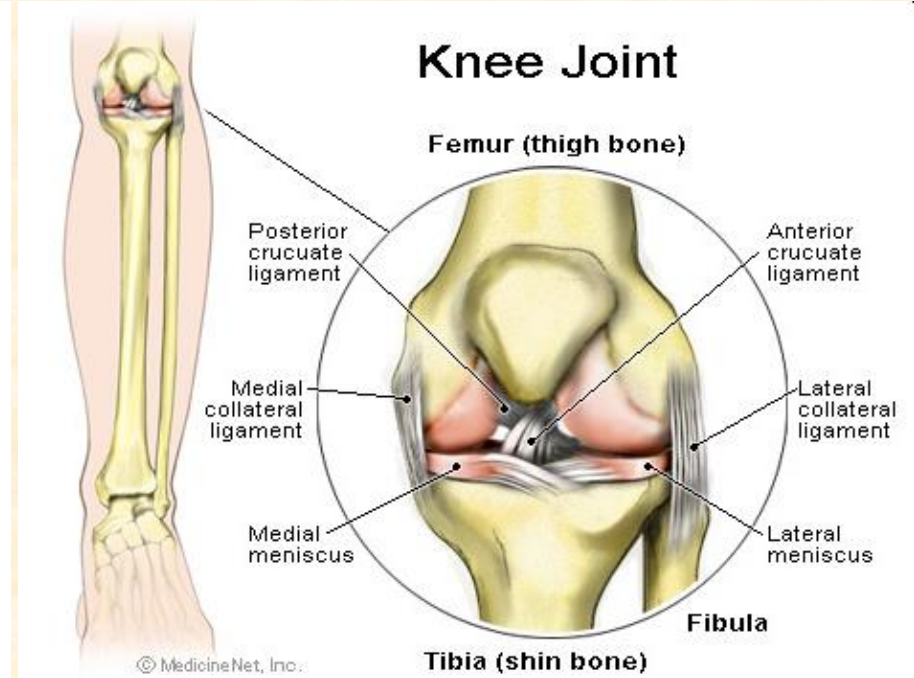
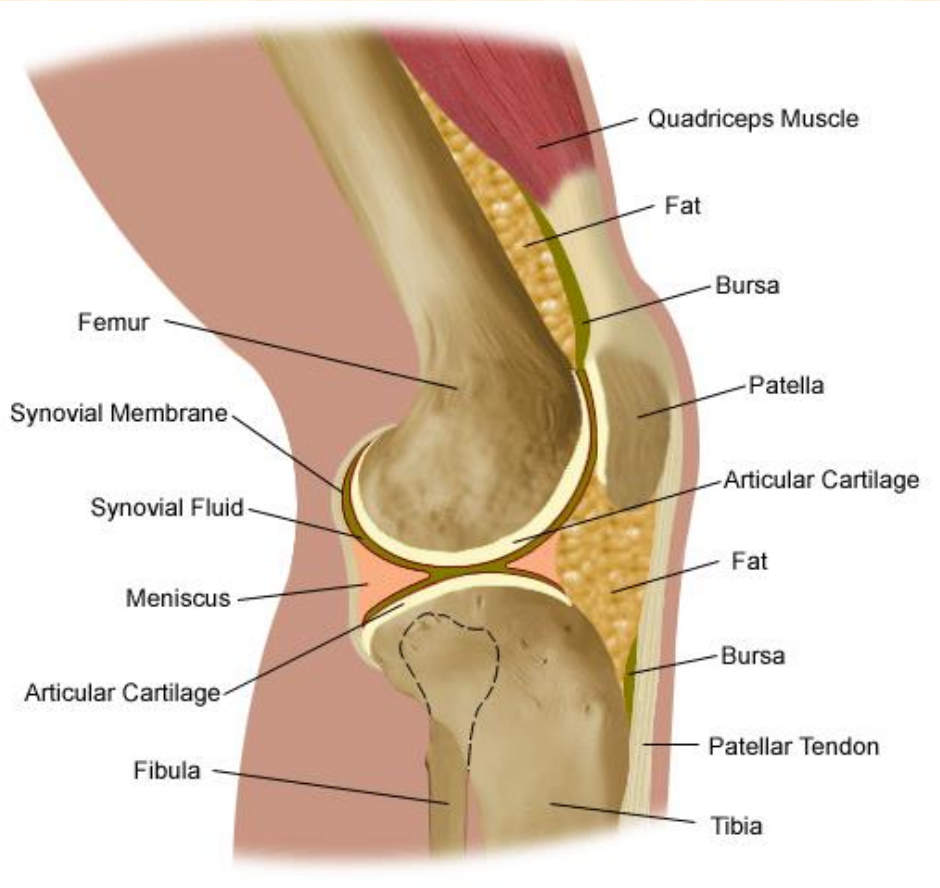
3) LOWER LEG (CRURAL) JUNCTIONS

