FACULTY OF MEDICINE IN PILSEN
CHARLES UNIVERSITY

Upper limb (UL) Summary I - joints

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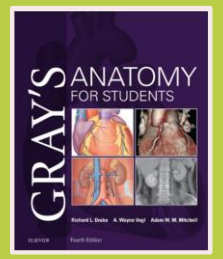
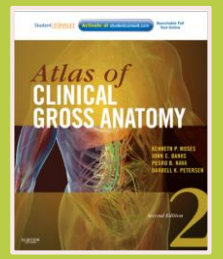
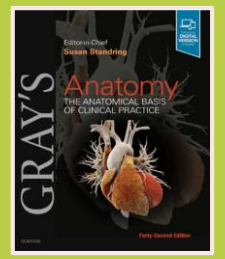
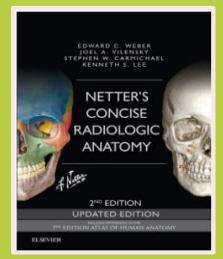
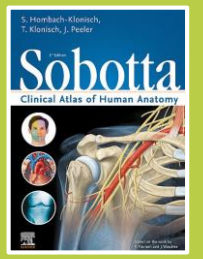
10_2024











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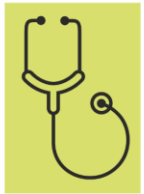
Univerzita
Karlova

Contents

- Applied general arthrology
- Joints of the upper limb - review

Pictograms:

 Clinical notes

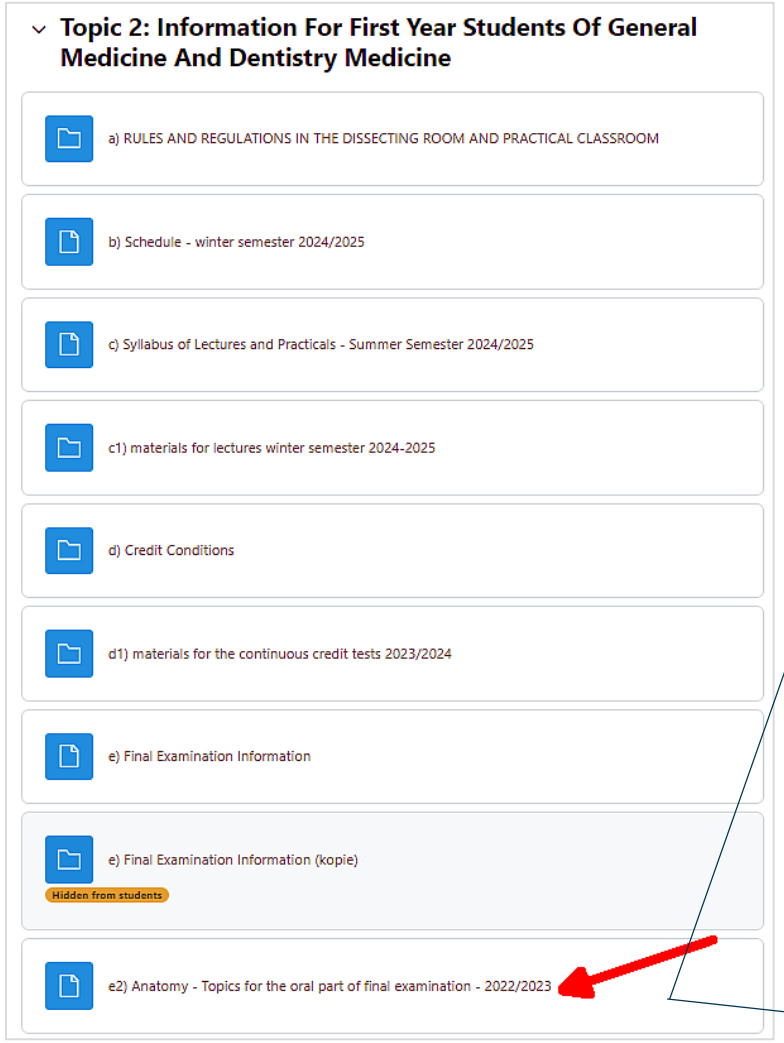
 Recall, reflex

 Look up

 Complete

Learning goals

https://moodle.lfp.cuni.cz/course/view.php?id=652



Otázky k závěrečné ústní zkoušce z Anatomie / Questions for the final oral exam in Anatomy

Skupina první - Group One

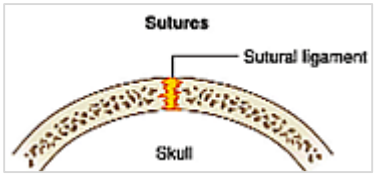
1. Obecná osteologie – obecná stavba kosti / General osteology – general bone structure
2. Obecná osteologie – části kosti, druhy kostí / General osteology -- parts of bone, types of bone
3. Obecná osteologie – ossa pneumatica/ General osteology – pneumatic bones
4. Obecná osteologie – enchondrální a endesmální osifikace / General osteology -- enchondral and intramembranous ossification
5. Obecná artrologie – synostosis / General arthrology – synostosis
6. Obecná artrologie – synchondrosis / General arthrology – synchondrosis
7. Obecná artrologie – syndesmosis / General arthrology – syndesmosis
8. Obecná artrologie – diarthrosis / General arthrology – diarthrosis
9. Obecná artrologie – pomocná zařízení kloubů / General arthrology – auxiliary apparatus of joints
10. Obecná artrologie – articulatio simplex et composita / General arthrology – simple and complex joints
11. Obecná artrologie – articulatio sphaeroidea / General arthrology – ball-and-socket joint (spheroid joint)
12. Obecná artrologie – articulatio elliptica, articulatio sellaris / General arthrology – joint, saddle joint
13. Obecná artrologie – articulatio cylindrica, articulatio trochlearis / General arthrol cylindrical joint, trochlear (hing) joint
14. Obecná artrologie – articulatio plana, amphiarthrosis / General arthrology – flat amphiarthrosis
15. Obecná artrologie – stavba synoviálního kloubu / General arthrology – structures synovial joint

Topics for the oral exam on anatomy

https://moodle.lfp.cuni.cz/course/view.php?id=260

Joints

Articulatio, art. (latin) = joint
Árthron (greek) = joint



Continuous

Discontinuous (synovial)

Fibrous

Cartiliginous

Osseous

Art. fibrosa

- Syndesmosis ✓
- Suturae
- Gomphosis

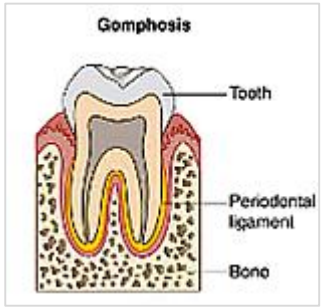
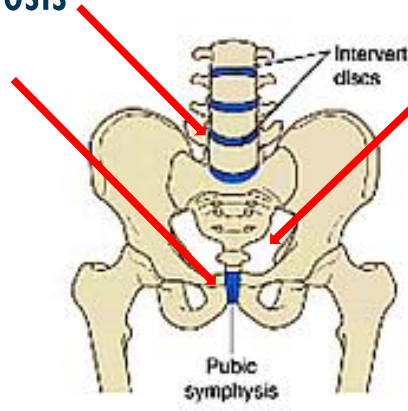


Fig.: Interosseous membrane (syndesmosis)

Art. cartilaginea

- Synchondrosis
- Symphysis



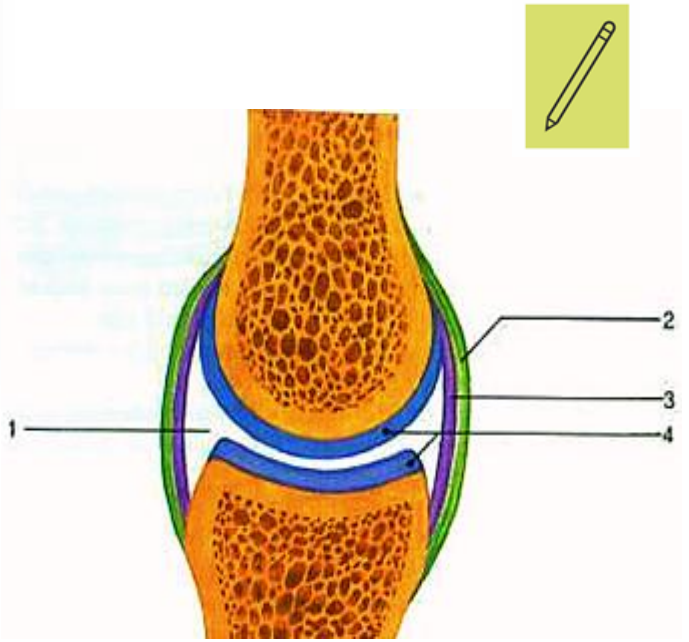
Art. ossea

- Synostosis

Fig.: Elbow joint (synovial, compound)

Basic algorithm for the description of a joint

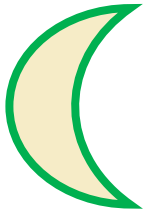
1. Name of the joint
2. Type of the joint (simple/compound, geometry)
3. Description of articular surfaces, event. of the auxiliary structures
4. Description of the joint capsule, joint ligaments (extra-/intraarticular)
5. Movements

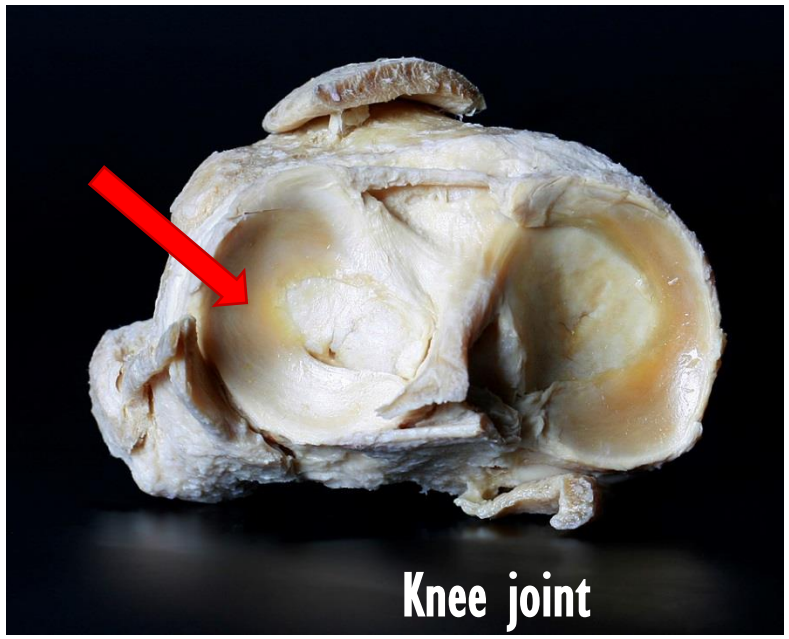


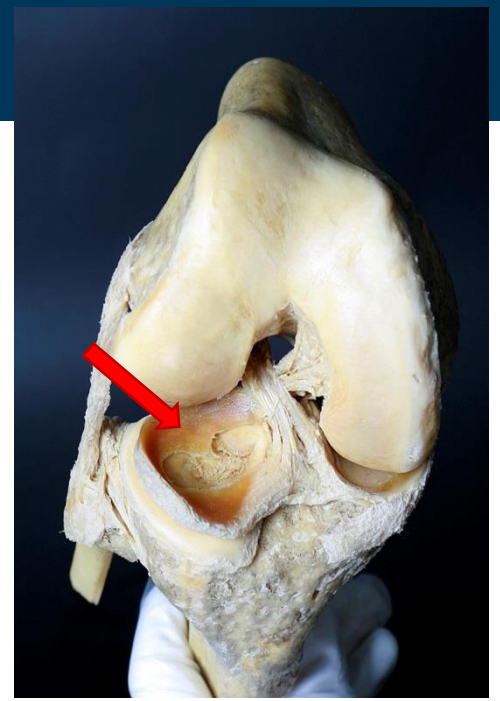
SIMPLE/COMPOUND?!

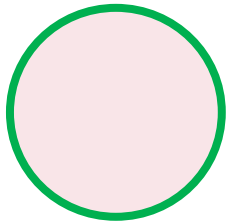
Description of a joint is derived from the so-called basic position of the joint, which corresponds to the **basic anatomical position** of the body (standing upright, free-hanging upper limbs, palms facing forward).