4) FOOT JOINTS

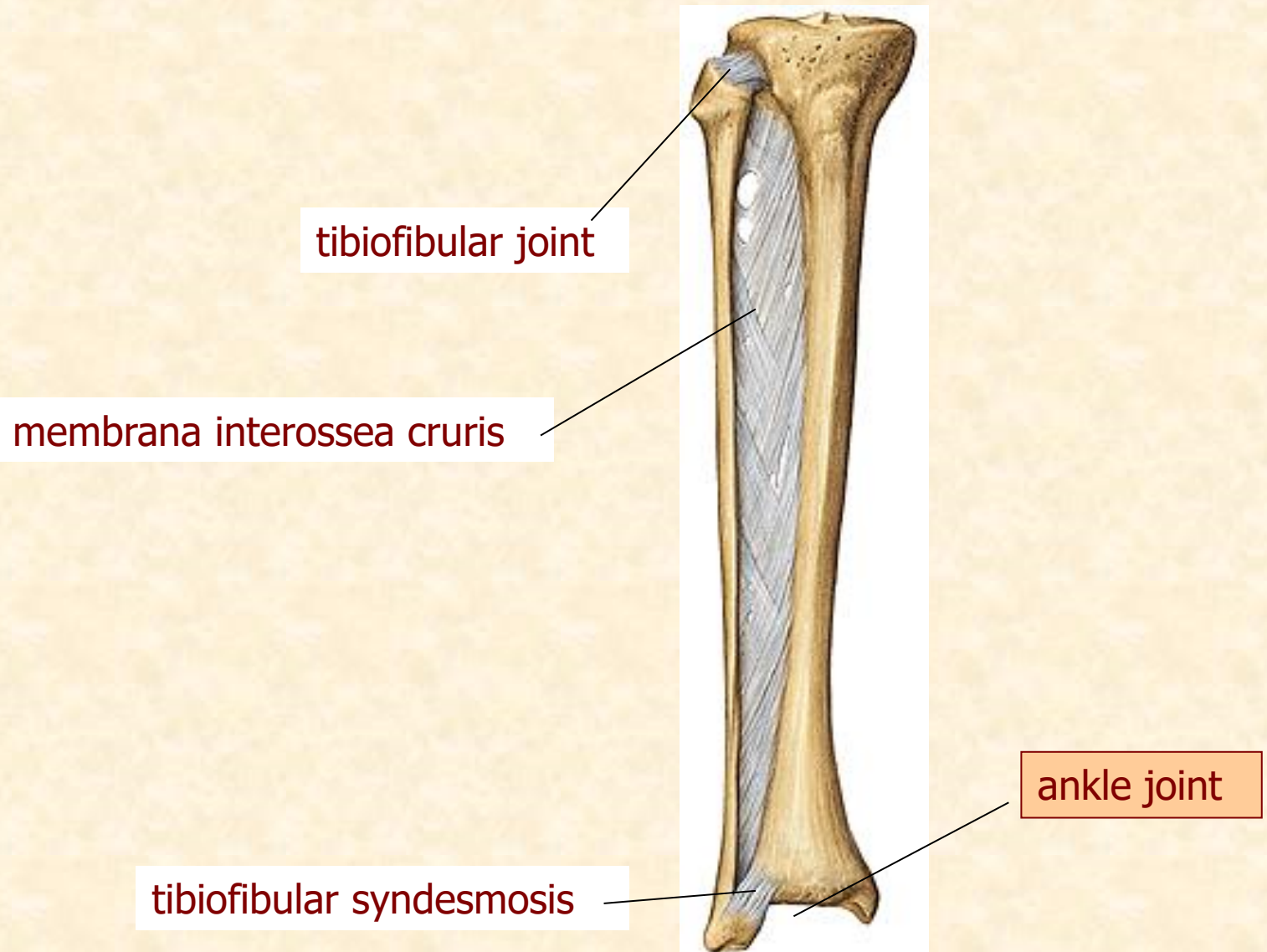
# HIP JOINT right side



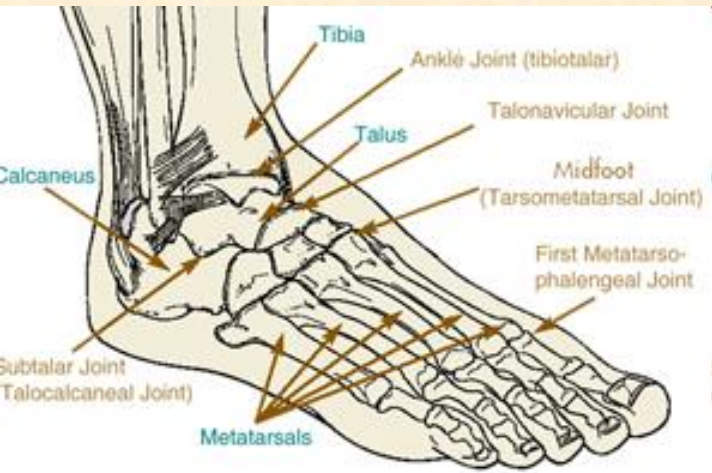
# KNEE JOINT



# LOWER LEG (CRURAL) JUNCTIONS



# FOOT JOINTS



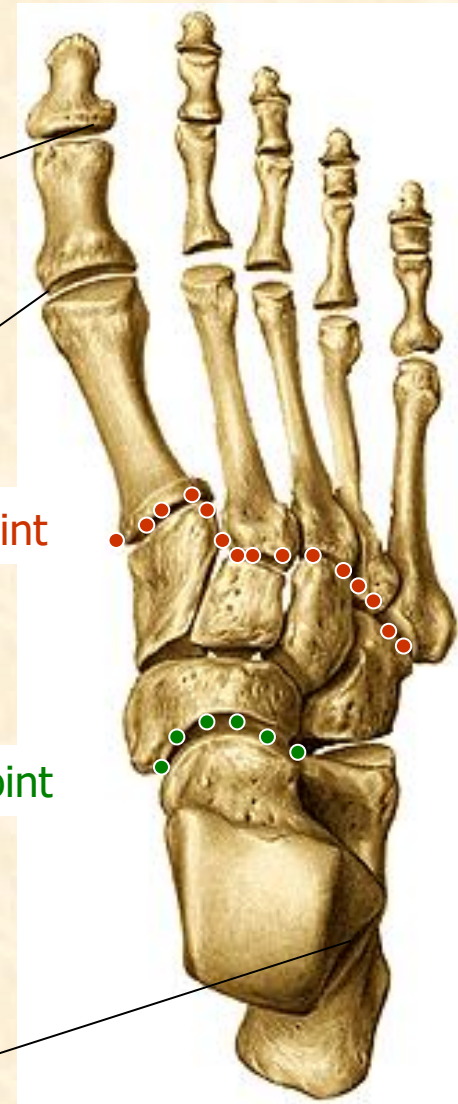
interphalangeal joint

metatarsophalangeal joint

tarsometatarsal joint

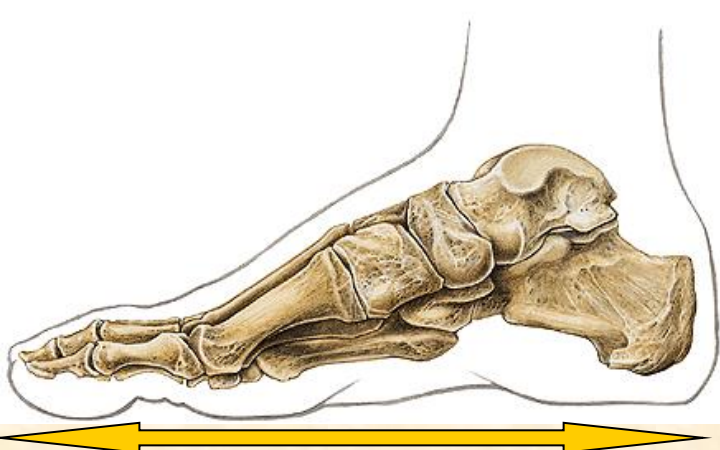
talonavicular joint

subtalar (talocalcaneal) joint

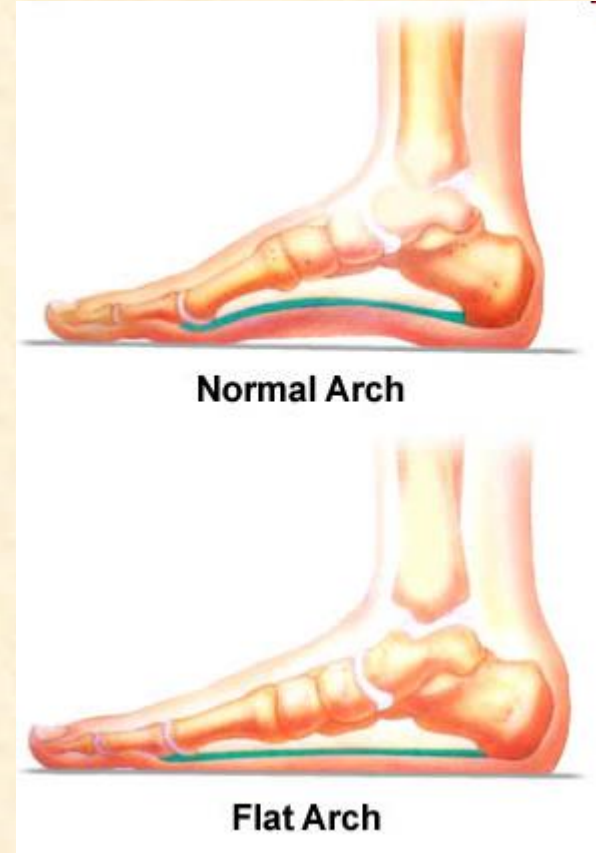
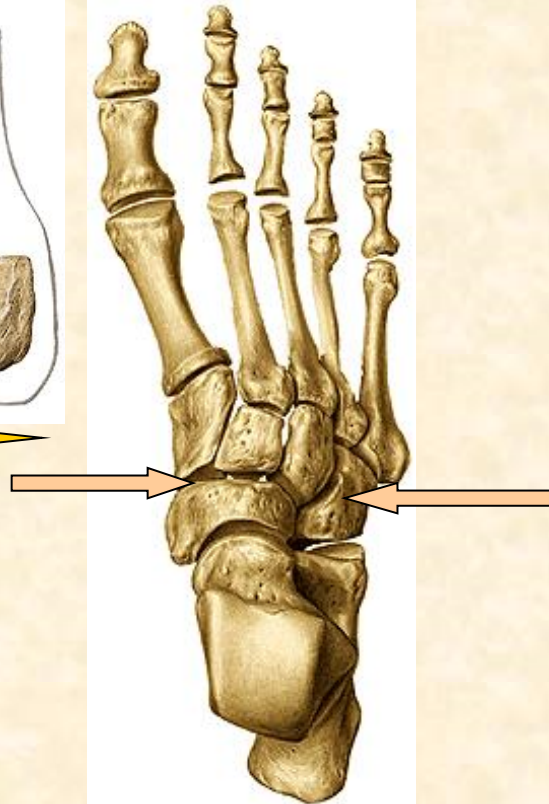


# ARCH OF THE FOOT

**LONGITUDINAL**



**TRANSVERSE**



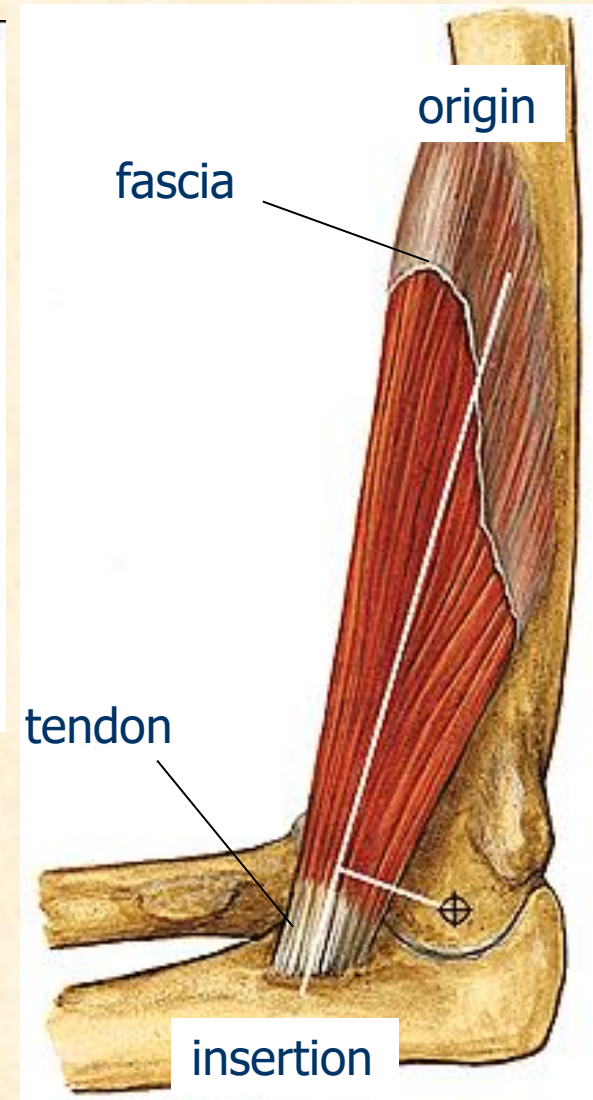
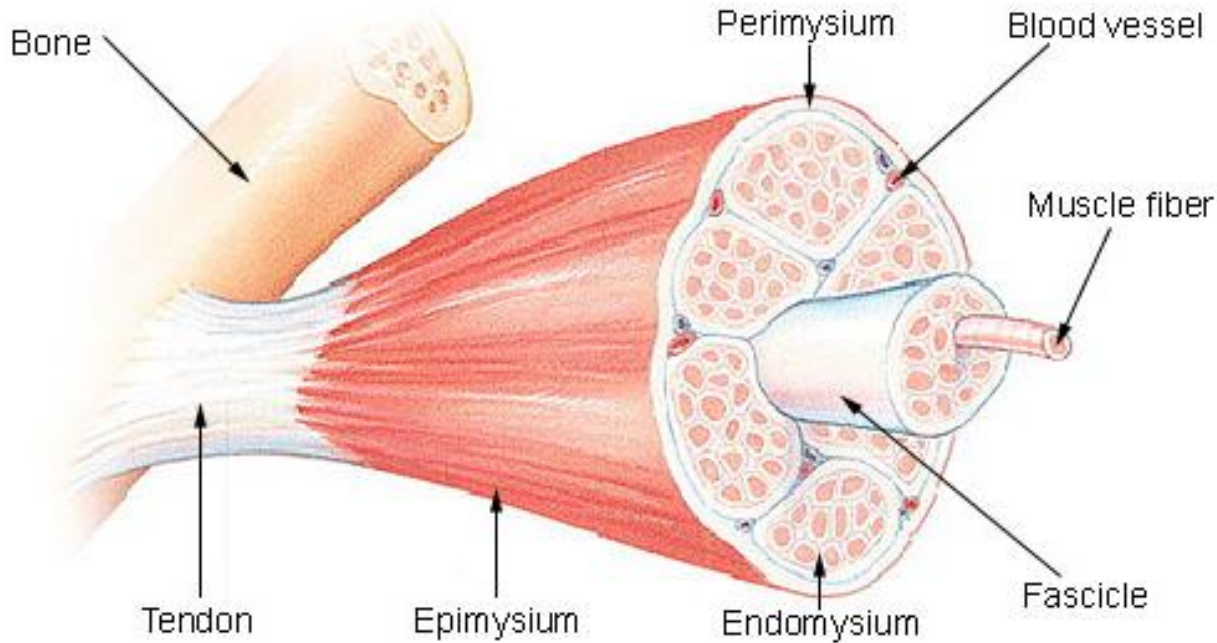


# MYOLOGY

- mys, myos = muscle /gr./
- muscular system = active part of locomotory system
- consists of about 600 skeletal muscles (musculi)
- 32–36 % of body weight in adult
- each muscle composed of muscle fibres

# SKELETAL MUSCLE

## Structure of a Skeletal Muscle



# OTHER STRUCTURES IN MUSCLES

## 1) FASCIAE

- fibrous tissue covering a muscle, providing its shape and position

## 2) TENDON SHEATHS

- layer of connective tissue round tendon, permitting the tendon to move in mechanically stressed places and reduce the friction
- filled with synovial fluid
- fibrous tendon sheath
- synovial sheath

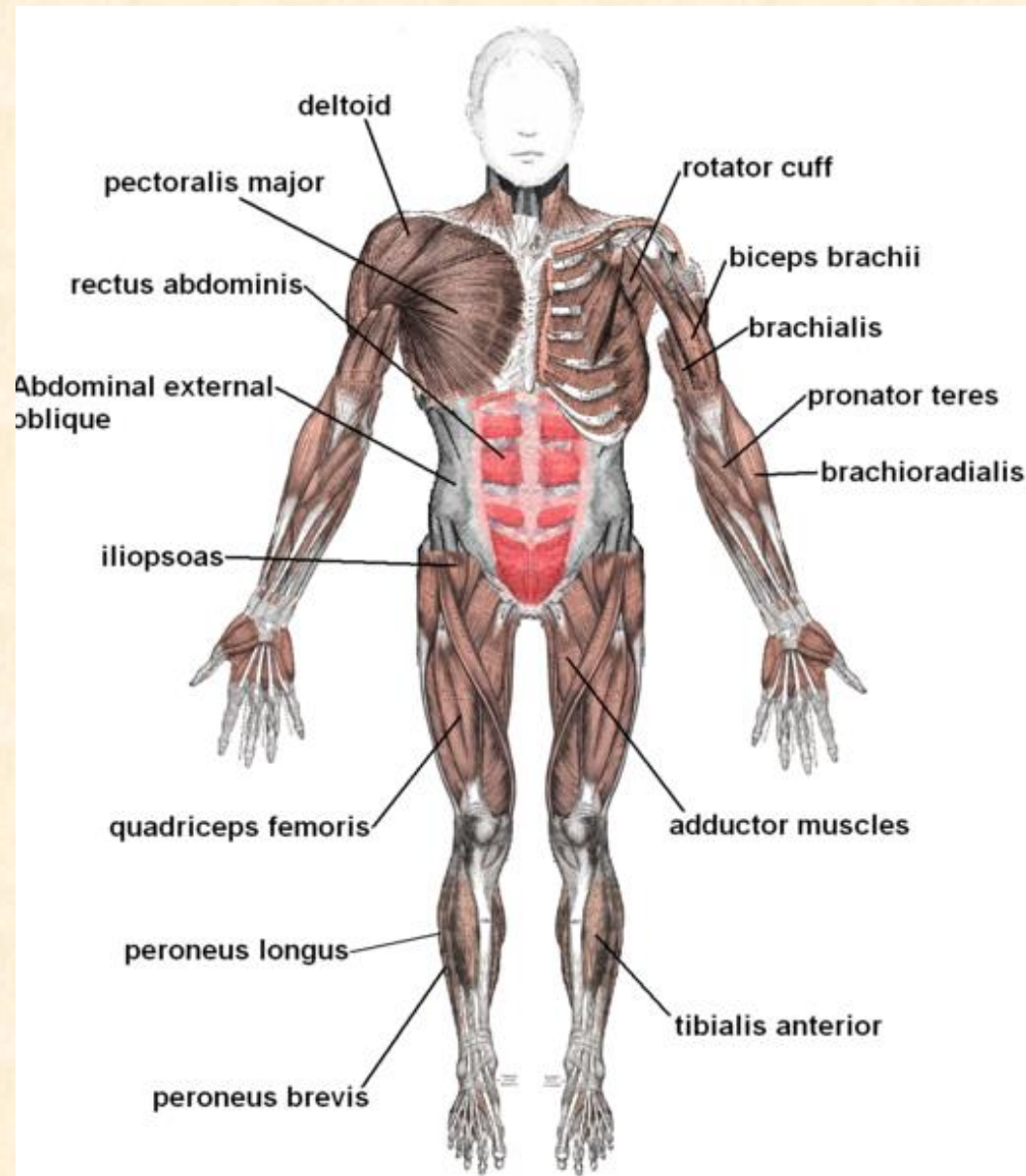
## 3) SYNOVIAL BURSAE

- sacs containing fluid, part of the normal structure of a joint (knee, elbow), where it protects against frequent pressure and rubbing