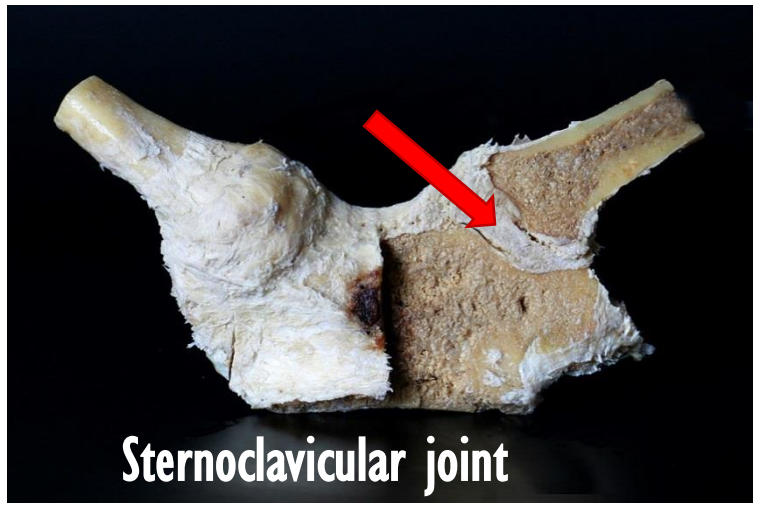
Discus vs. meniscus

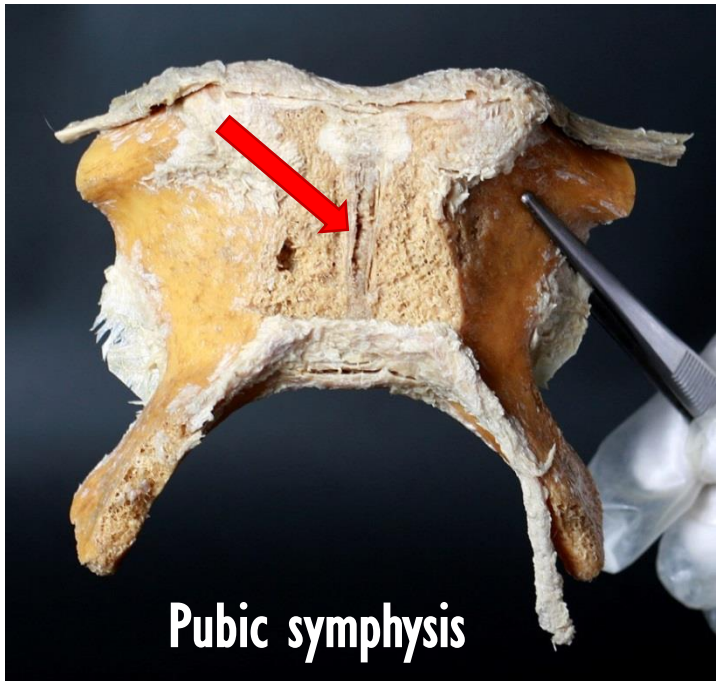




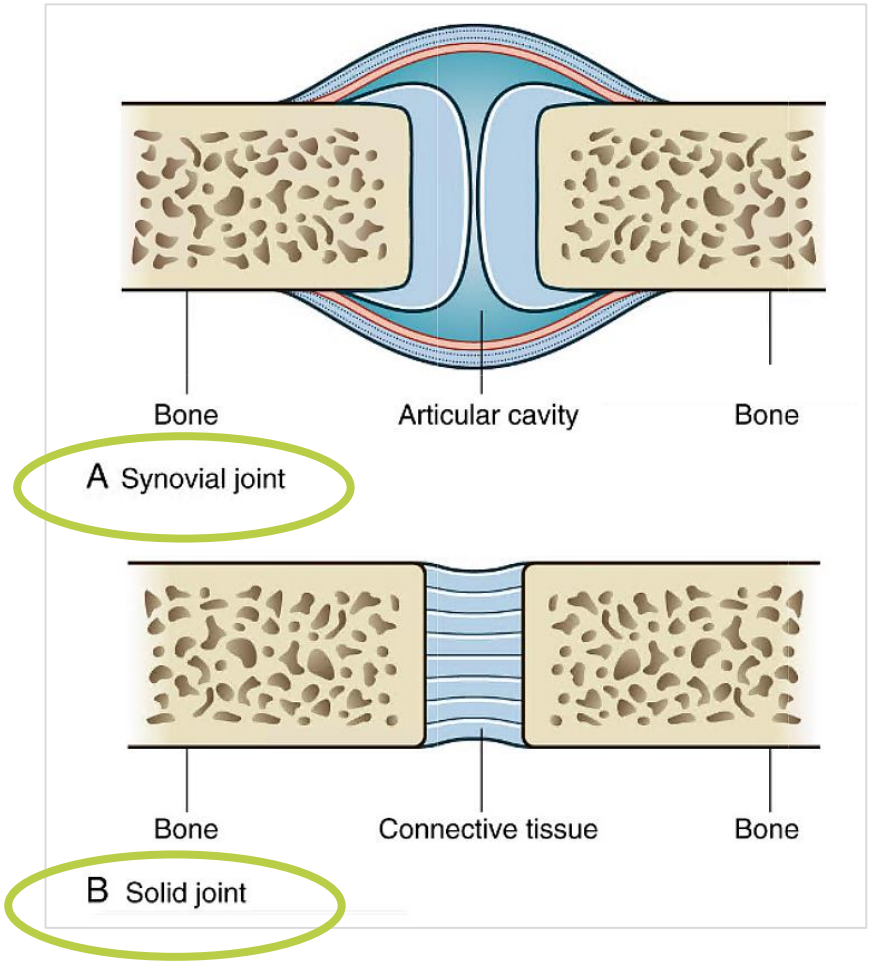




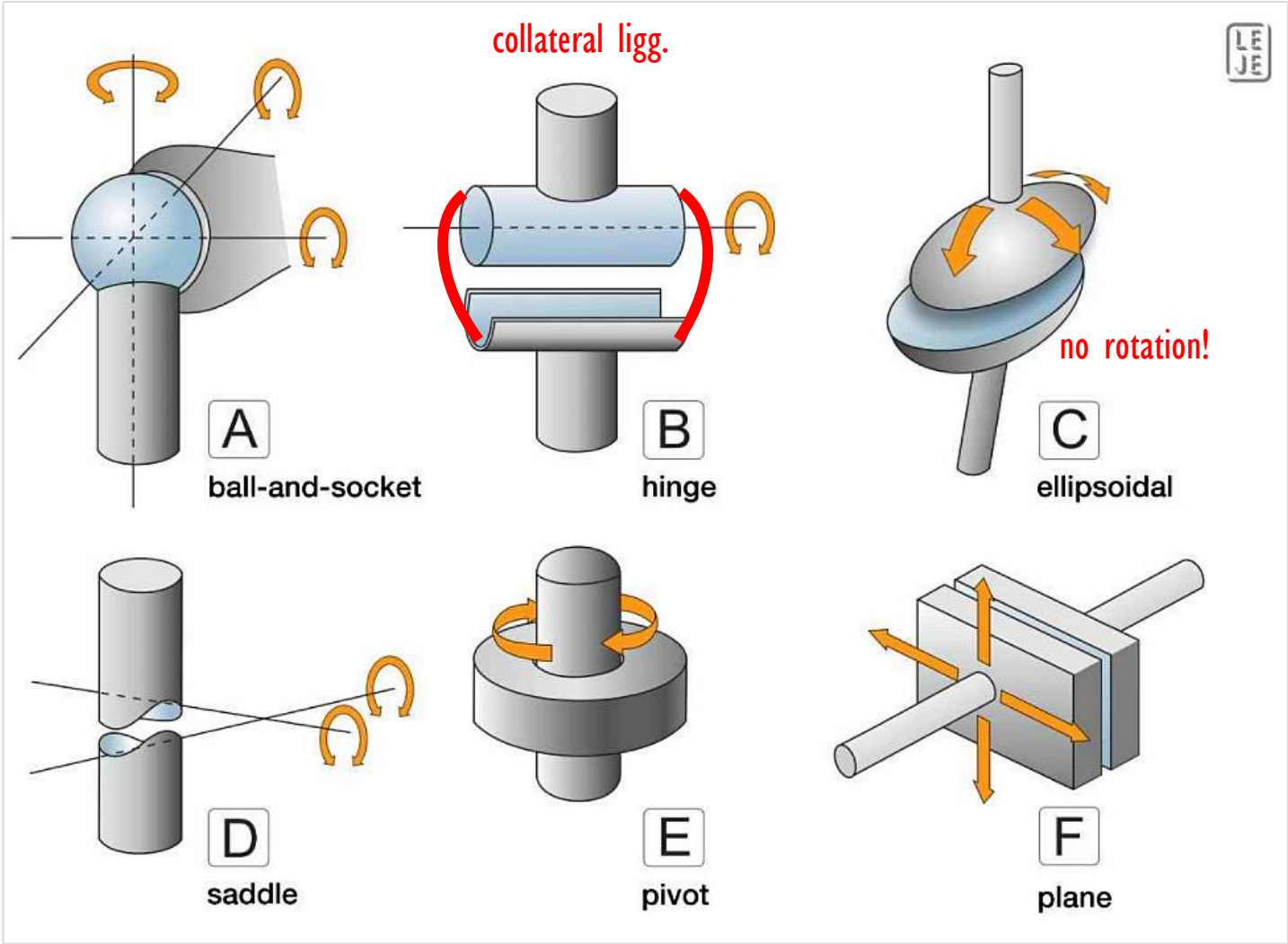




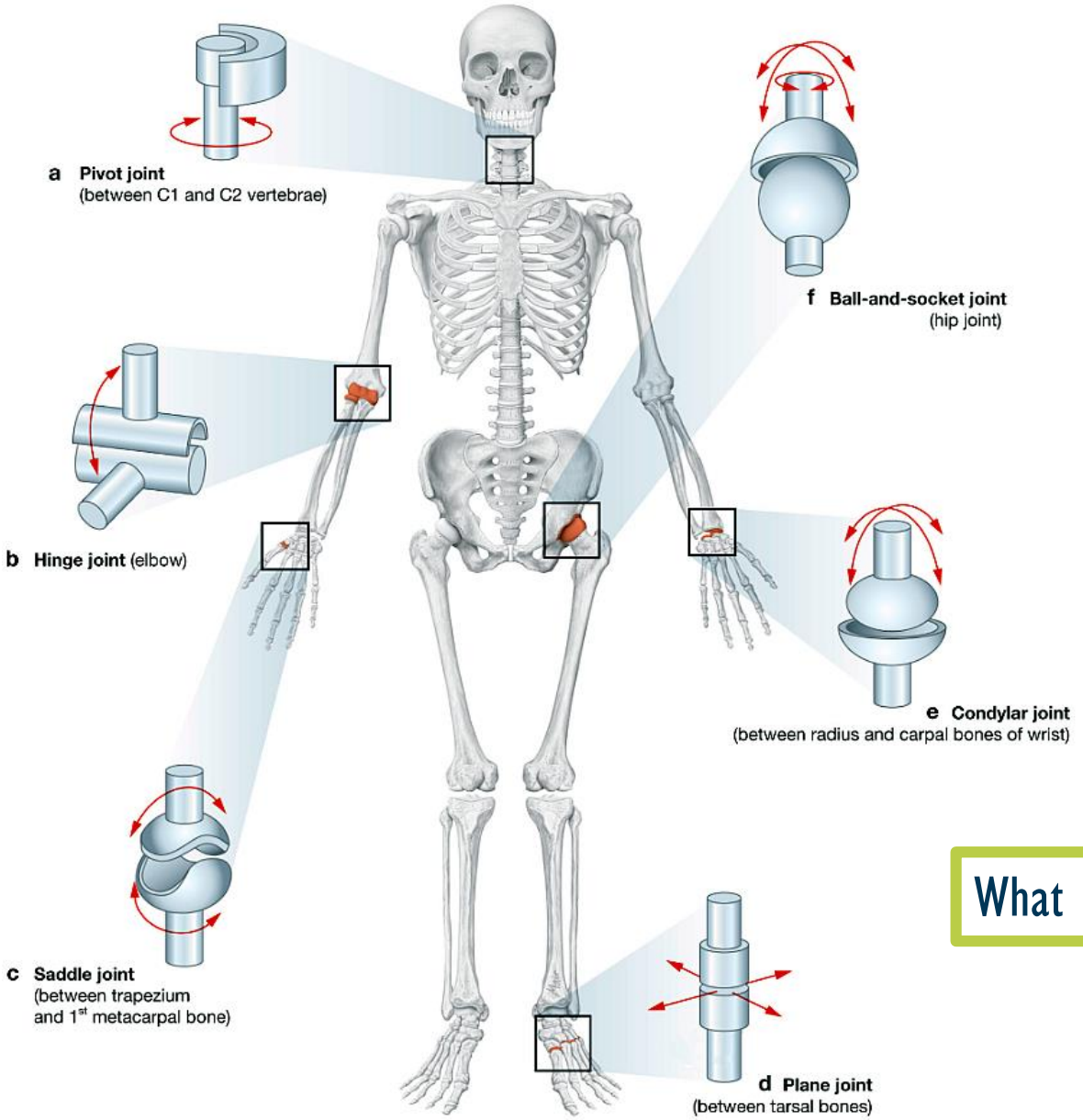
JOINTS – what kind?