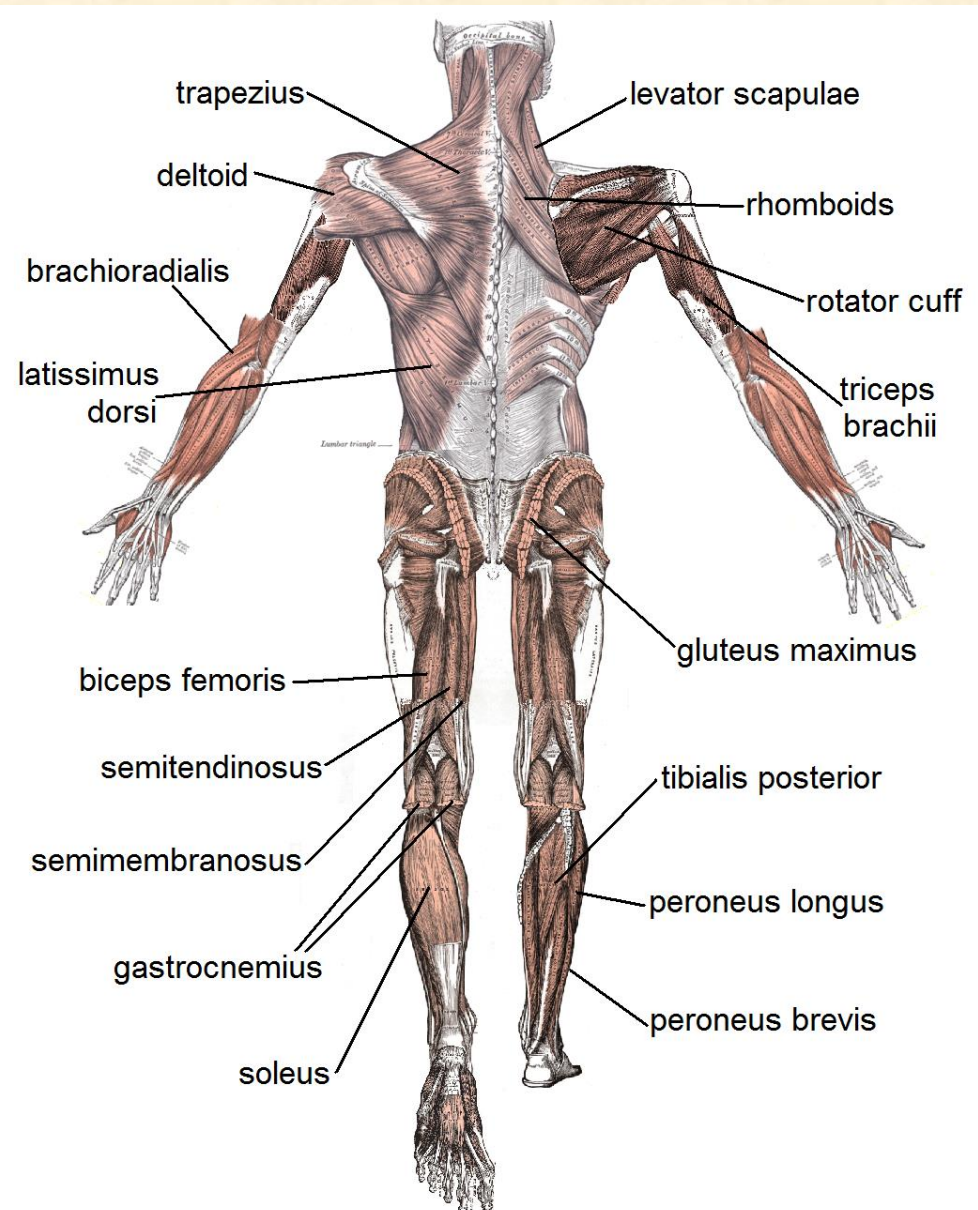
# MUSCLE FUNCTIONS

- **SYNERGIST** – muscles that act together and increase the effectiveness of both
- **ANTAGONIST** – opposes another muscle in a movement
- **FLEXOR** (makes a joint bend)  
**EXTENSOR** (makes a joint become straight)
- **ADDUCTOR** (pulls a part of the body towards the midline of the body)
- **ABDUCTOR** (pulls a part of the body away from the midline of the body or from a neighbouring part)
- **SPHINCTER** (ring of muscle at the opening of a passage in the body, which can contract to close the passage)
- **DILATOR** (ring of muscle that extend to open the )
- **LEVATOR** (lifts a limb or a part of the body)  
**DEPRESSOR** (pulls part of a body downwards)

# MUSCULAR SYSTEM, anterior view

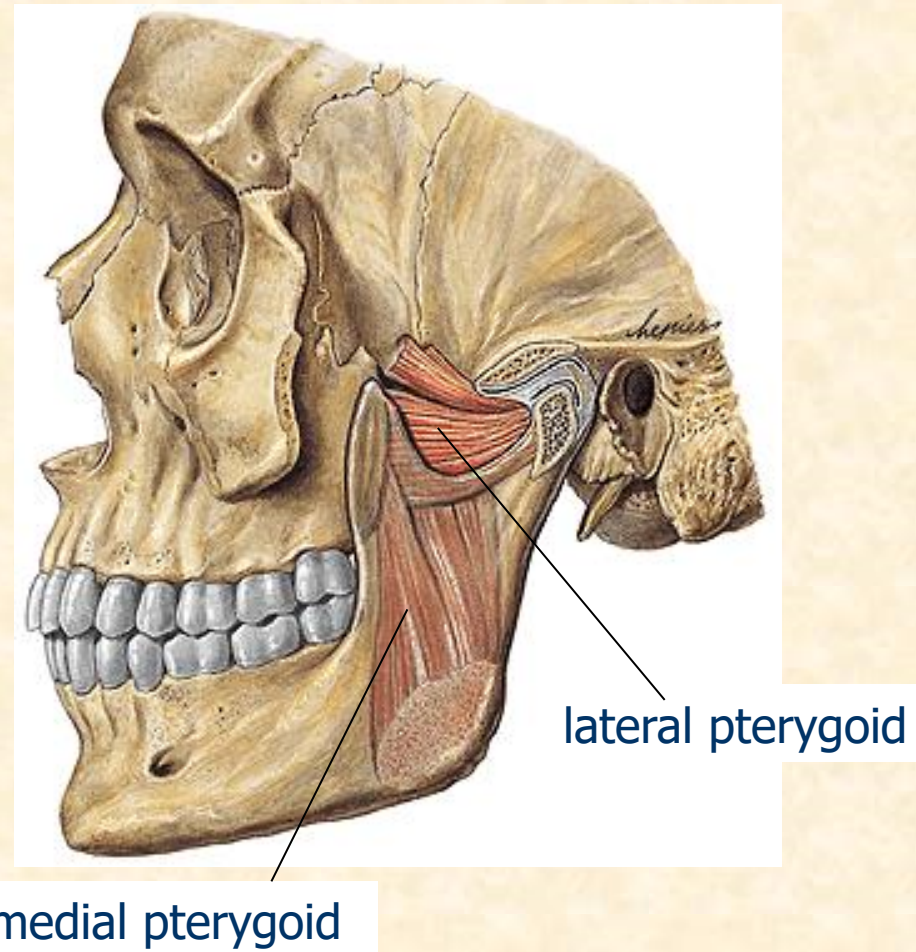
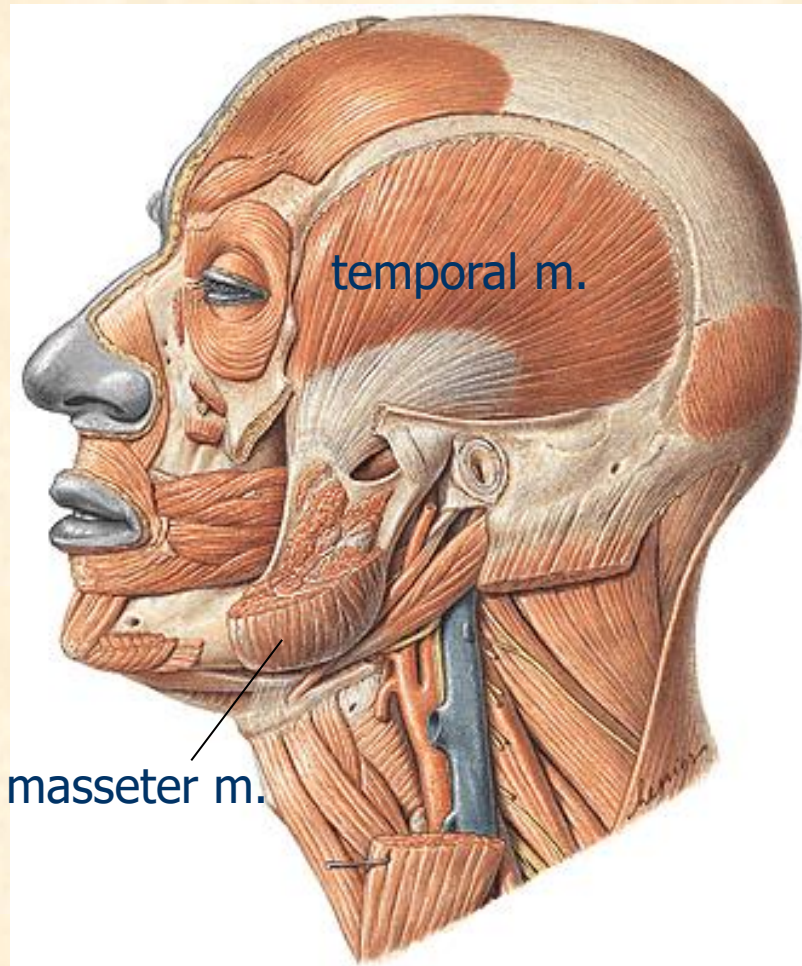


# MUSCULAR SYSTEM, posterior view



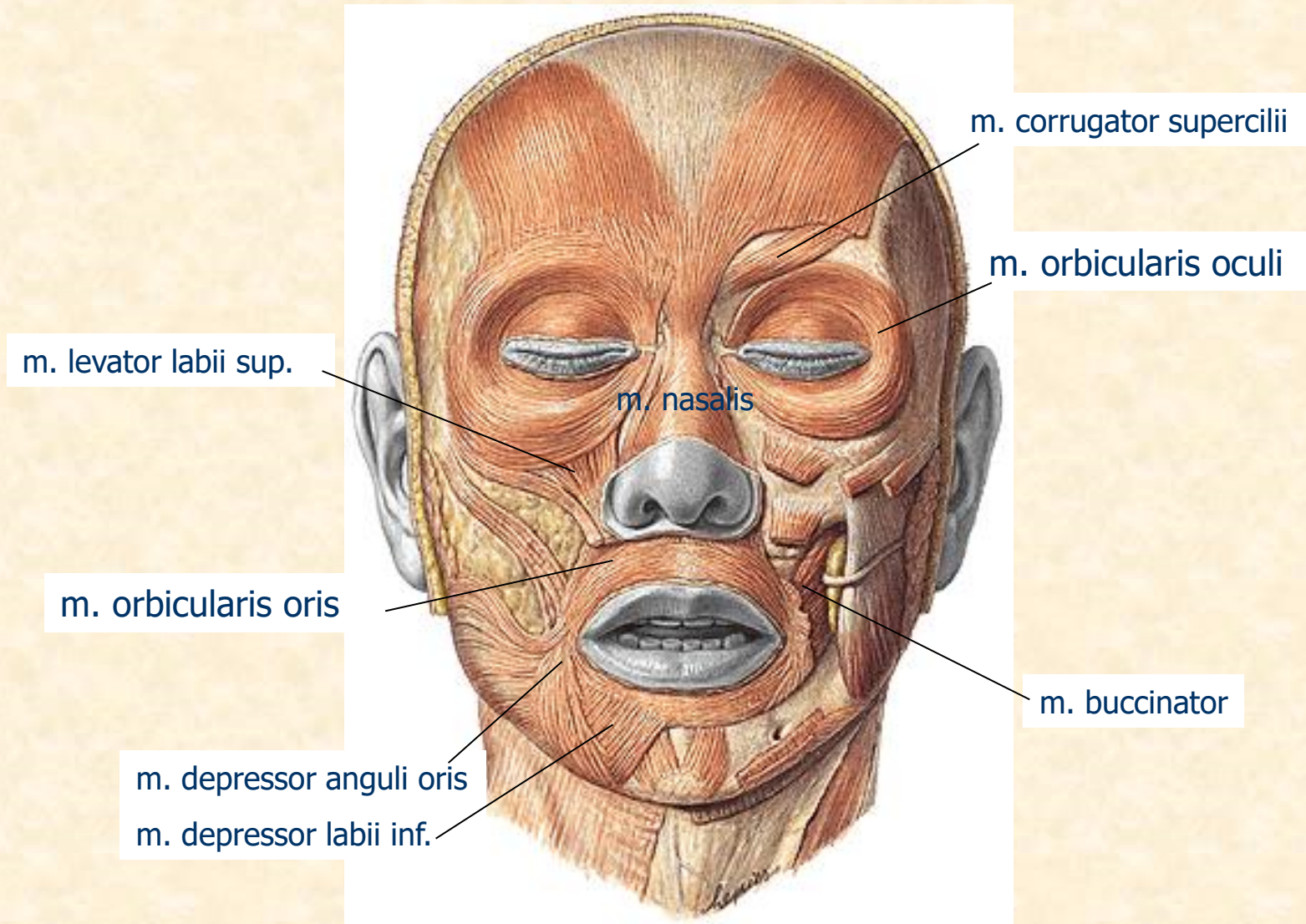
# HEAD MUSCLES

## MASTICATORY MUSCLES



# HEAD MUSCLES

## FACIAL MUSCLES





# FACIAL MUSCLES – Face Expressions



Occipitofrontalis



Corrugator supercilii



Procerus + transverse part of nasalis



Orbicularis oculi



Lev. labii sup. alaeque nasi + alar part of nasalis



Buccinator + orbicularis oris



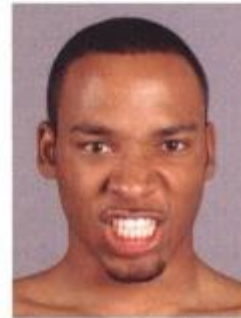
Zygomaticus major + minor



Risorius



Risorius + depressor labii inferioris



Levator labii superioris + depressor labii



Dilators of mouth: tensor plus levator labii superioris + depressor labii inferioris



Orbicularis oris



Depressor anguli oris

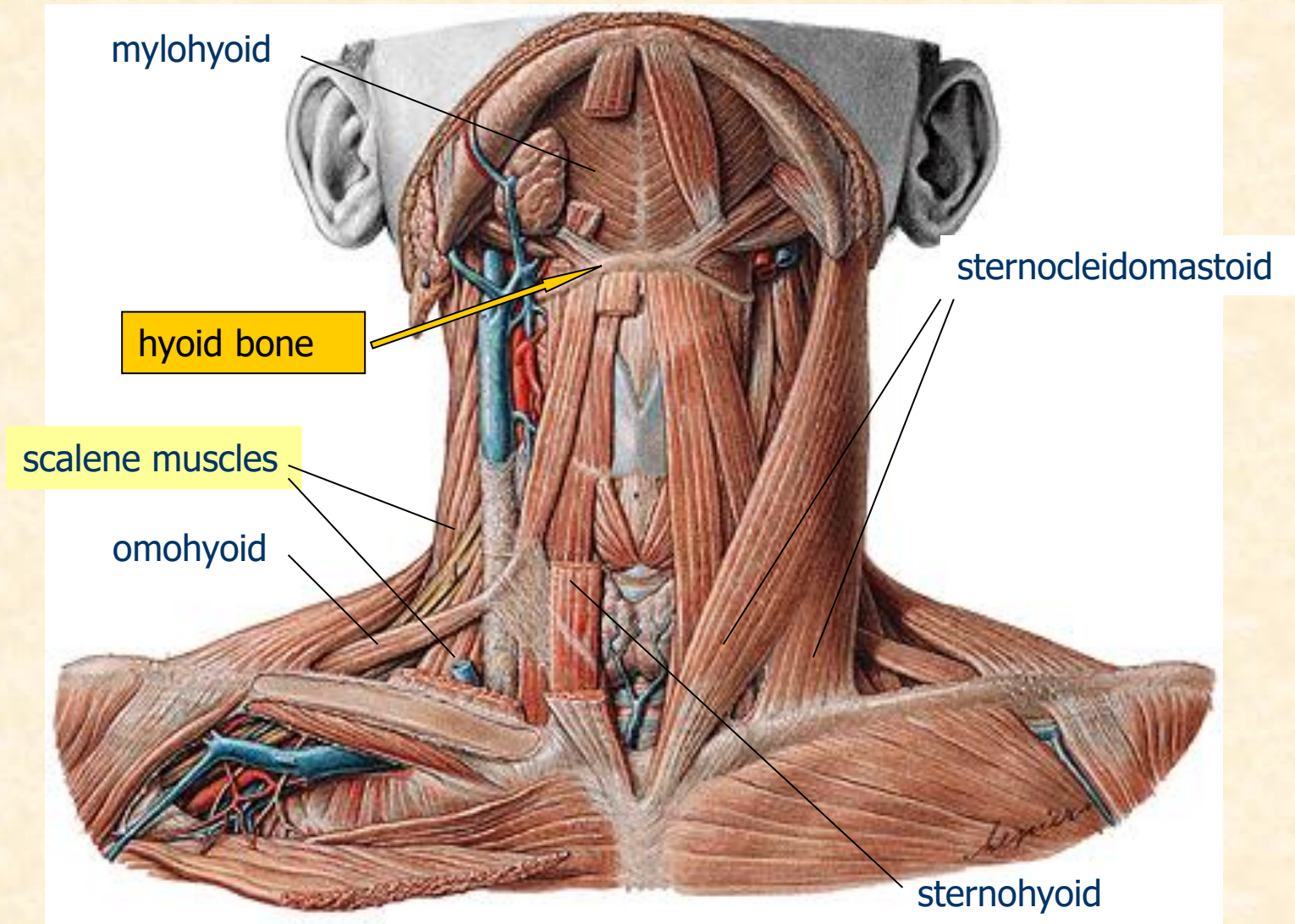


Mentalis



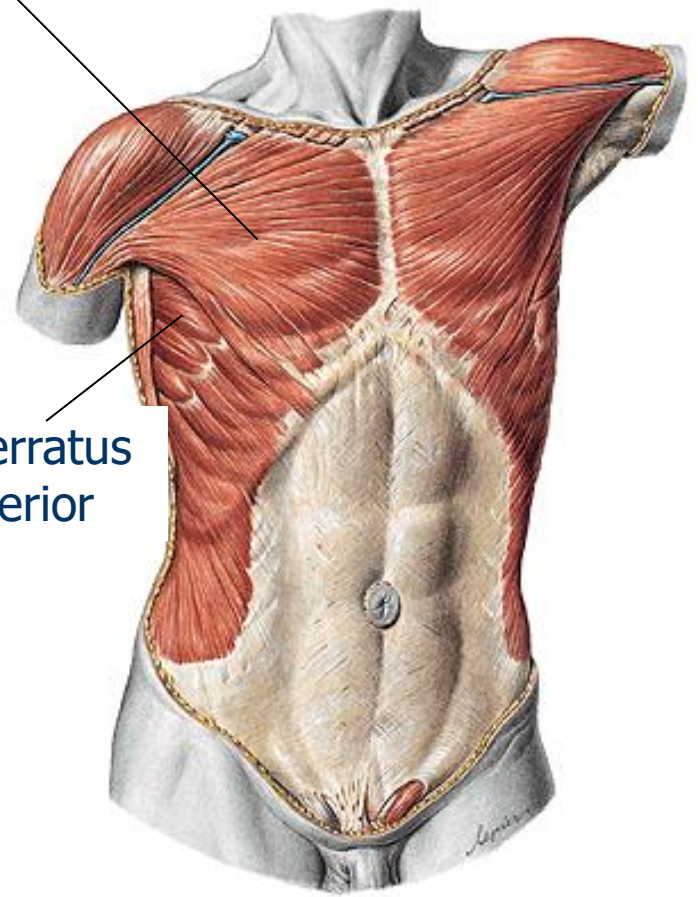
Platysma

# NECK MUSCLES



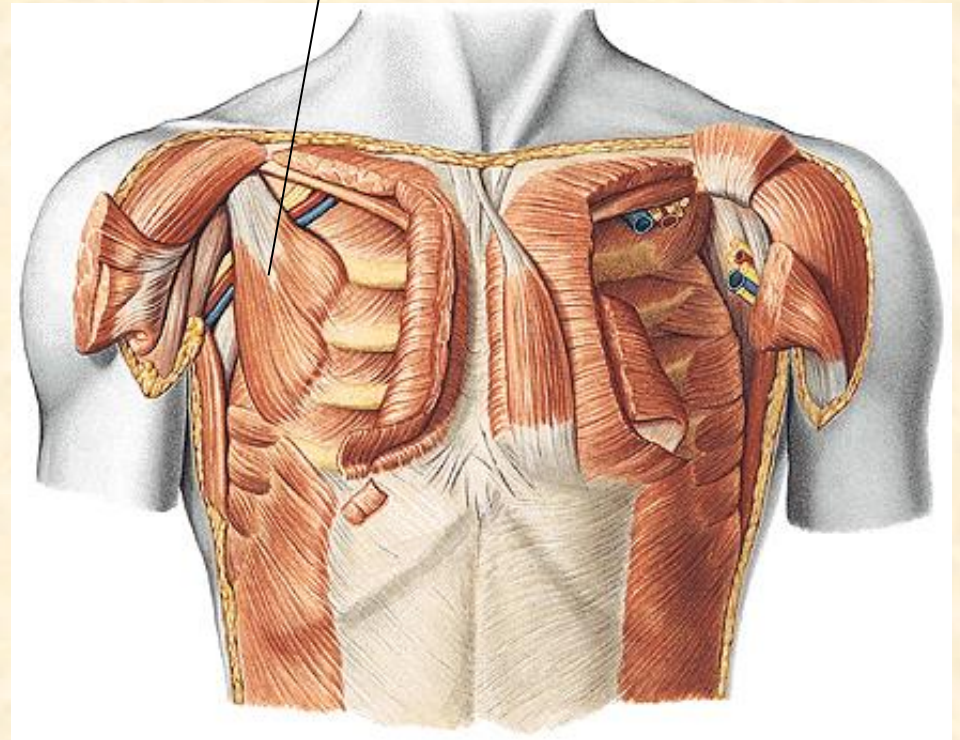
# THORAX MUSCLES

m. pectoralis major

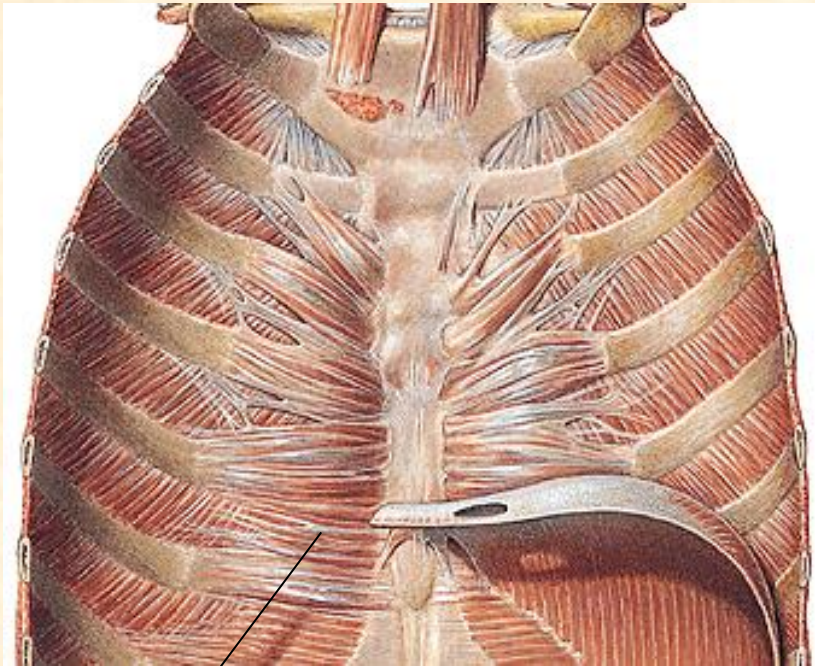


m. serratus anterior

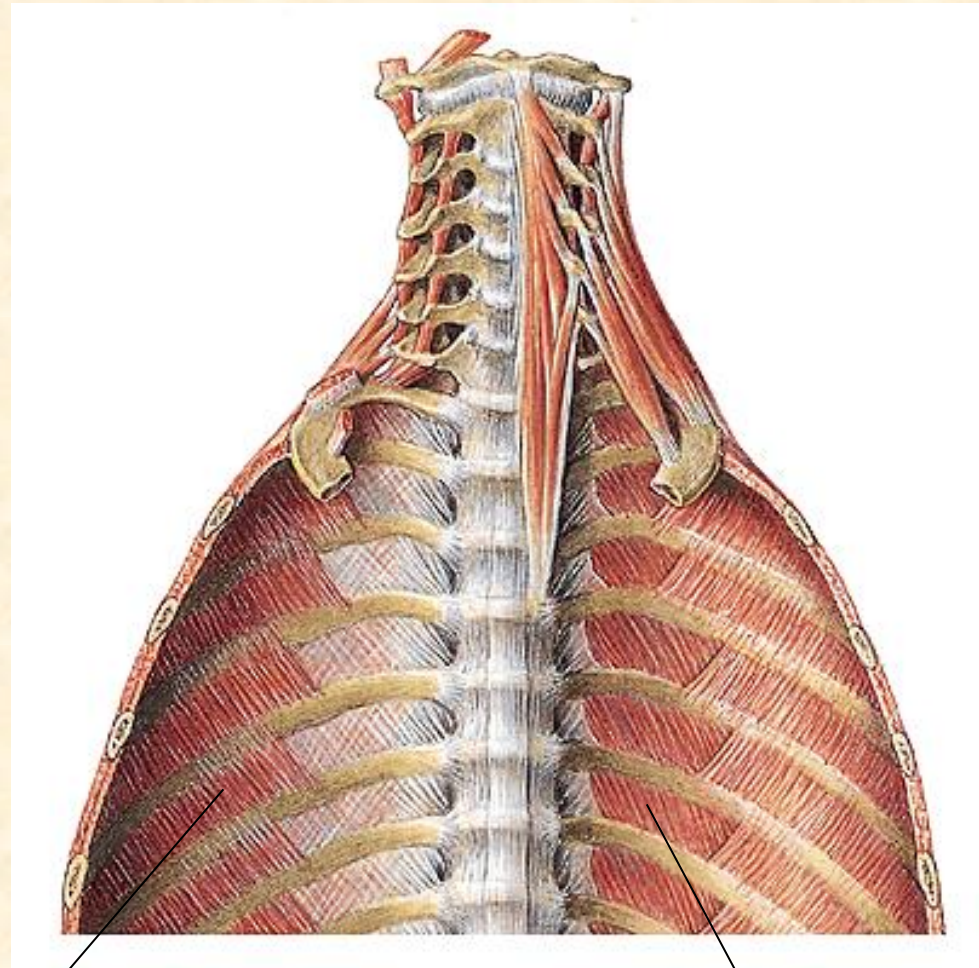
m. pectoralis minor



# THORAX MUSCLES



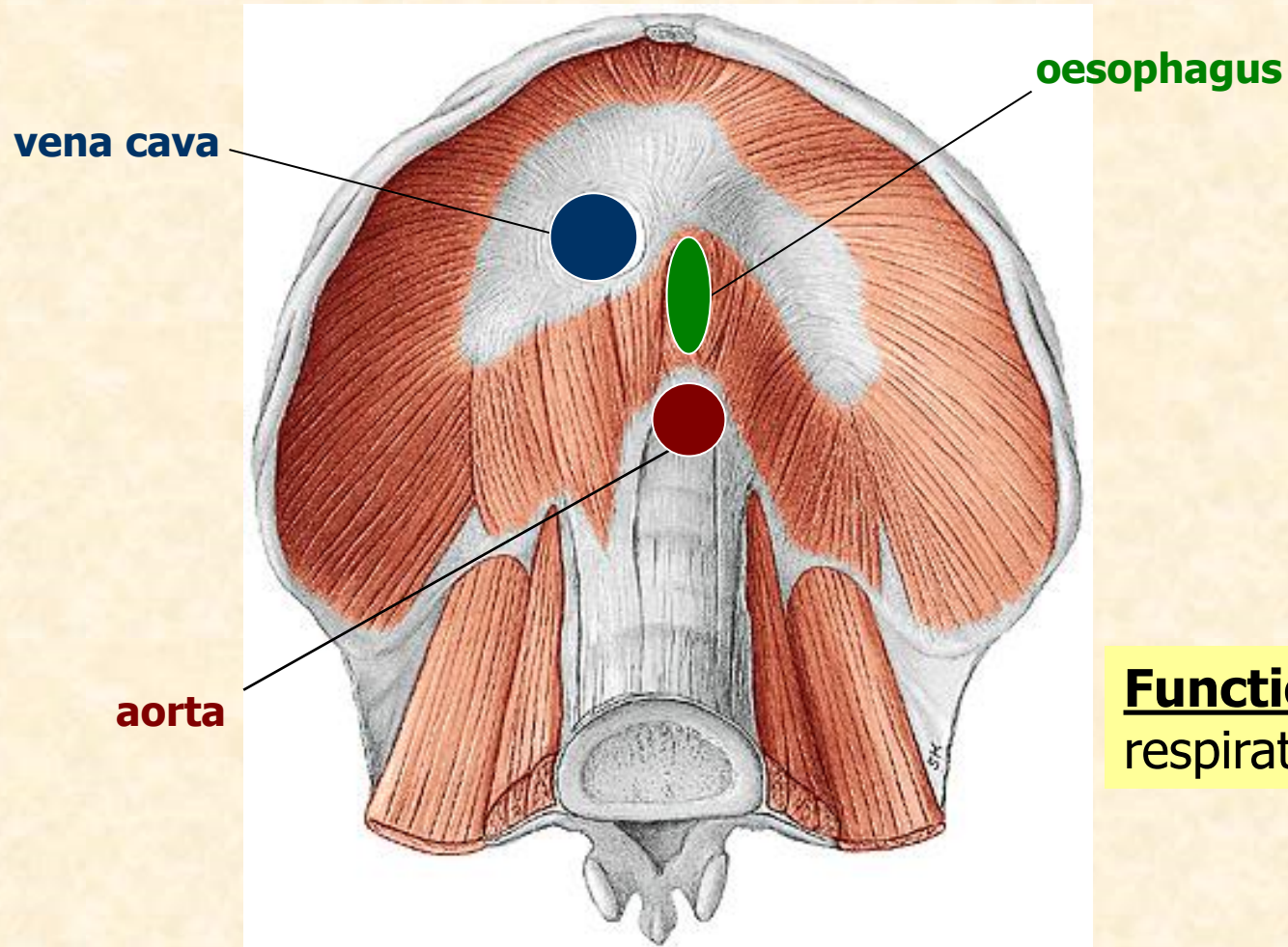
m. transversus thoracis