SYNOVIAL JOINTS – GEOMETRY – MOVEMENTS

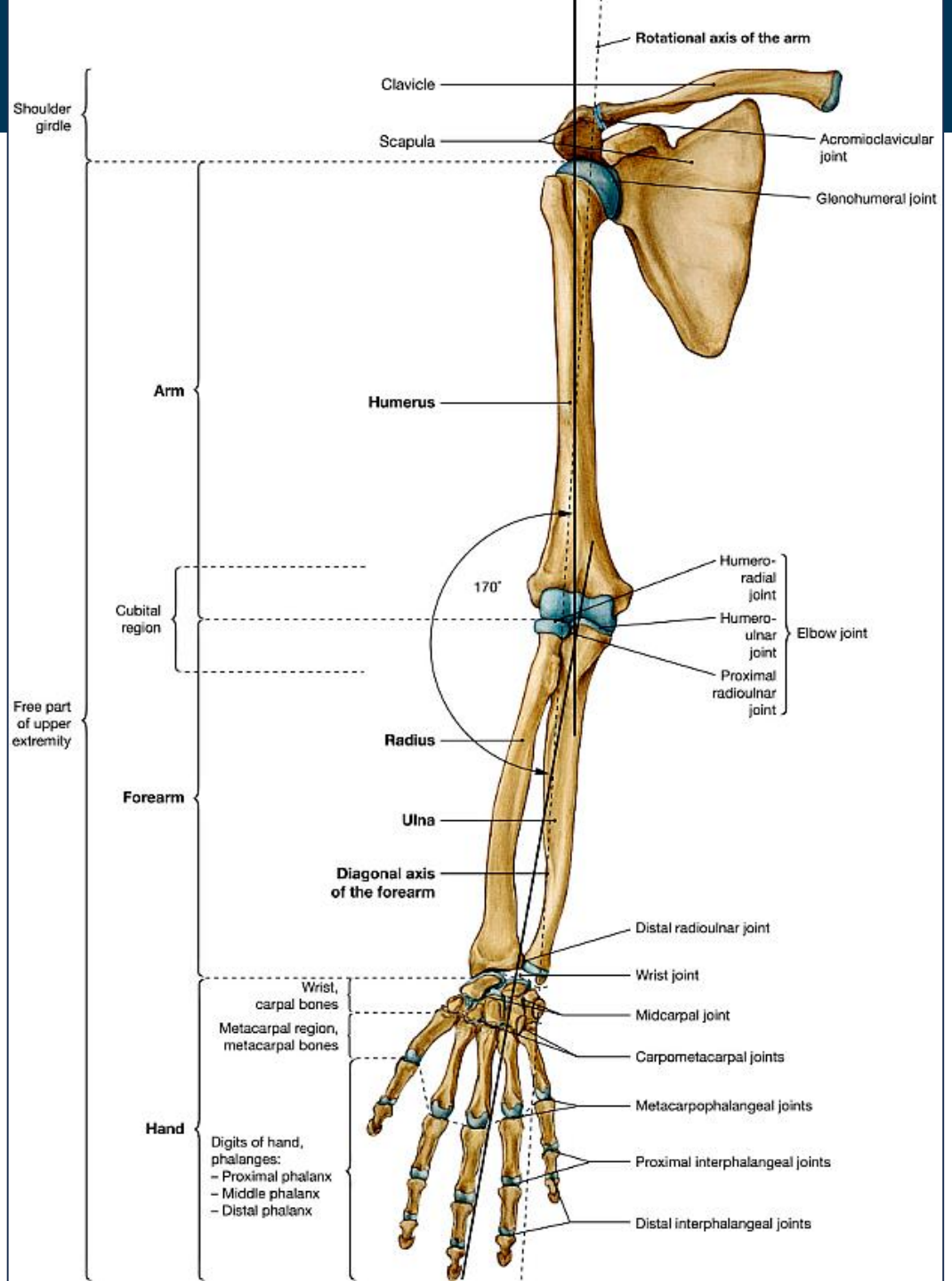


JOINTS – what kind?

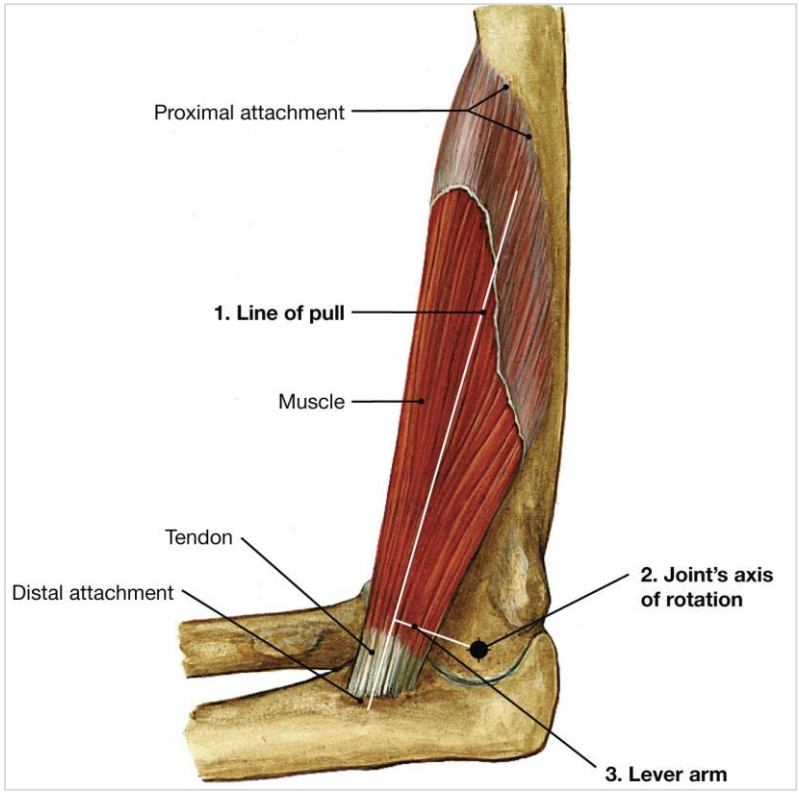


What is the amphiathrosis?

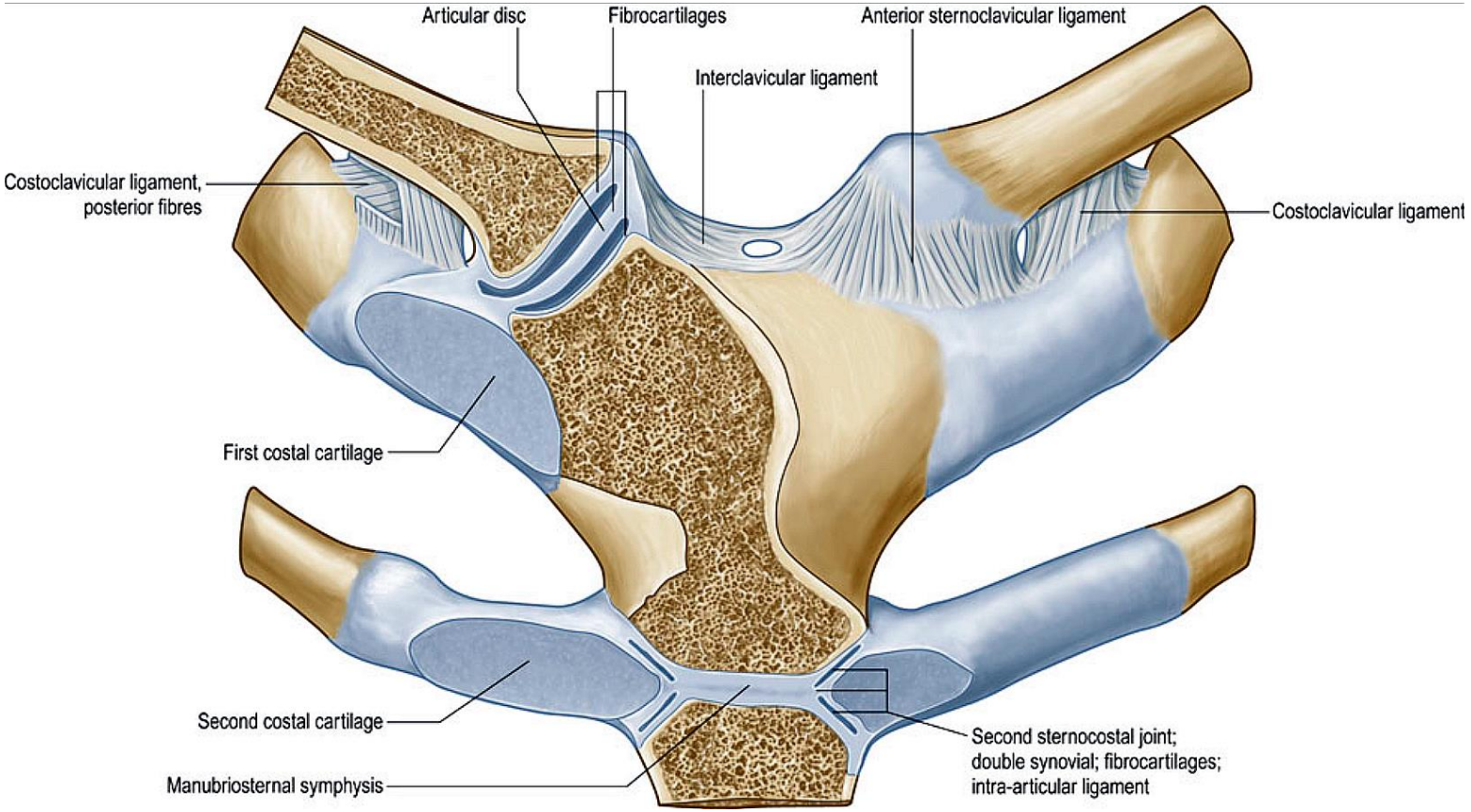
Joints of the UL



Joints ⟷ Skeletal muscles



Sternoclavicular joint



Type:
Compound (discus), saddle-like

(Extra-)capsular ligaments:
Anterior sternoclavicular ligament
Posterior sternoclavicular ligament
Interclavicular ligament
Costoclavicular ligament

Fig.: Sternoclavicular joint, anterior view

Acromioclavicular joint

Type: Plane-type synovial joint

Articulating surfaces: Acromion and acromial end of clavicle

Ligaments: Superior acromioclavicular
Inferior acromioclavicular
Coracoclavicular

Movements: Minimal, connected with scapula

Scapular movements:
Elevation and depression
Protraction and retraction

Fig.: Acromioclavicular joint

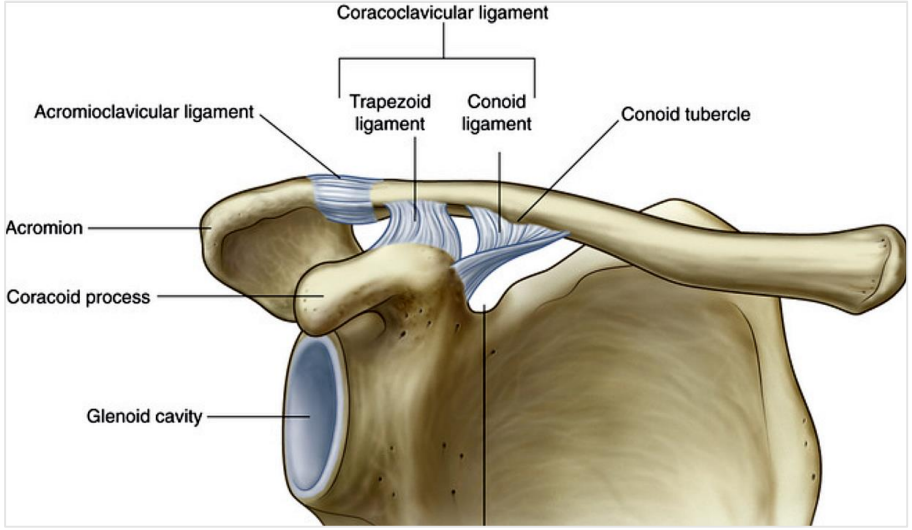
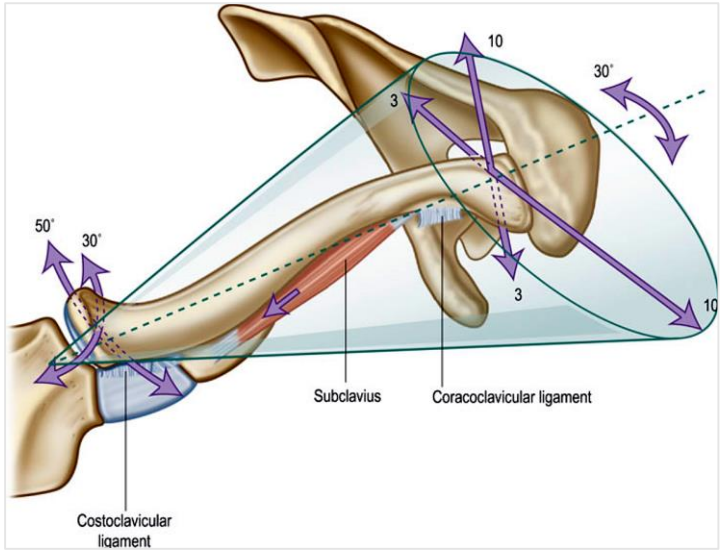