mm. intercostales interni

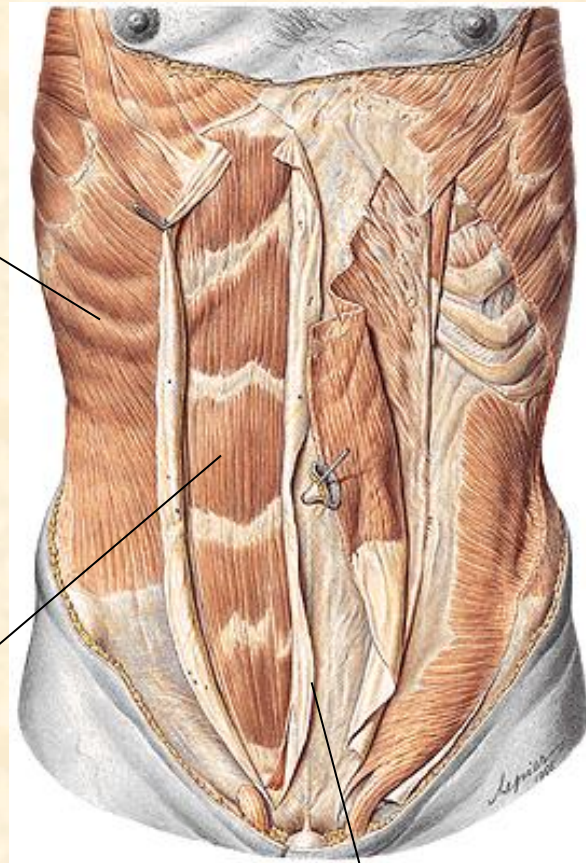
mm. intercostales externi

# DIAPHRAGM



**Function:** main respiratory muscle

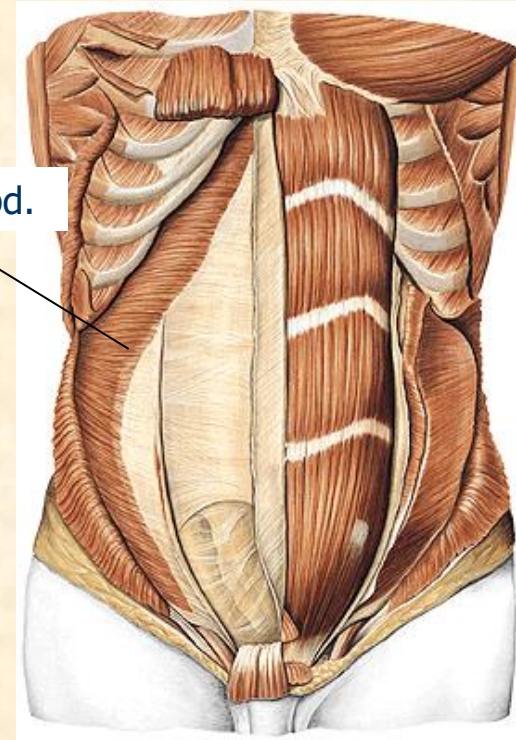
# ABDOMINAL MUSCLES



m. obliquus externus  
et internus abdominis

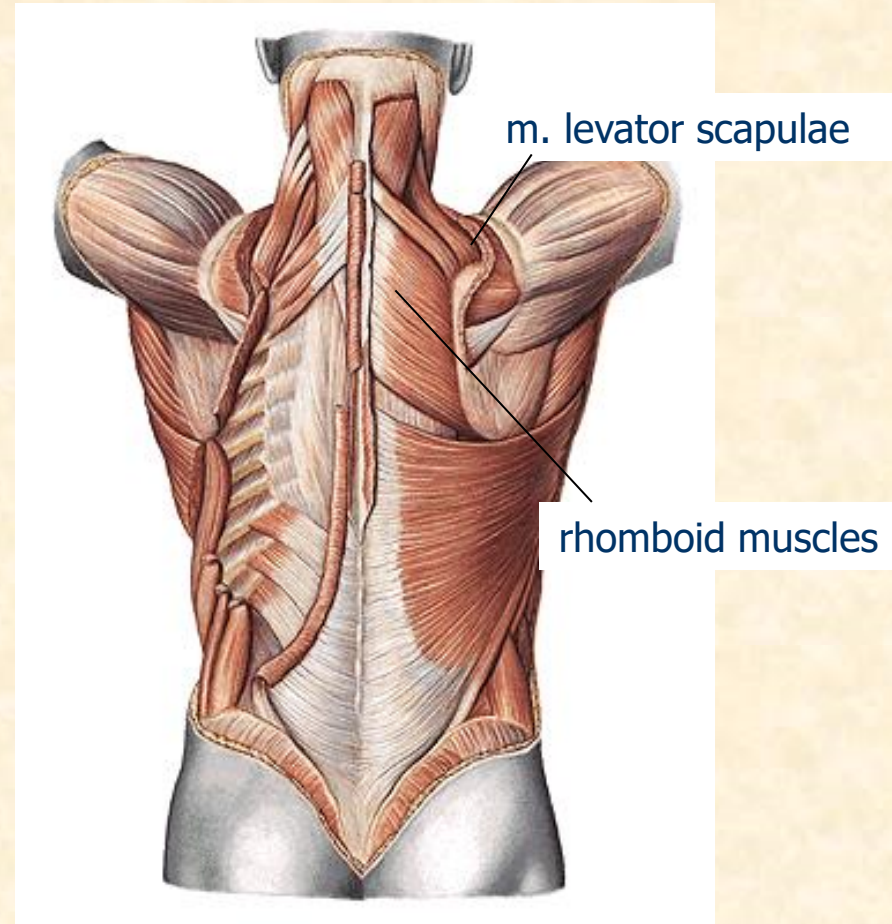
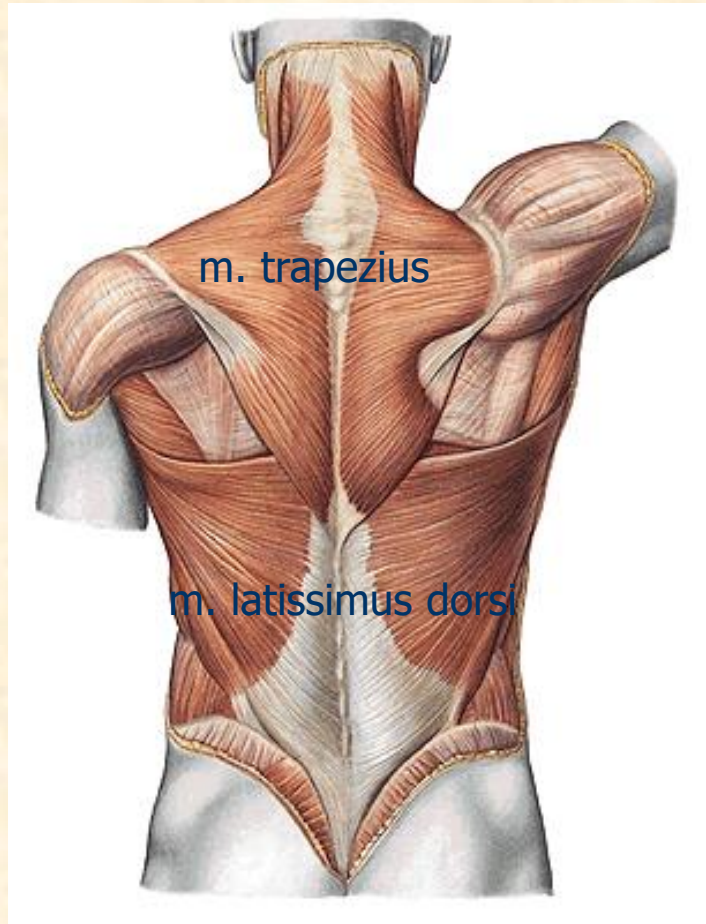
m. rectus abdominis

linea alba

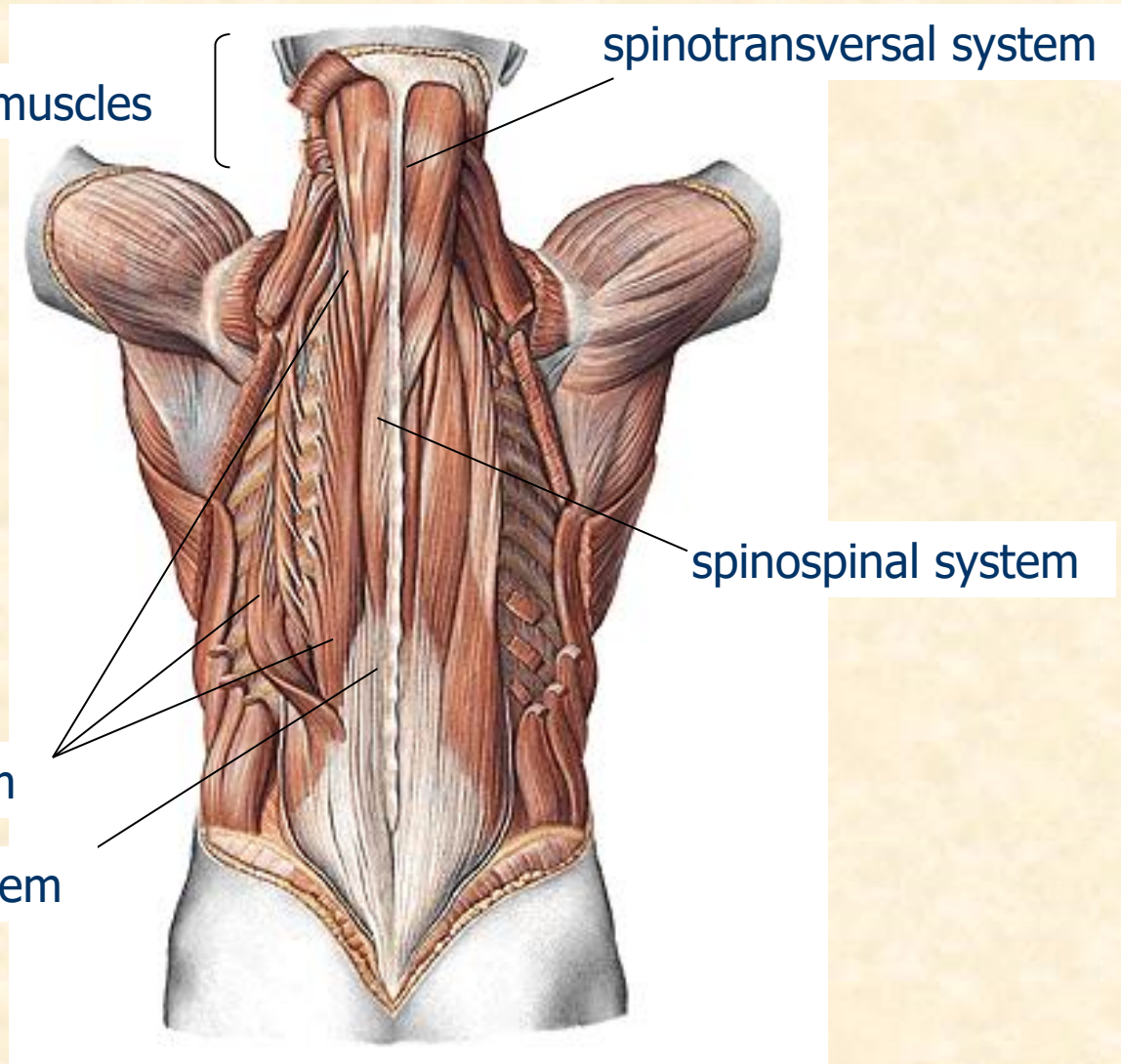


m. transversus abd.