Fig.: Scapula and clavicle, view from above



Glenohumeral (shoulder) joint

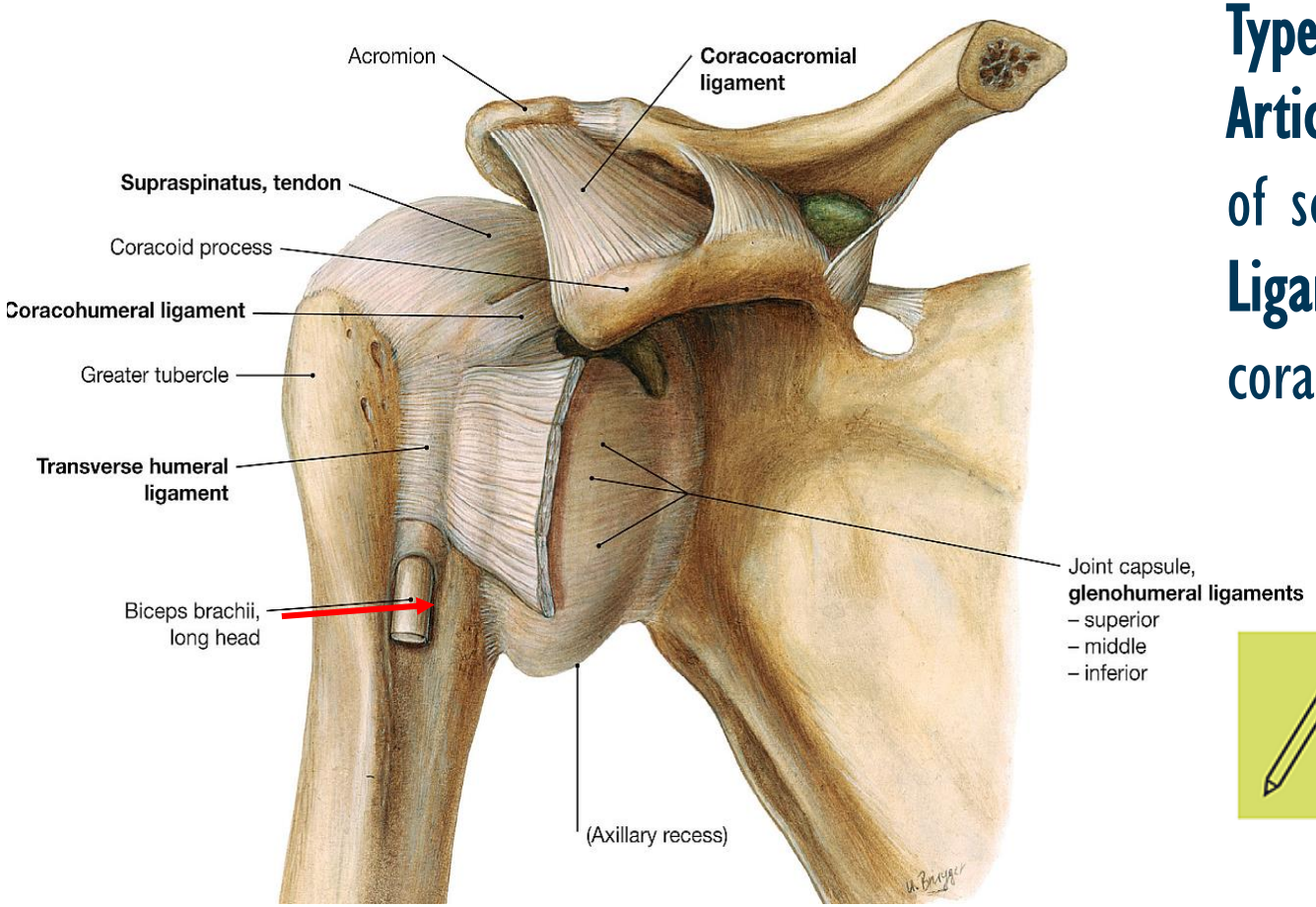


Fig.: Shoulder joint, anterior view

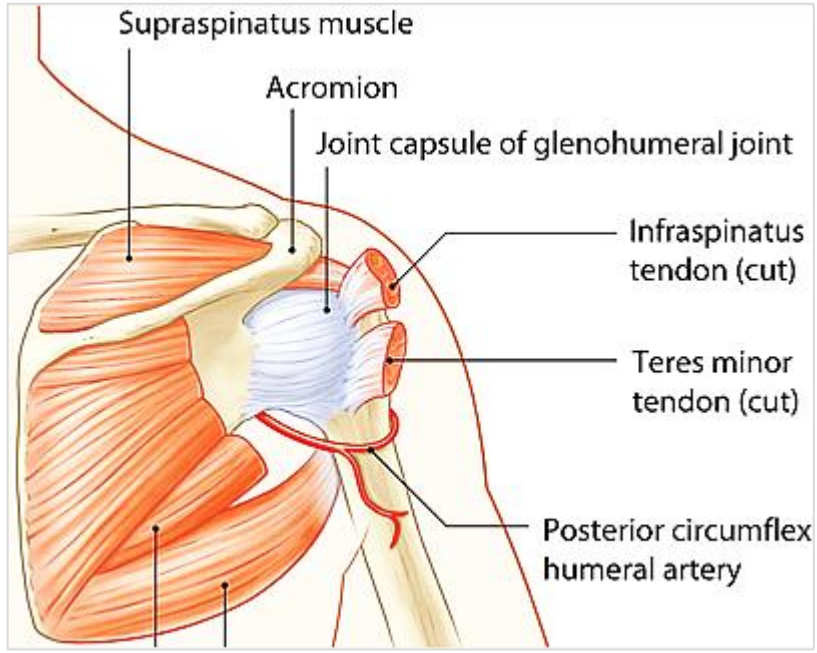
Type: Ball-and-socket, synovial joint

Articulating surfaces: Glenoid cavity (and labrum) of scapula, head of humerus

Ligaments: glenohumeral ligg. (3), coracohumeral, coraco-acromial lig.

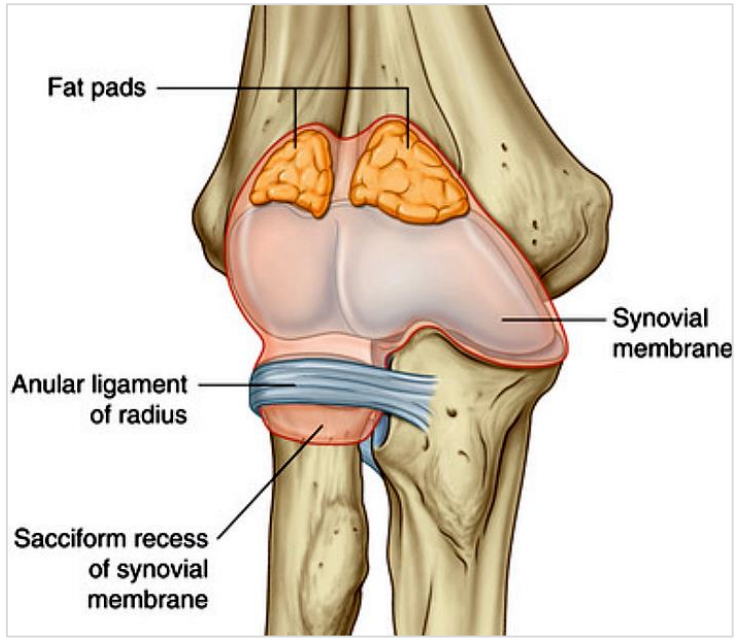
Muscles of the rotator cuff!

https://www.youtube.com/watch?v=RaIt79pPfgE



Movements: flexion, extension, abduction, abduction, rotation, circumduction

Elbow joint



1. Name of the joint
2. Type of the joint (simple/compound, geometry)
3. Description of articular surfaces, event. of the auxiliary structures
4. Description of the joint capsule, joint ligaments (extra-/intraarticular)
5. Movements

Bones of the hand

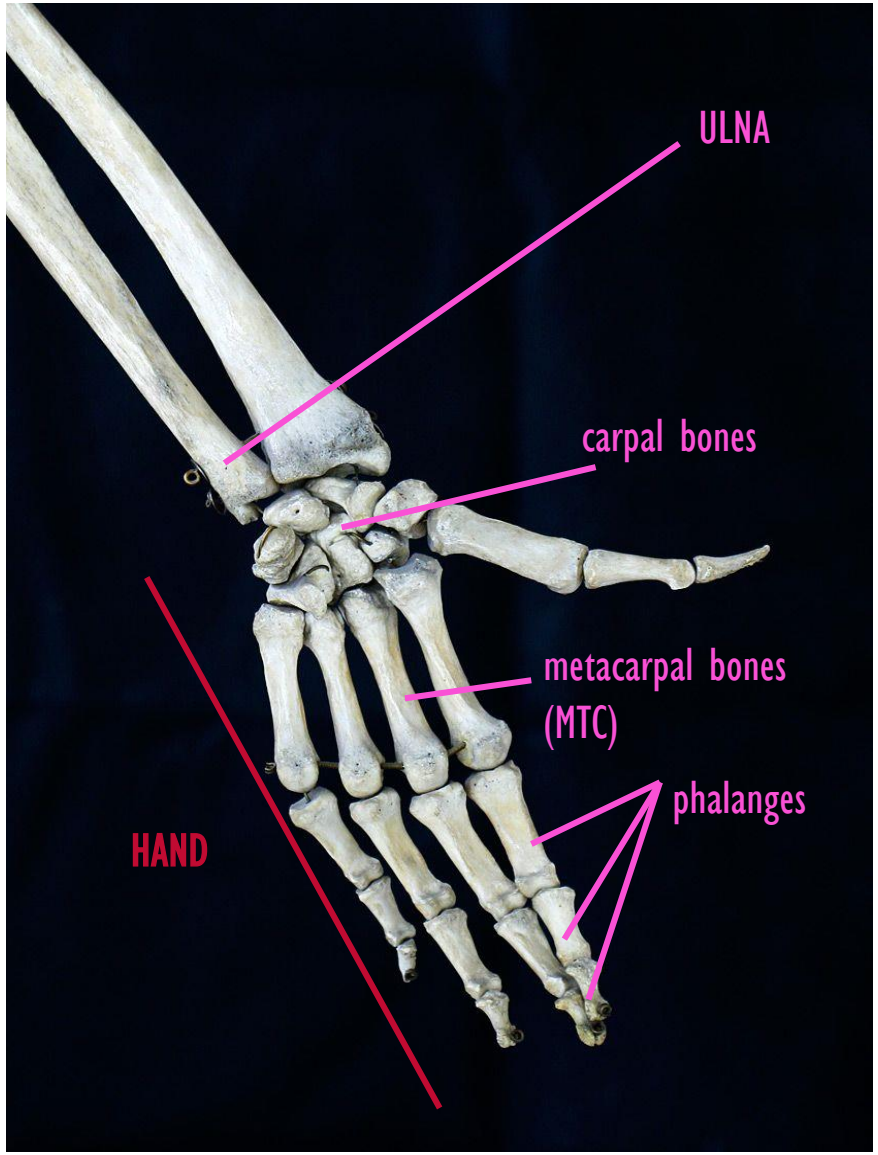


Fig.: Left hand, anterior view

From the anatomical point of view, the hand is formed by the wrist, palm and fingers.

Division	Bones
Wrist	8 carpal bones
Palm	5 metacarpal bones (MTC)
Fingers I–V	I (thumb): 2 phalanges II–V: 3 phalanges

Bones of the hand

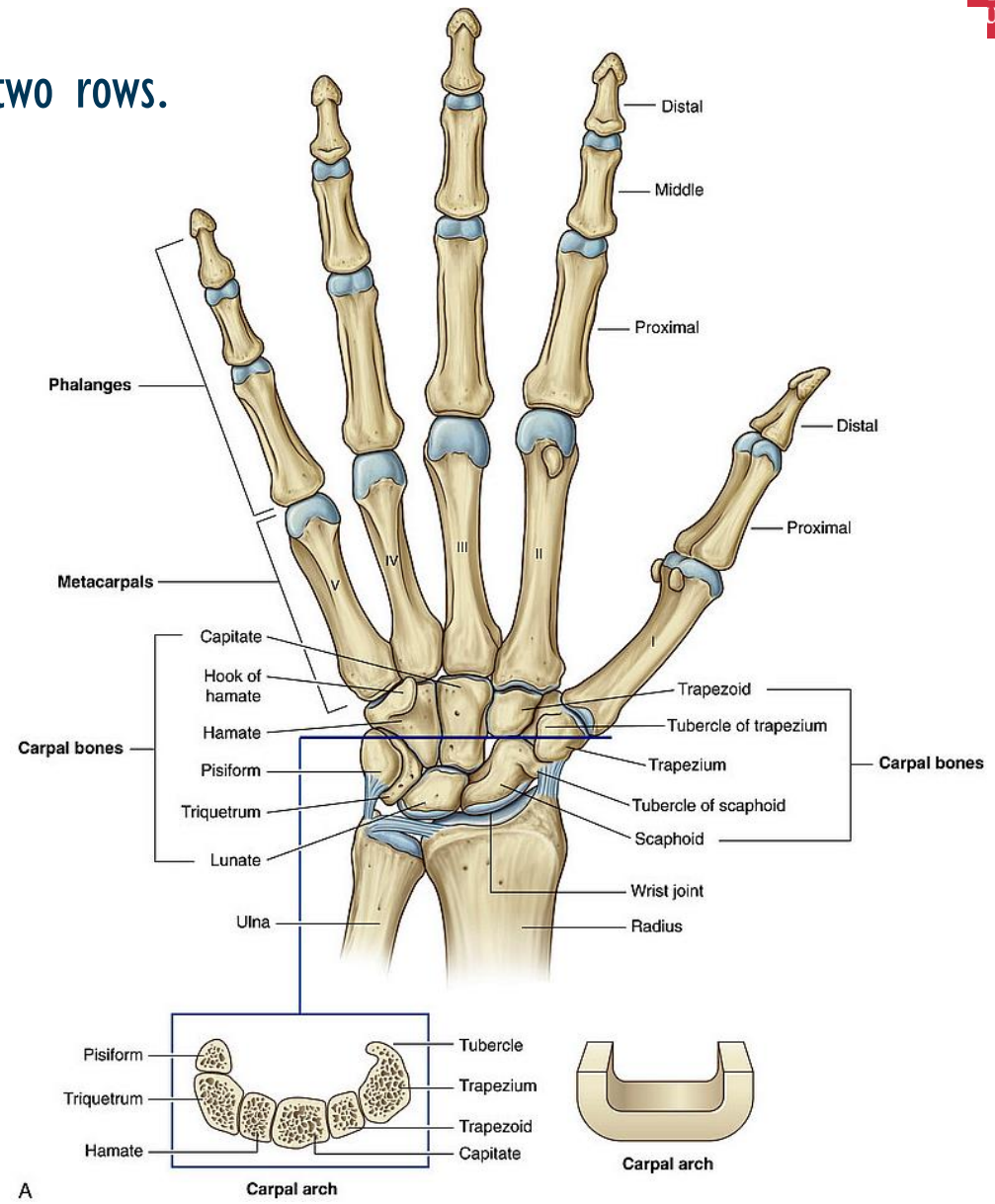
Carpal bones form the skeleton of the wrist.
They comprise 8 short bones arranged into two rows.

Proximal row:

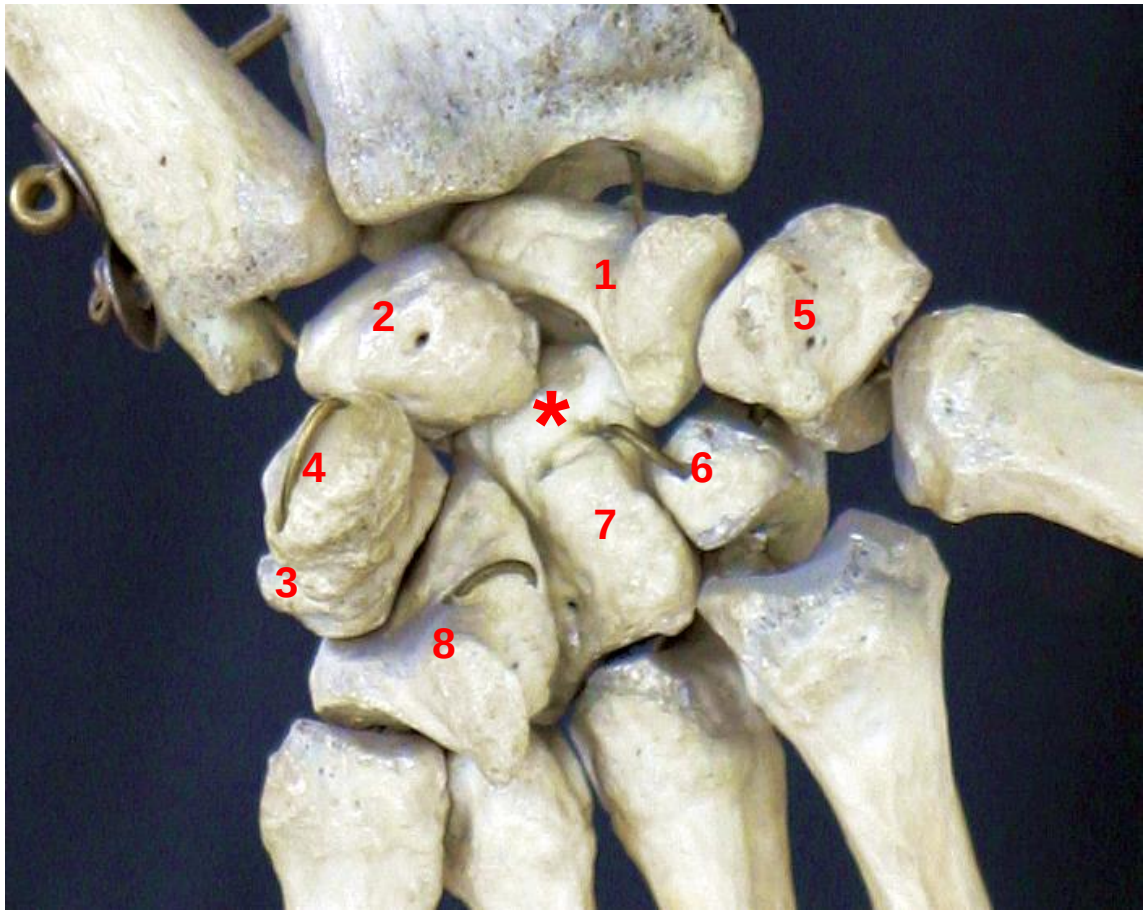
- scaphoid
- lunate
- triquetrum
- pisiform

Distal row:

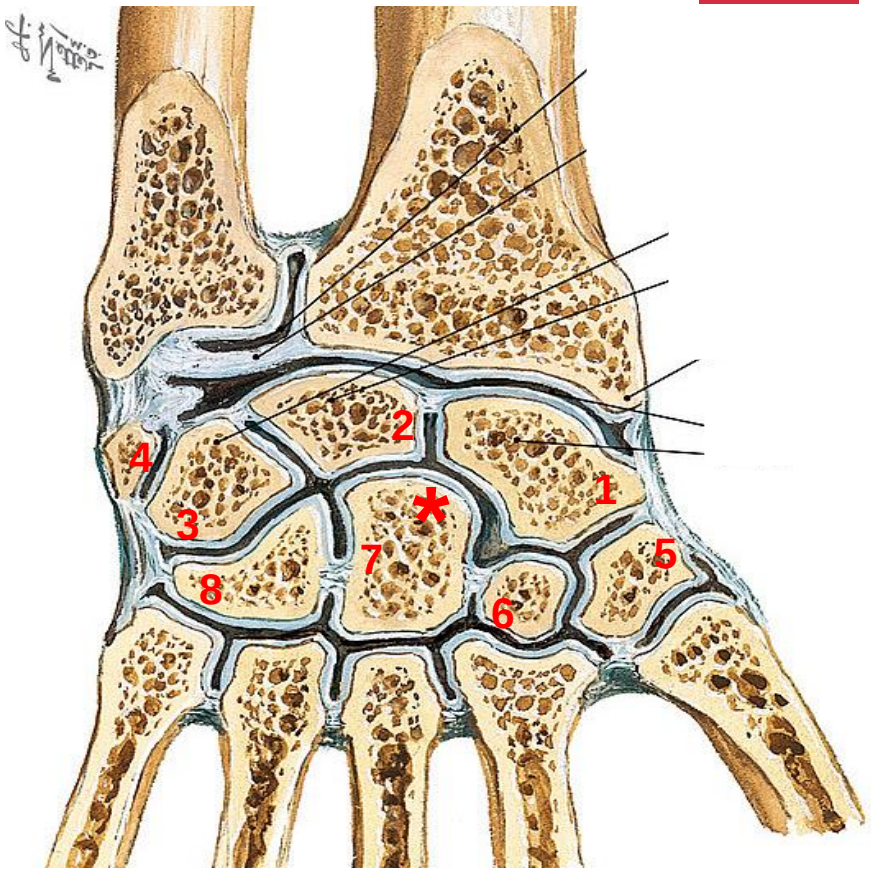
- trapezium
- trapezoid
- capitate
- hamate



Carpal bones



1 scaphoid
2 lunate
3 triquetrum
4 pisiform
5 trapezium
6 trapezoid
7 capitate
8 hamate



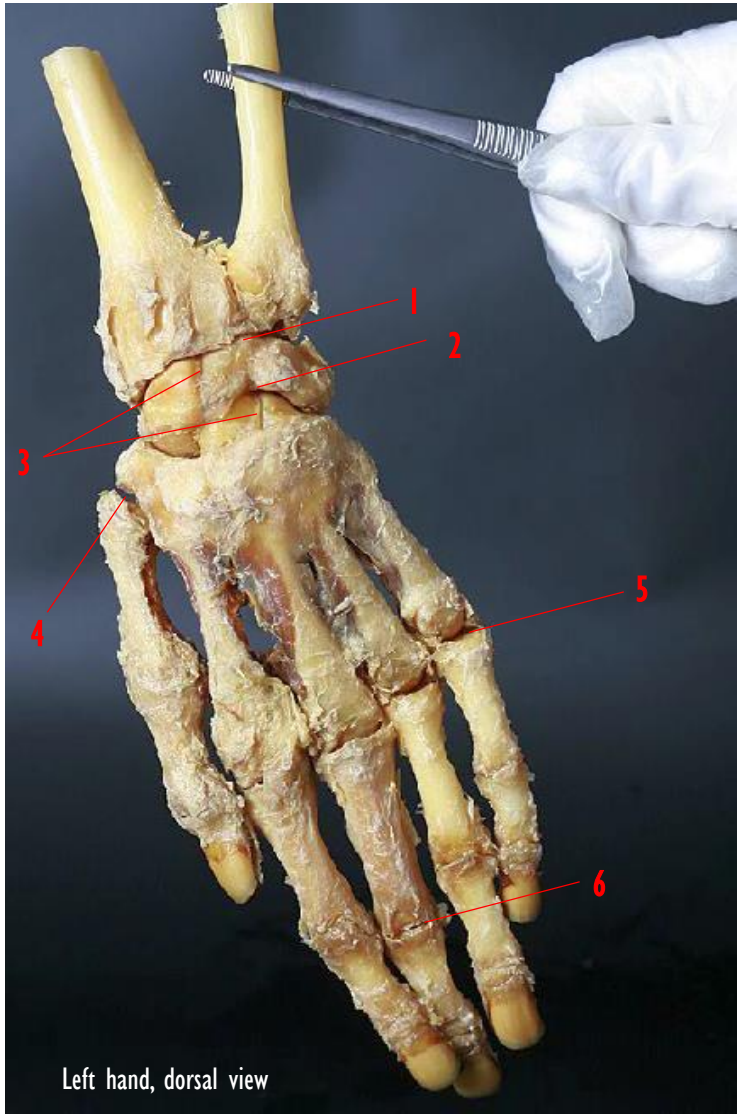
Bones of the left wrist, anterior view; head of the capitate (asterisk)

Fig.: Bones of the left wrist, anterior view, coronal section head of the capitate (asterisk)

The **scaphoid** is the most frequently fractured carpal bone, often resulting from a fall on the palm with an abducted hand. Pain is felt in the anatomical snuff-box.