# BACK MUSCLES



# BACK MUSCLES



deep neck muscles

spinotransversal system

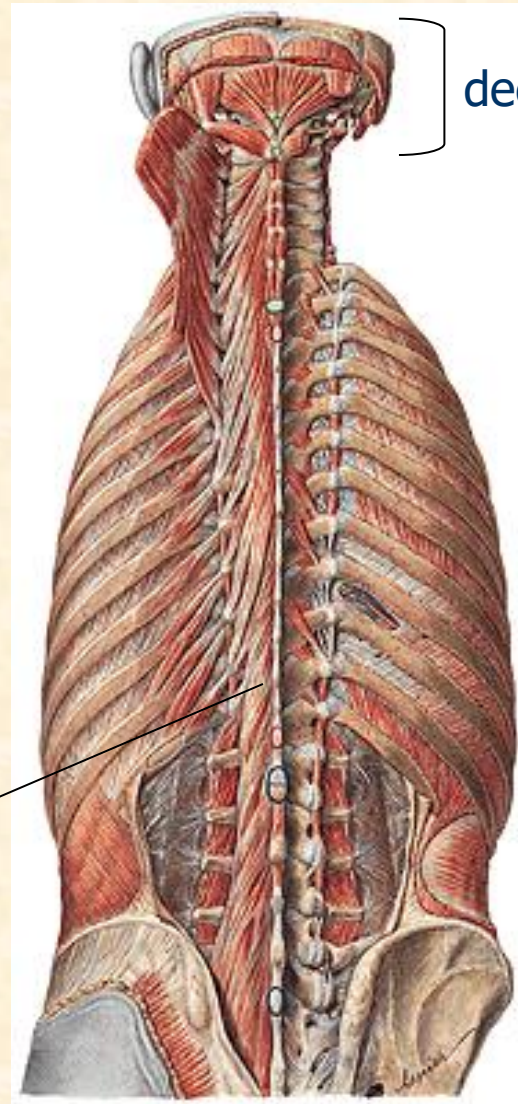
spinospinal system

sacrospinal system

transversospinal system



# BACK MUSCLES



deep neck muscles

transversospinal system

# UPPER LIMB MUSCLES

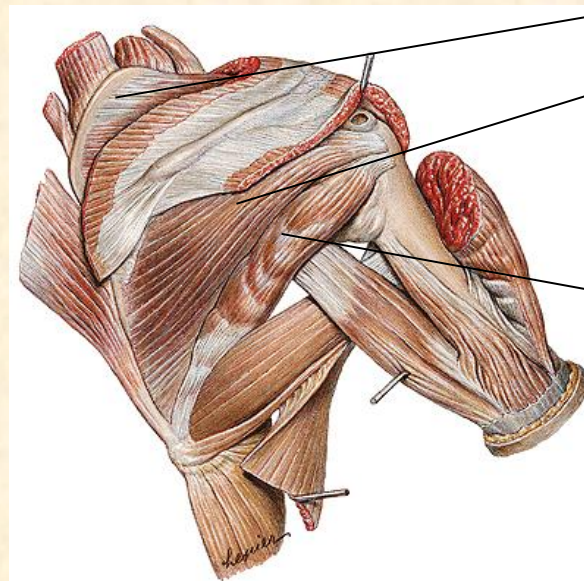
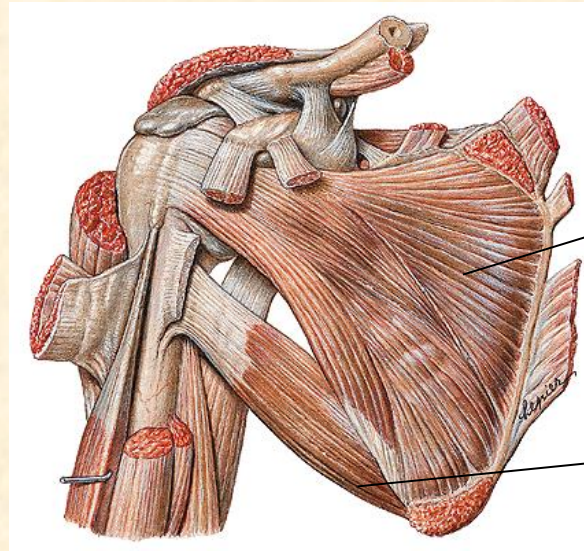
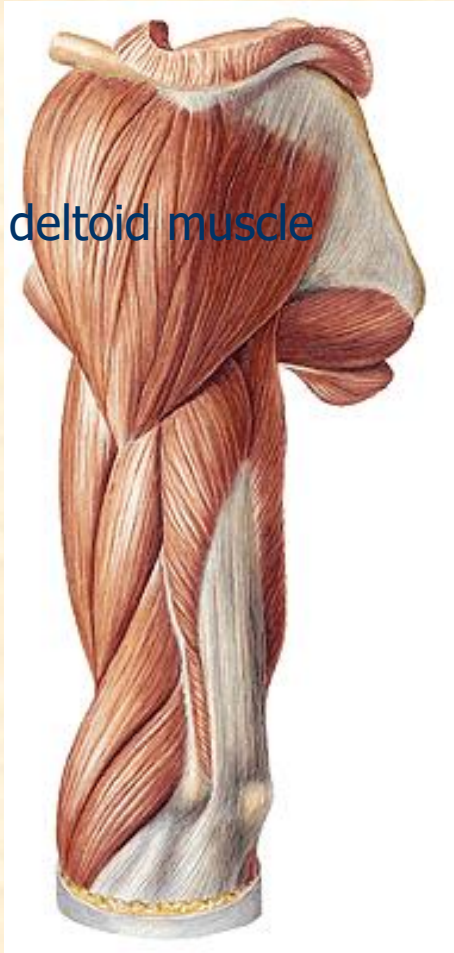
1) SHOULDER MUSCLES

2) ARM MUSCLES

3) FOREARM MUSCLES

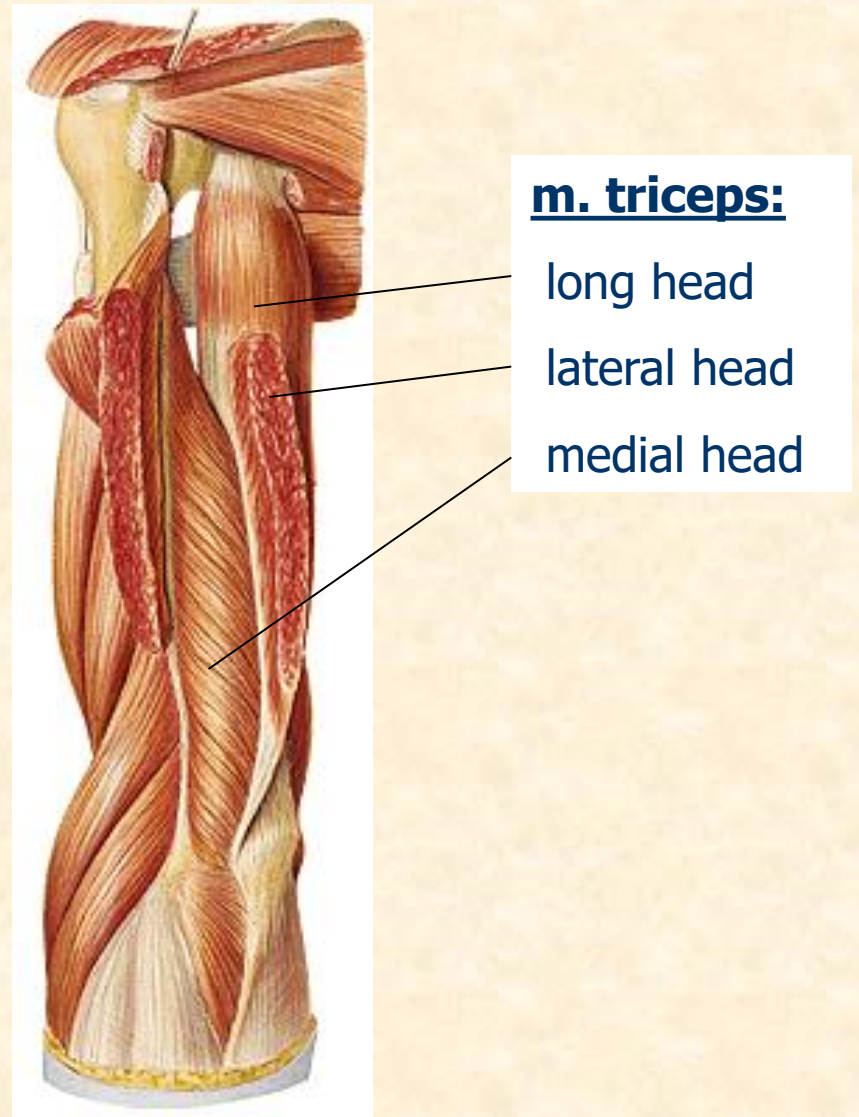
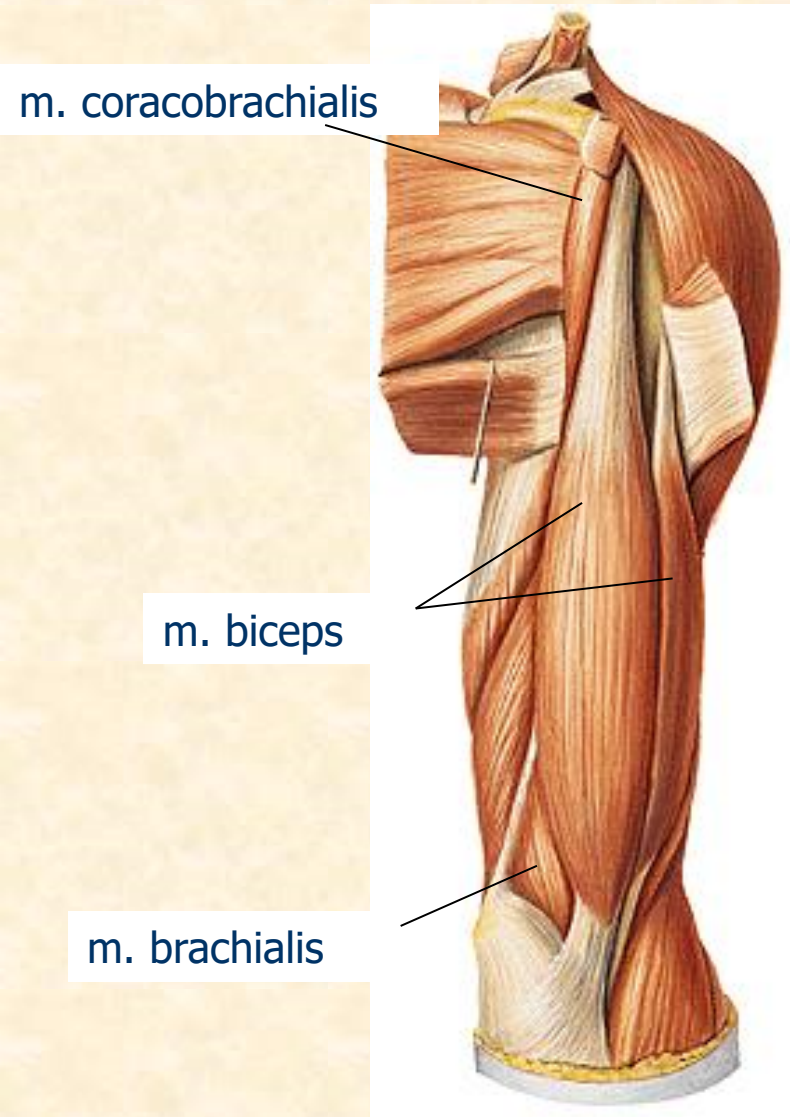
4) HAND MUSCLES