Joints of the hand, review

NAME, LINE
Radiocarpal joint 1
Mediocarpal joint 2
Intercarpal joints 3
Carpometacarpal joints 4
Intermetacarpal joints
Metacarpophalangeal joints 5
Interphalangeal joints 6



Joints of the hand

NAME (RAW)
Radiocarpal joint 1
Mediocarpal joint 2
Intercarpal joints 3
Carpometacarpal joints 4
Intermetacarpal joints
Metacarpophalangeal joints 5
Interphalangeal joints 6

1. Name of the joint
2. Type of the joint (simple/compound, geometry)
3. Description of articular surfaces, event. of the auxiliary structures
4. Description of the joint capsule, joint ligaments (extra-/intraarticular)
5. Movements

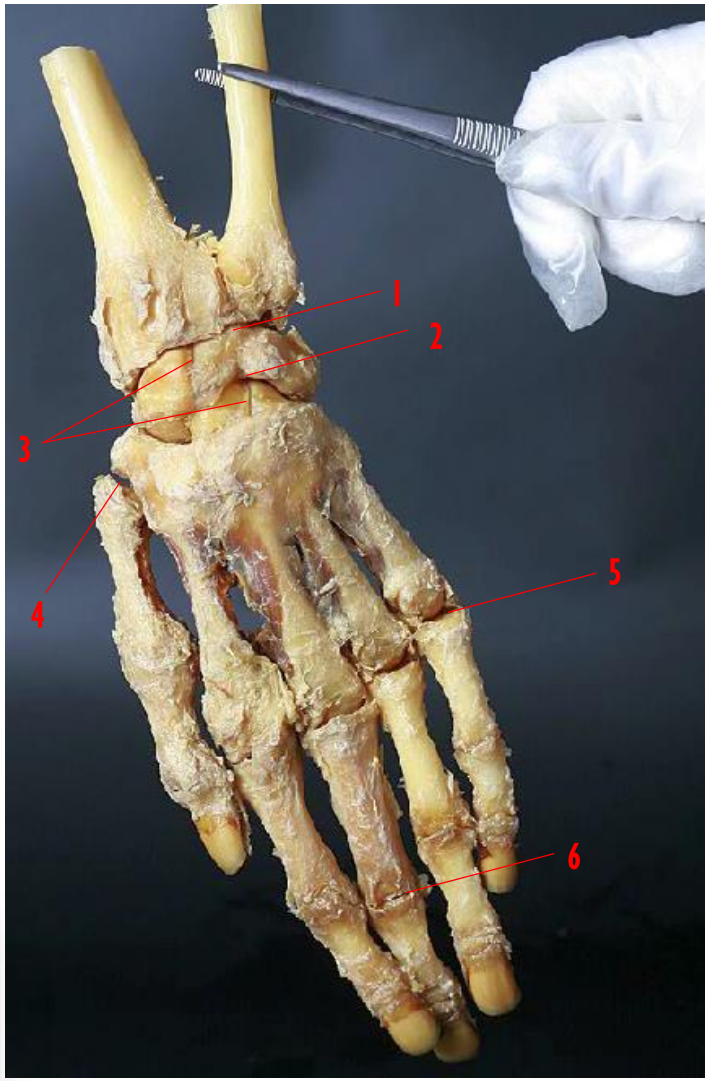


Fig.: Left hand, dorsal view

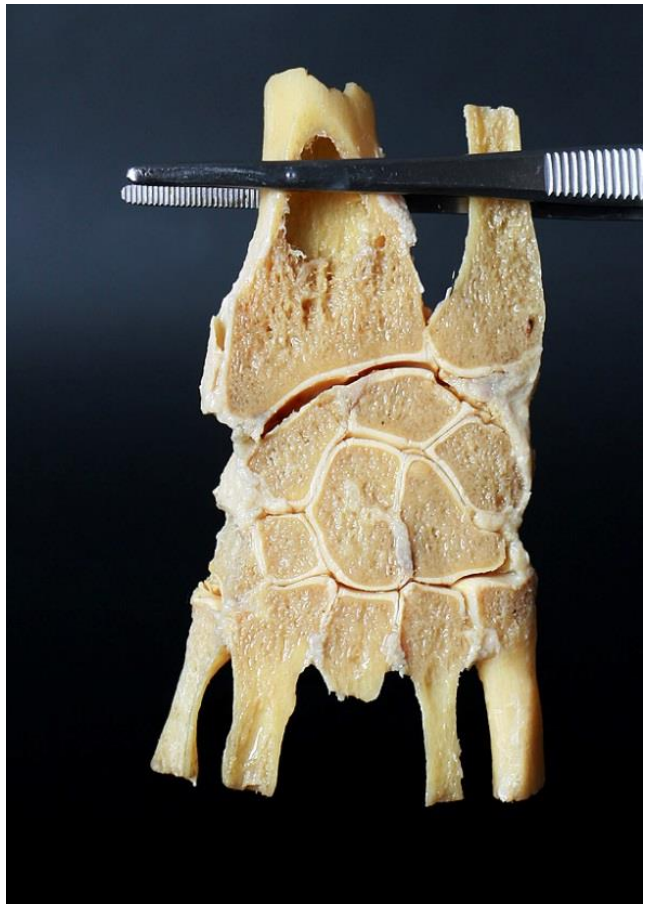


Fig.: Right carpus, coronal section, anterior view

Joints of the hand

JOINT	SPECIFICATION (kind, geometry, articulating surfaces)	LIGAMENTS	MOVEMENTS
Radiocarpal joint	**Type:** compound, ellispoid **Head:** scaphoid, lunate, triquetrum **Socket:** distal radius, articular disc	Radiocarpal palmar and dorsal ligg., ulnocarpal palmar and dorsal ligg., medial and lateral collateral ligg; adjacent bones are connected by the firm and short interosseal ligg. – the **scapholunate lig.** is very important for stabilizing the wrist.	Wrist works as a functional unit. It allows for the flexion, extension, abduction, adduction, circumduction.
Mediocarpal joint	**Type:** compound, ball-and-socket **Head:** head of the capitate, hamate **Socket:** scaphoid, lunate, (triquetral)		
Intercarpal joint/s	**Type:** simple, plane jonts between the adjacent carpal bones		
Carpometacarpal joints II-V	**Type:** simple, plane	Carpometacarpal ligg.	Rigid, minimal movement
Intermetacarpal joints		Intermetacarpal ligg.	
Carpometacarpal joint I	**Type:** simple, saddle		Ab-/adduction, opposition, reposition, circumduction
Metacarpophalangeal joints	**Type:** ball-and-socket (dorsally), honge (palmarly)	Collateral, palmar ligg., palmar fibrocartilages	Fle-/extension, in extension also a slight ab-/adduction
Interphalangeal joints	**Type:** trochlear (kind of hinge)	Collateral ligg., palmar ligg., palmar fibrocartilages	Fle-/extension

Carpal tunnel

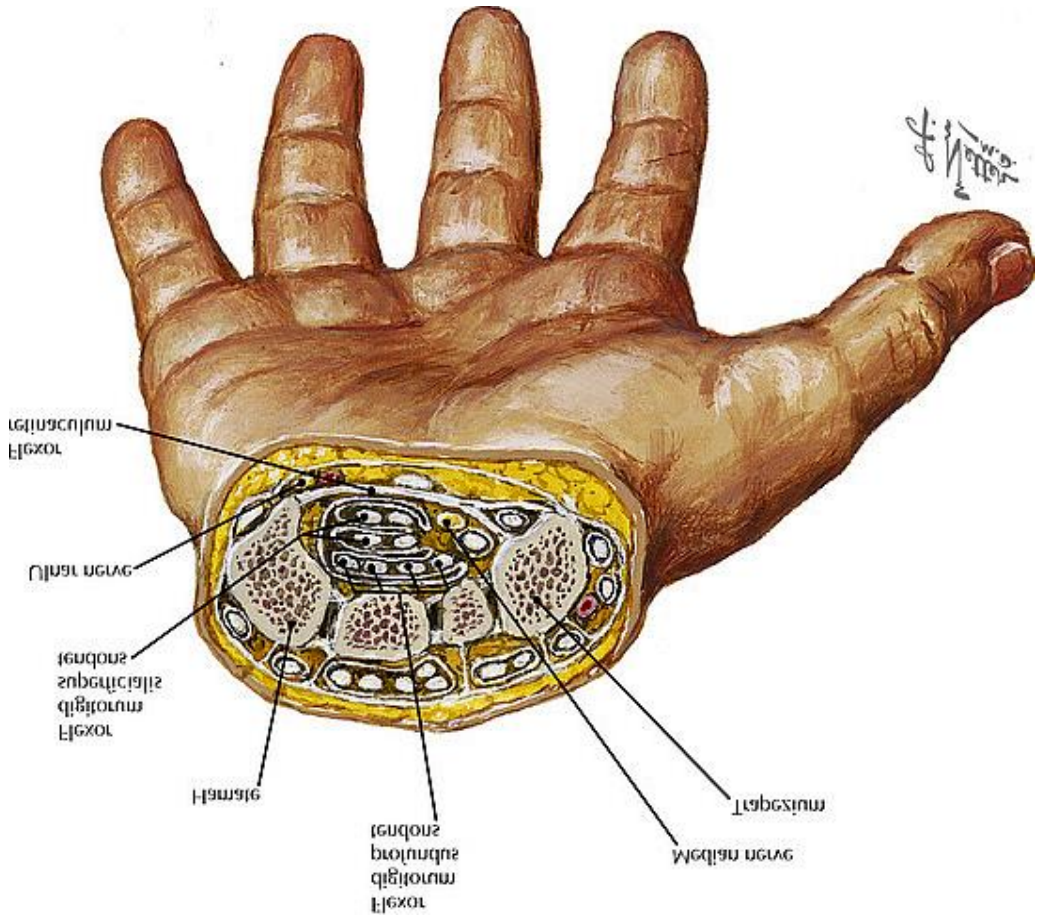
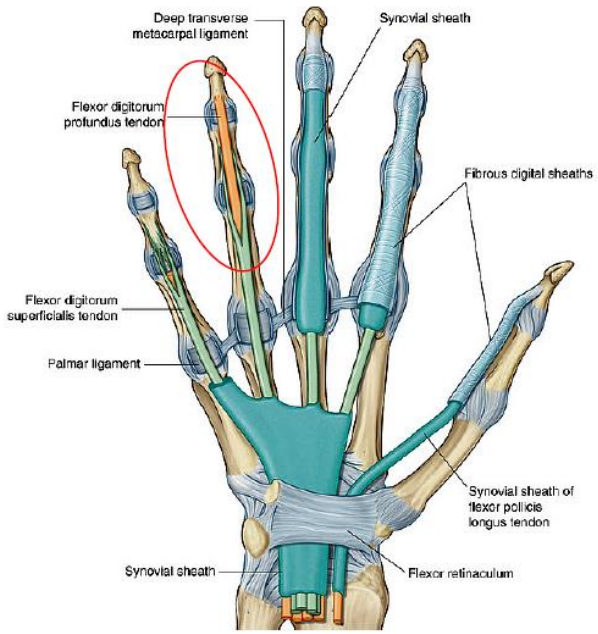


Fig.: Right hand, anterior view, coronal section



Carpal Tunnel Syndrome

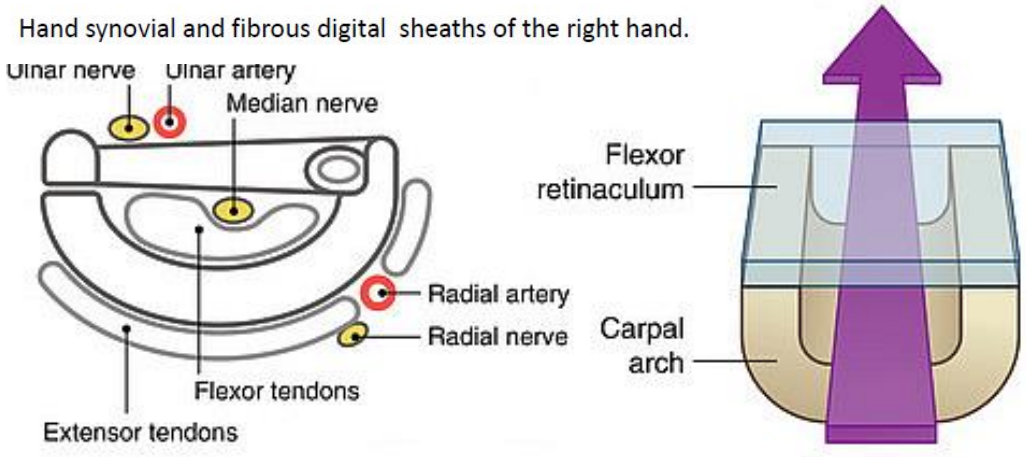


Fig.: Right carpus, anterior view, coronal section

Tendon synovial sheaths

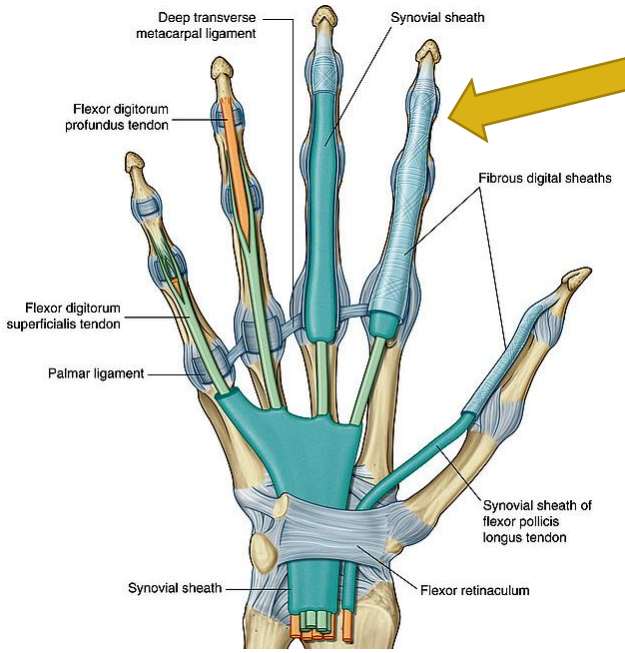


Fig.: Tendons of the „extrinsic“ hand muscles covered with the synovial sheaths within the carpal tunnel, palm and fingers

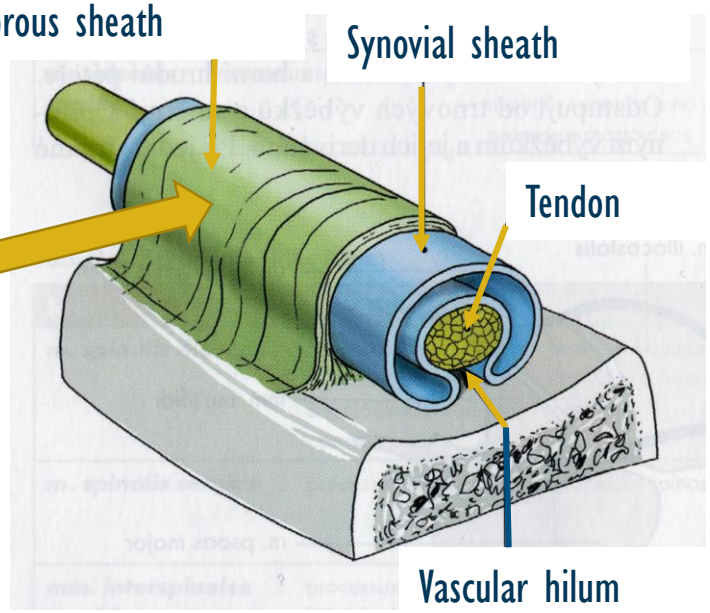


Fig.: Detailed anatomy of the tendon synovial and fibrous sheath

Fig.: Phlegmona – inflammation within the synovial sheaths spreads freely without a barrier

Tendon synovial sheaths

develop at the sites with high friction (ankles, wrist, hand, foot)

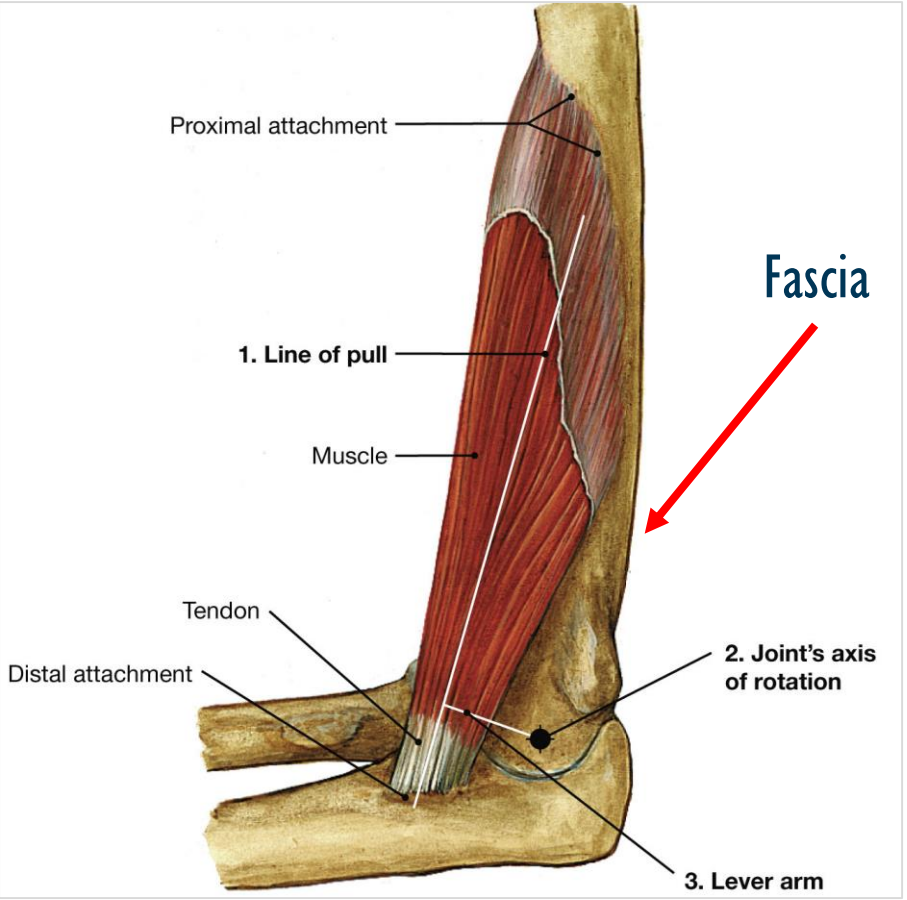
General Myology; L. Eberlova, 2023

Skeletal muscles

Skeletal muscle description:

- Compartment, group
- Origin (usually the fix point above the insertion)
- Insertion
- Innervation
- Function

KNOWLEDGE of bones and joints helps to logically derive the muscle function!



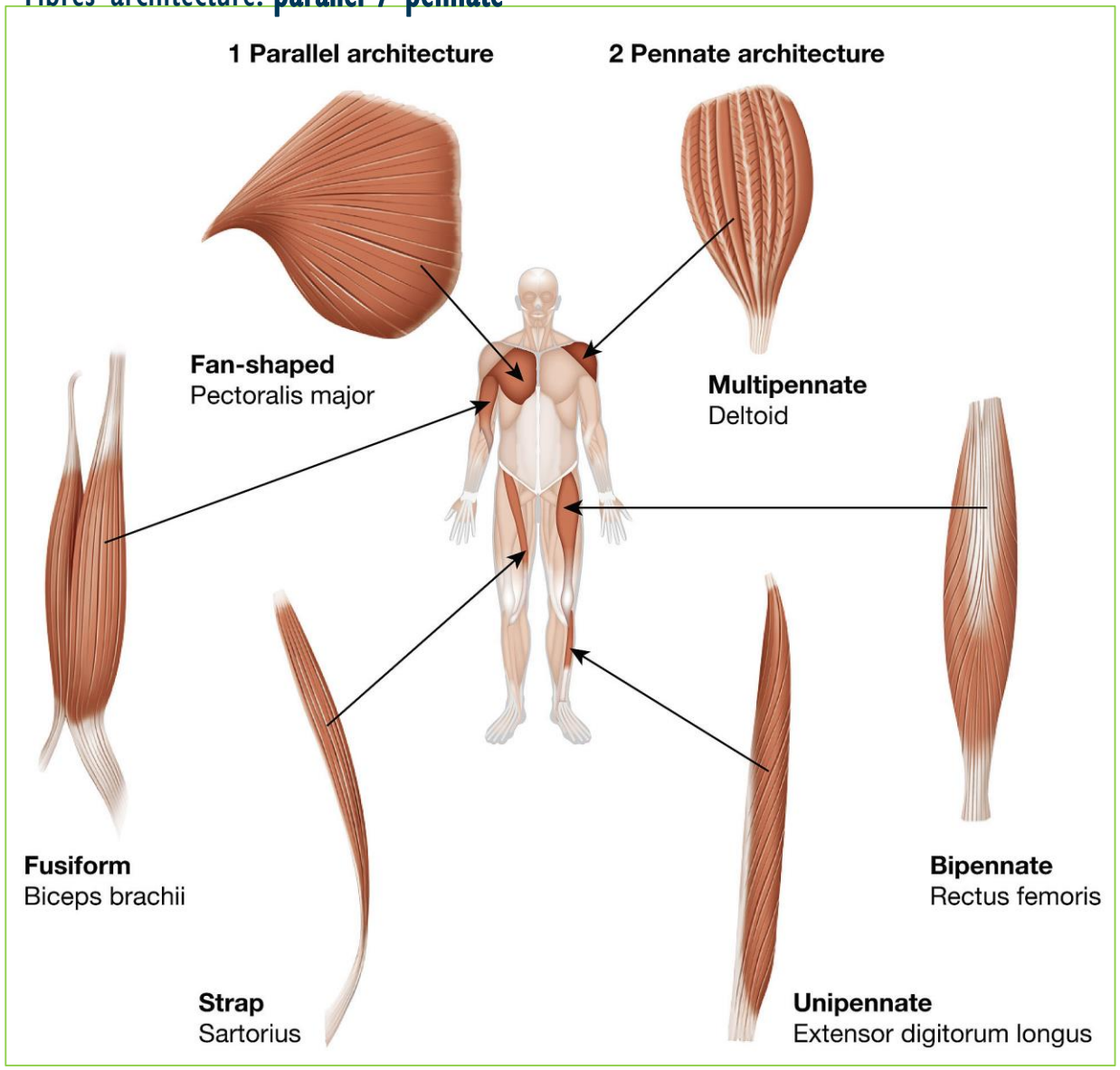
Moodly Anatomy Muscles

https://moodle.lfp.cuni.cz/course/view.php?id=260

Muscles of the brachium YouTube
https://www.youtube.com/watch?v=h_SMXP2ppTw

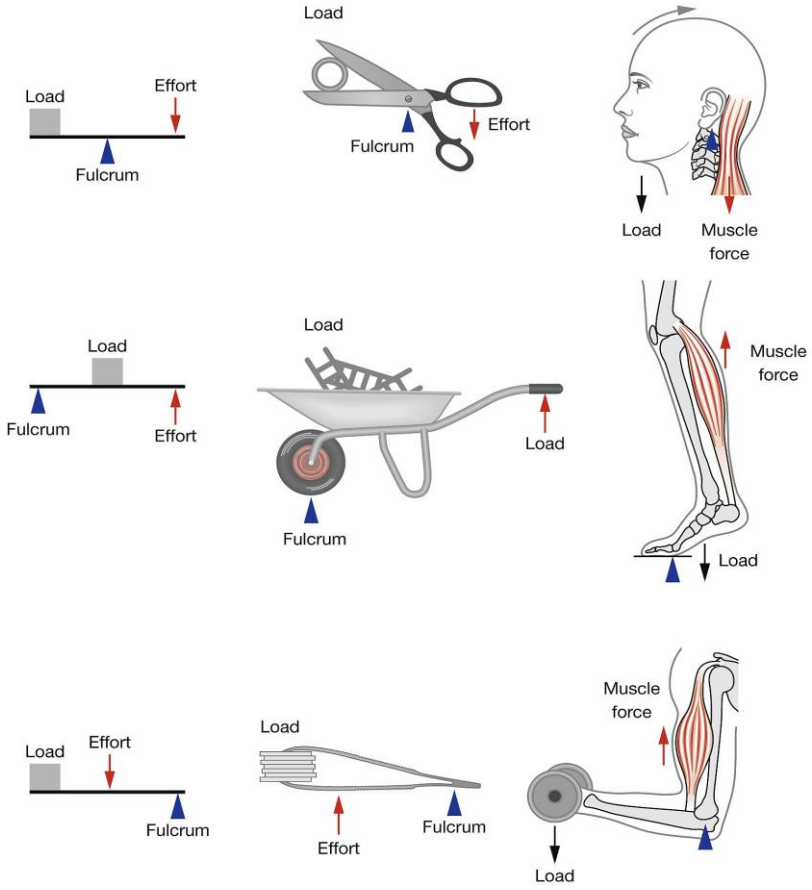
Skeletal muscles

Fibres architecture: **parallel / pennate**



Accessory structure/s:
fibrous loop, **trochlea** *(obliquus bulbi superior muscle)*
Fibrous intersections *(rectus abdominis muscle)*

Contraction: vector origin → insertion



Skeletal muscles

Names of the skeletal muscles
Adjectives according to the

- **Shape:**

deltoid (= triangular), quadratus (= square), rhomboid (= diamond-shaped), teres (= round), gracilis (= slender), rectus (= straight), lumbrical (= worm-like)

- **Size:**

major, minor, longus (= long), brevis (= short), latissimus (= broadest), longissimus (= longest)

- **Number of heads or bellies:**

biceps (2 heads), triceps (= 3 heads), quadriceps (= 4 heads), digastric (= 2 bellies bellies)

- **Position :**

anterior, posterior, interosseus (= between bones)
supraspinatus (= above spine of scapula scapula), infraspinatus (= below spine), dorsi (= of the back), abdominis (= of the abdomen), pectoralis (= of the chest), brachii (= of the arm); femoris (= of the thigh), oris (= of the mouth)

Skeletal muscles

Names of the skeletal muscles, adjectives according to the

- **Depth:**

superficialis (= superficial superficial), profundus (= deep), externus externus (or externi), internus (or interni interni)

- **Attachment:**

sternocleidomastoid (from the sternum, clavicle clavicle to the mastoid process)

coracobrachialis (from the coracoid process to the arm)

- **Action:**

extensor, flexor, abductor, adductor, levator (= lifter), depressor, supinator, pronator, constrictor (sphincter), dilator

Skeletal (mimic) muscle description:
Origin (usually the fix point)
Insertion (usually the moving point)
Innervation (peripheral or cranial nerve)
Function (vector connecting the origin and insertion)

(In the limbs consider also the osteofascial compartment!)