# SHOULDER MUSCLES

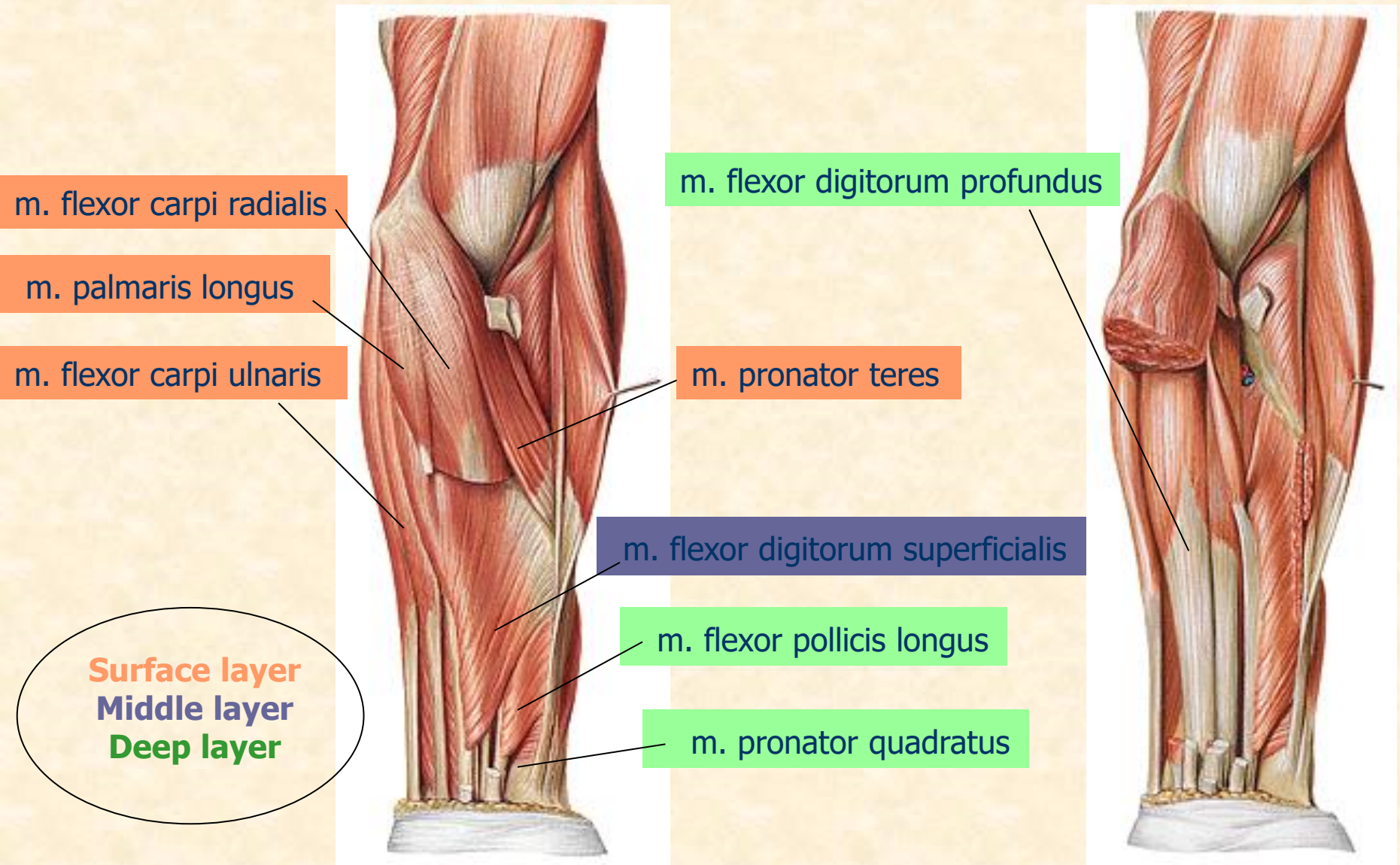


# ARM MUSCLES

## anterior and dorsal group



# FOREARM MUSCLES – ANTERIOR GROUP



# FOREARM MUSCLES – LATERAL GROUP

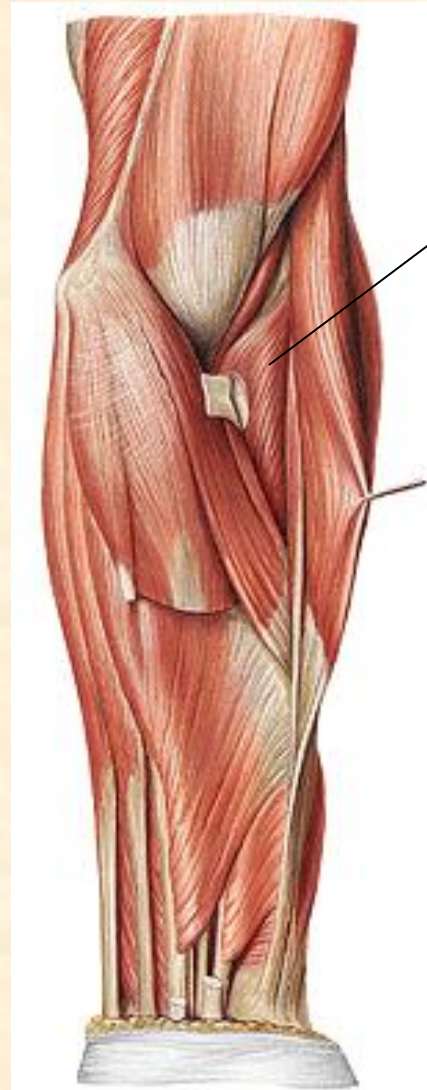
m. brachioradialis

m. extensor carpi radialis longus

m. extensor carpi radialis brevis

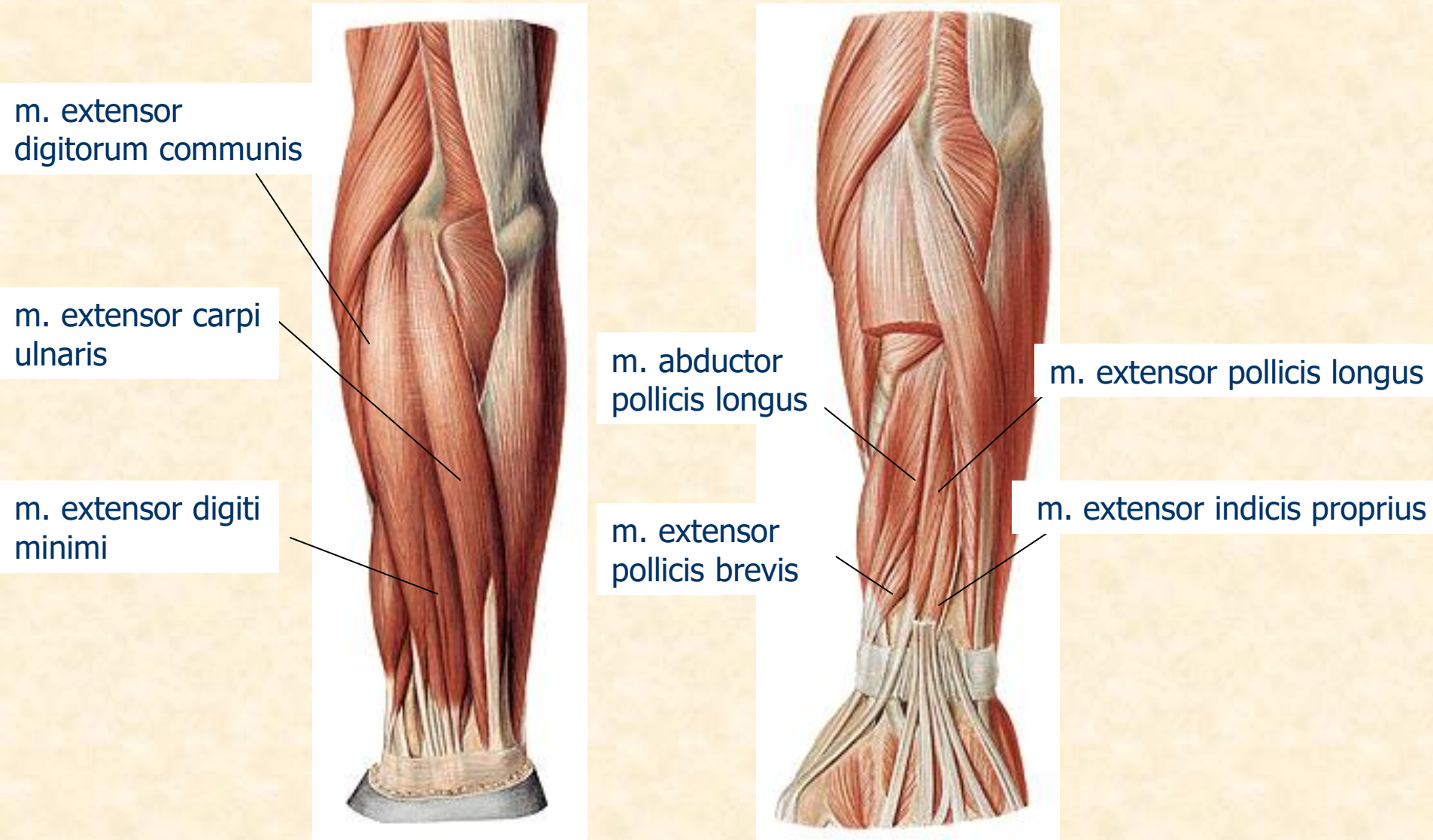


m. supinator



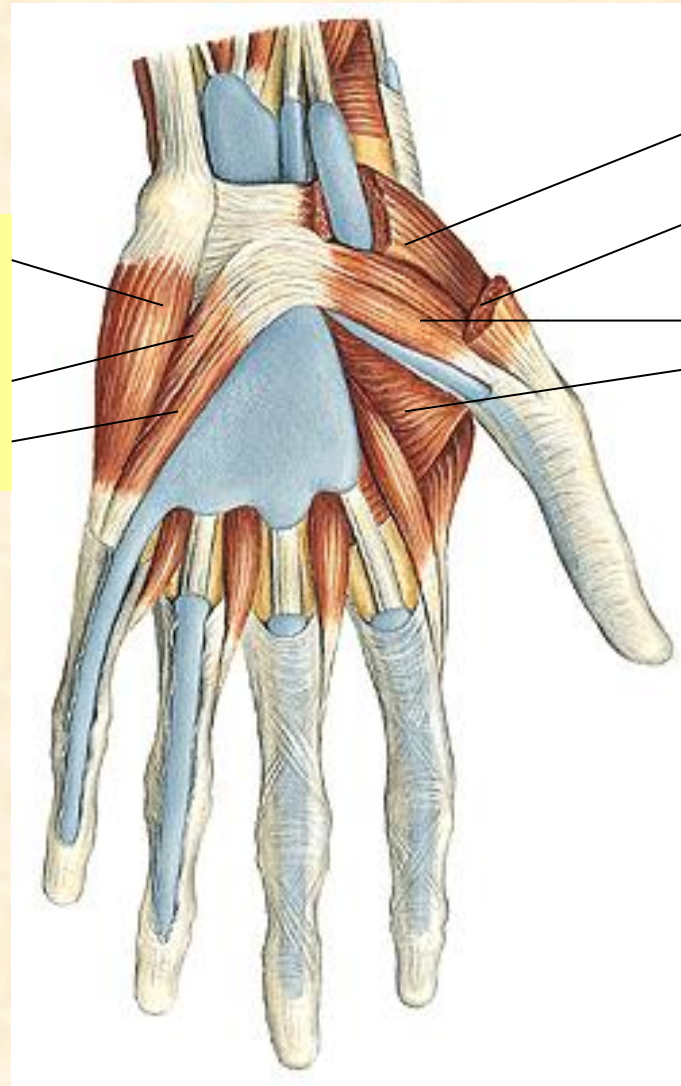
# FOREARM MUSCLES

## DORSAL GROUP – superficial and deep layer



# HAND MUSCLES

group of **HYPOTHENAR** and **THENAR**



m. abductor digiti minimi  
m. flexor digiti minimi  
brevis  
m. opponens digiti minimi

m. opponens pollicis  
m. abductor pollicis brevis  
m. flexor pollicis brevis  
m. adductor pollicis



# LOWER LIMB MUSCLES

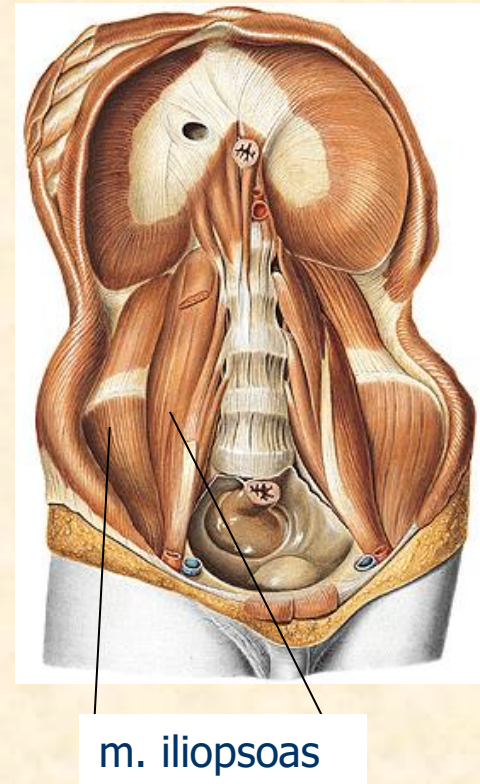
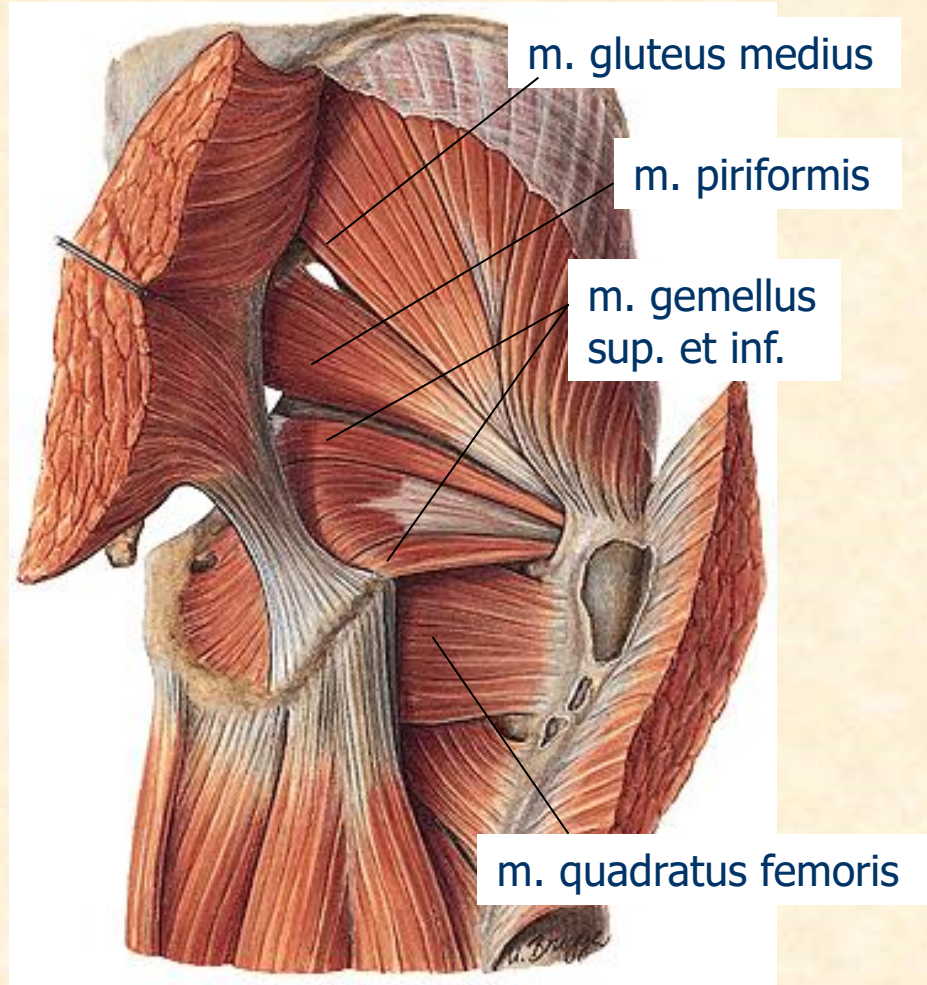
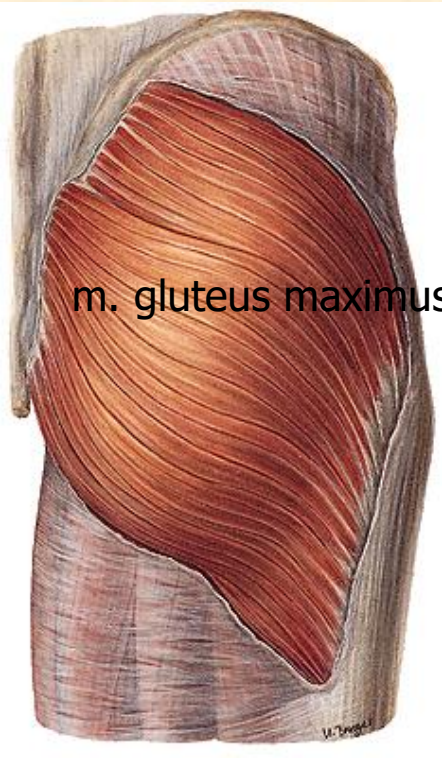
1) HIP MUSCLES

2) THIGH MUSCLES

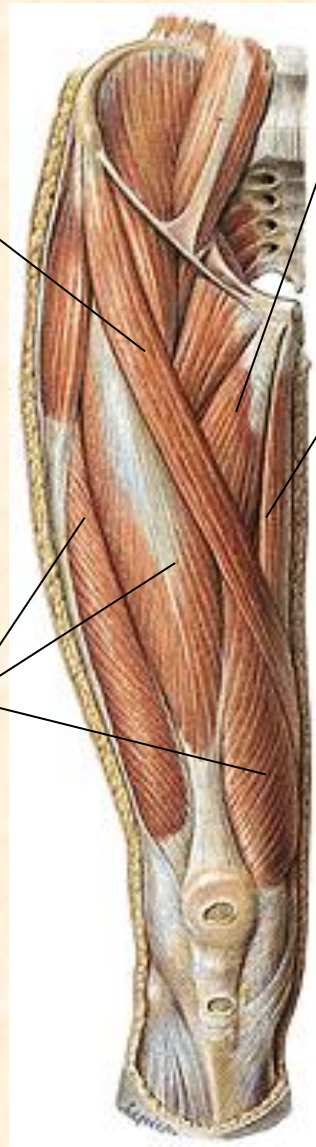
3) LOWER LEG (CRURAL) MUSCLES

4) FOOT MUSCLES

# HIP MUSCLES



# THIGH MUSCLES



m. sartorius

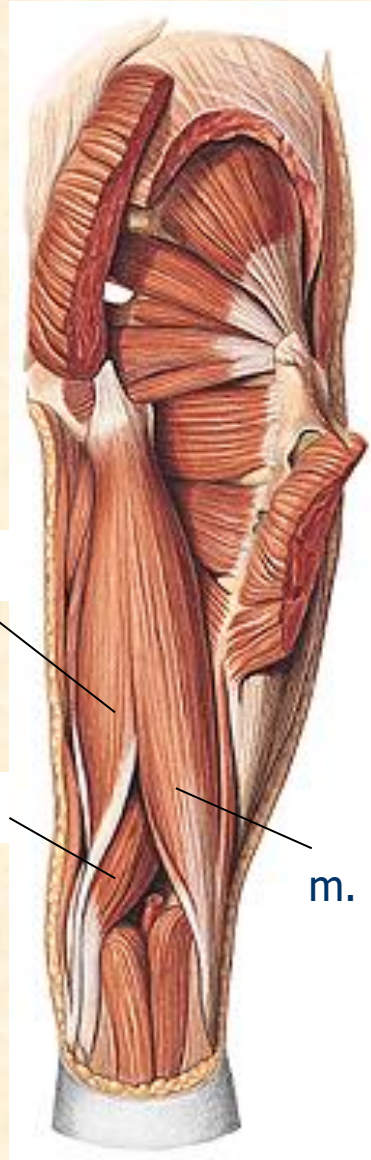
m. adductor longus,  
brevis et magnus

m. gracilis

**m. quadriceps  
femoris**

m. semitendinosus

m. semimembranosus



m. biceps femoris

# LOWER LEG (CRURAL) MUSCLES

m. peroneus longus

m. peroneus brevis

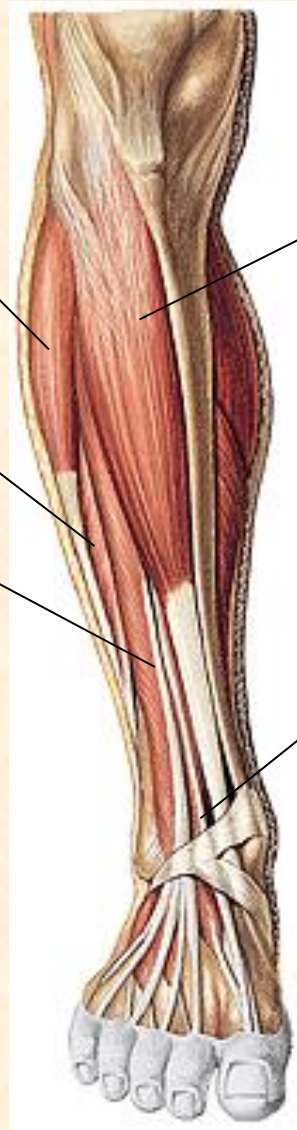
m. extensor digitorum longus

**lateral group**

**anterior group**

m. tibialis anterior

m. extensor hallucis longus



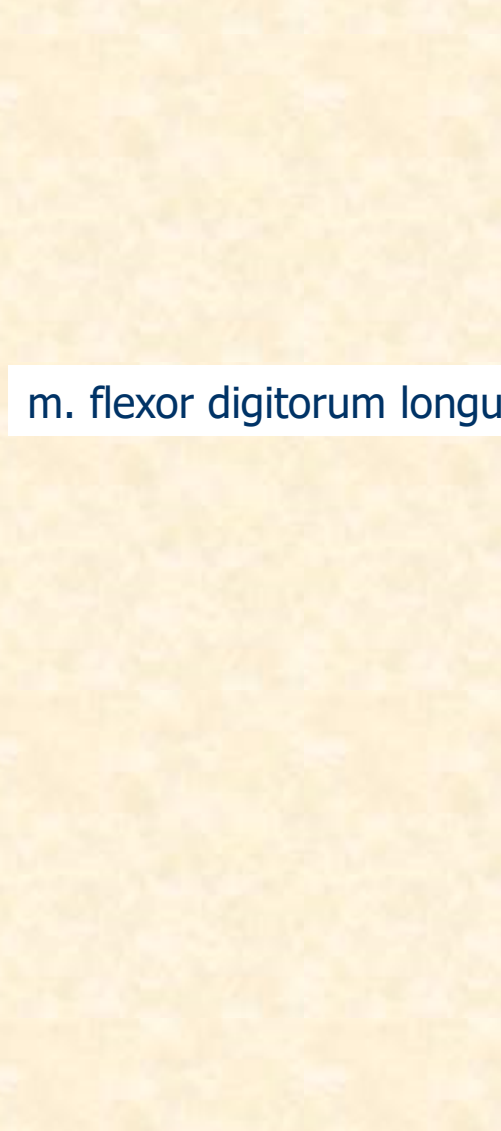
# LOWER LEG MUSCLES – dorsal group



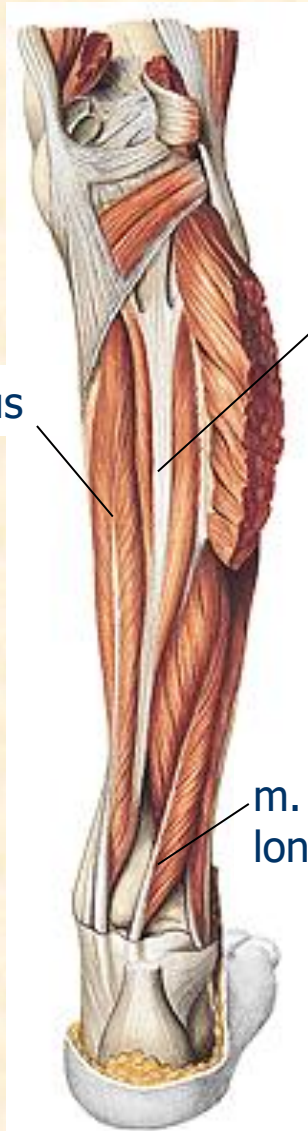
m. gastrocnemius

**m. triceps surae**

m. soleus



m. flexor digitorum longus



m. tibialis posterior

m. flexor hallucis longus

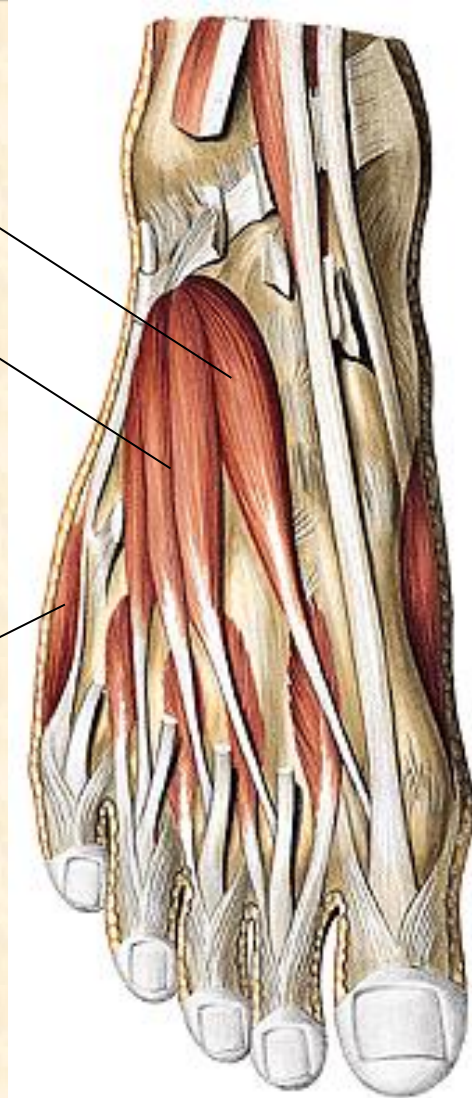
# FOOT MUSCLES

## dorsum

m. extensor hallucis brevis

m. extensor digitorum brevis

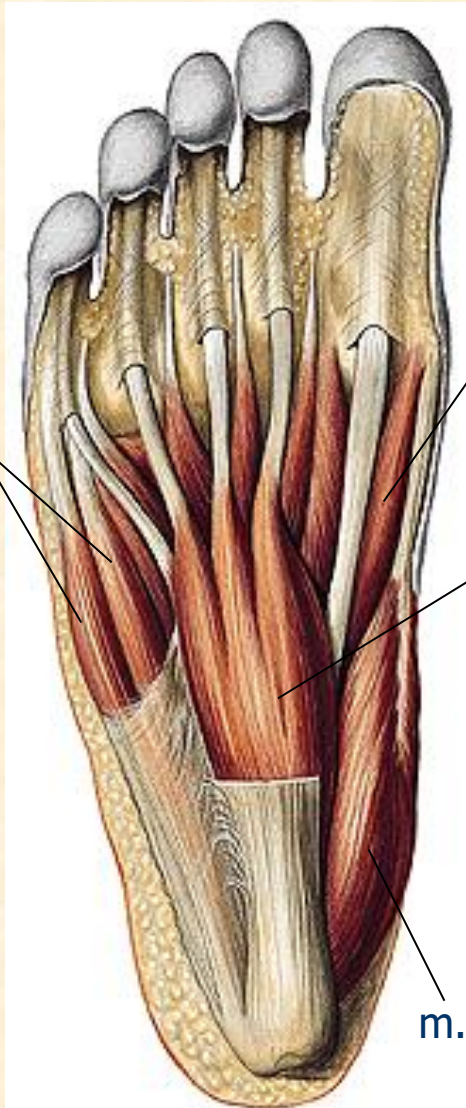
m. abductor digiti minimi



# FOOT MUSCLES (musculi pedis)

## planta

m. flexor et abductor digiti minimi brevis



m. flexor hallucis brevis

m. flexor digitorum brevis

m. abductor hallucis

m. quadratus plantae