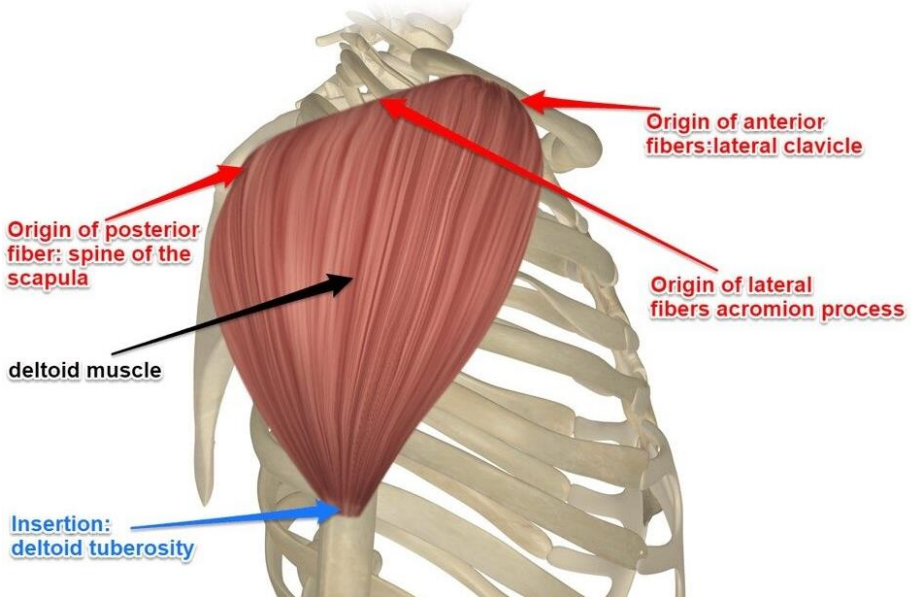


Fig. Deltoid muscle
Notice the different functions of various parts of the pennate muscle

Synovial bursae

Bursae are pouches **enlined by synovia, filled with fluid**, inserted between tendons to **decrease friction** or cussion the tendons from hard surfaces. Caution! Some bursae my communicate with the joint cavity!

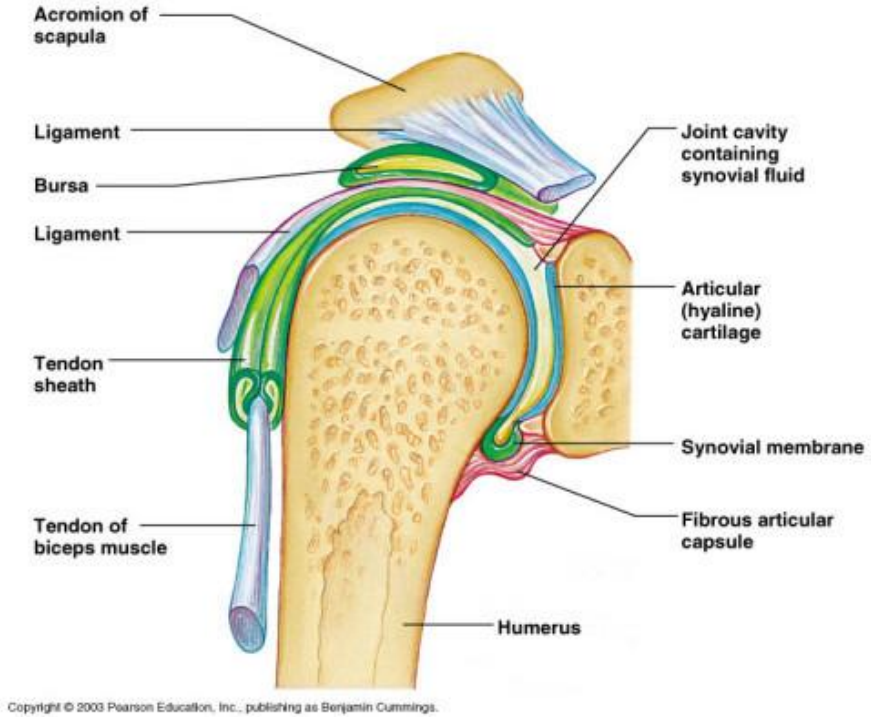


Fig.: Bursae around the shoulder joint

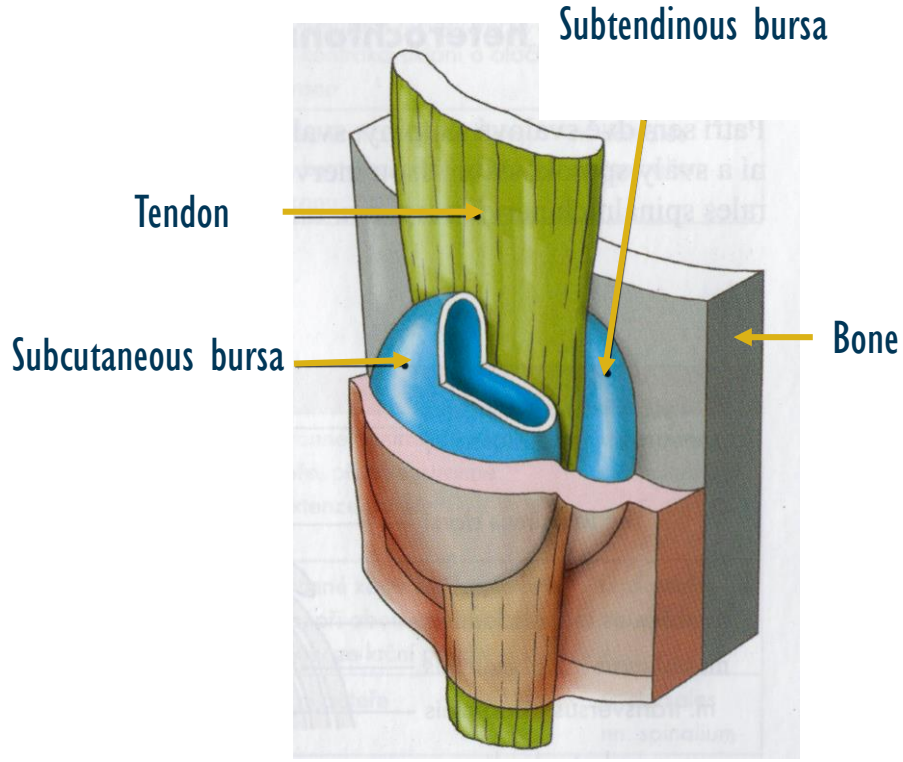


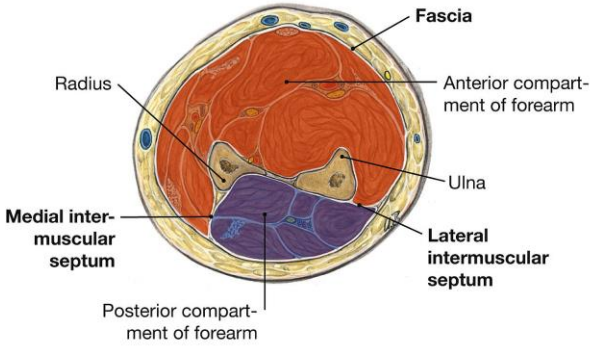
Fig.: Synovial bursa in vicinity of a muscle tenton

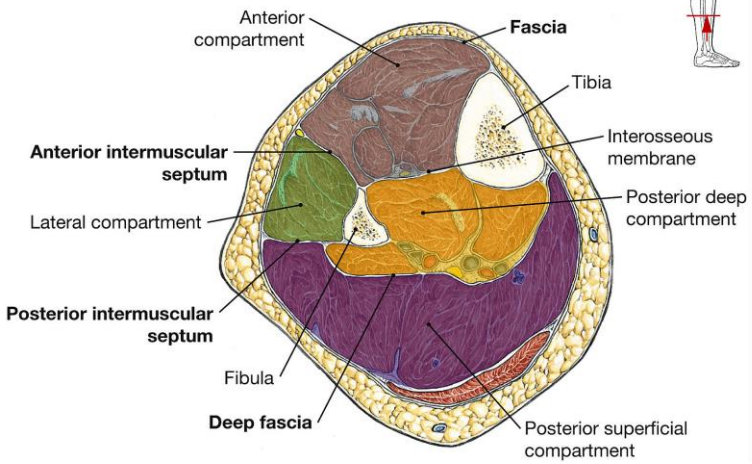
Muscles of the limbs

Limbs: osteo-fascial compartments

muscle groups covered by the joint fascia, separated by septa

! Shared innervation, similar function





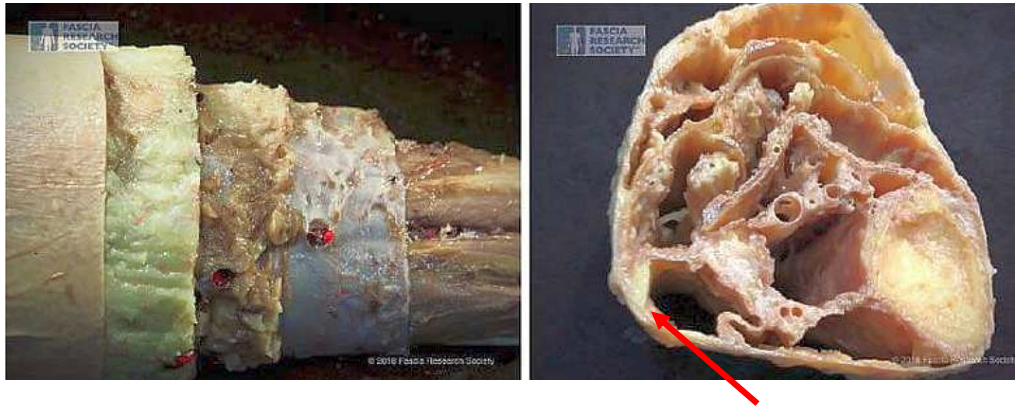
Fascia of forearm and lower leg.

Fascia forms a band or sheet of connective tissue beneath the skin that attaches, stabilizes, encloses or separates muscles and organs from one another.

! Normal fascia enables gliding, smooth movement of the muscle inside !

YouTube video

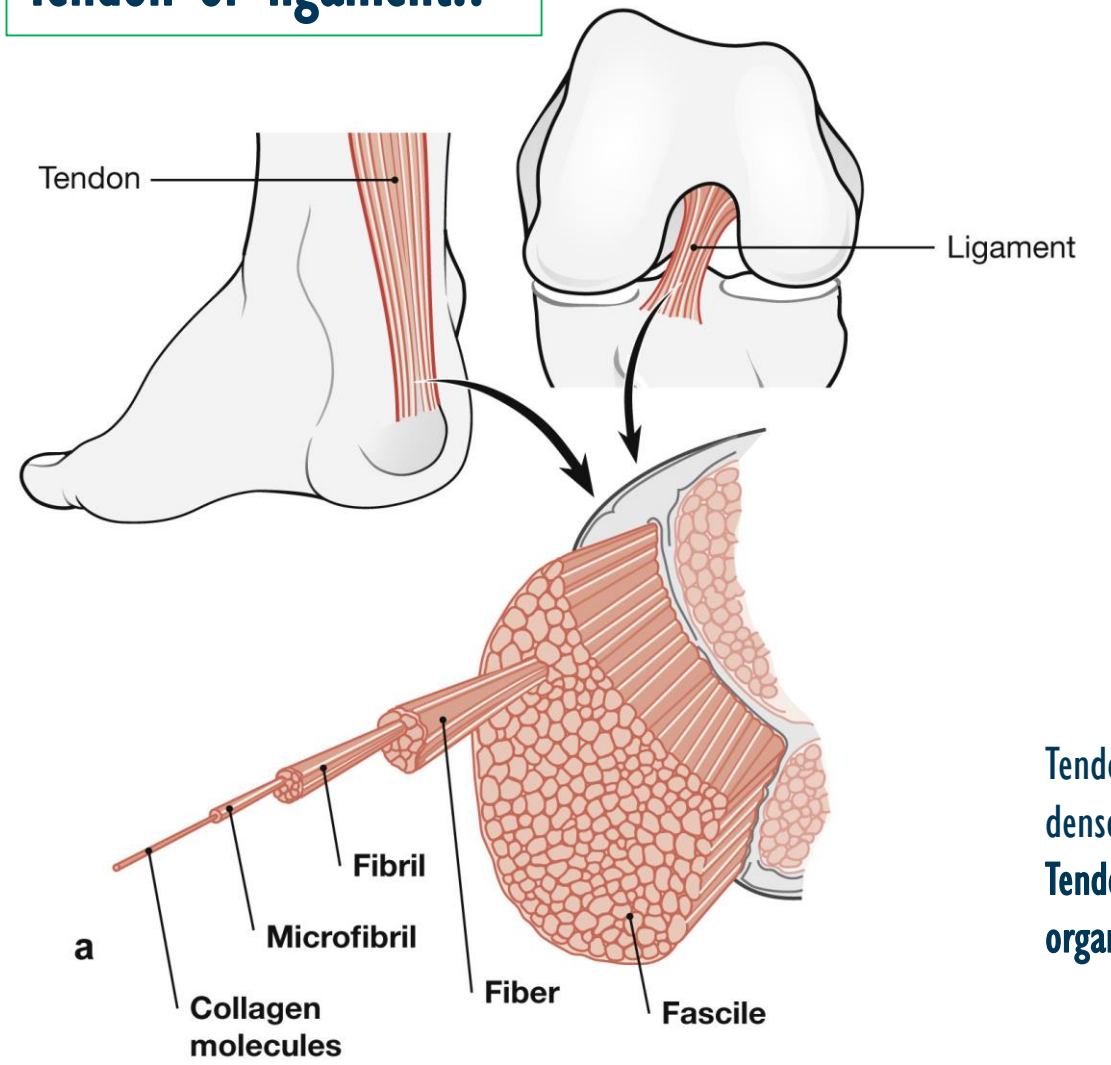
https://www.youtube.com/watch?v=wkdeiMs2nyo



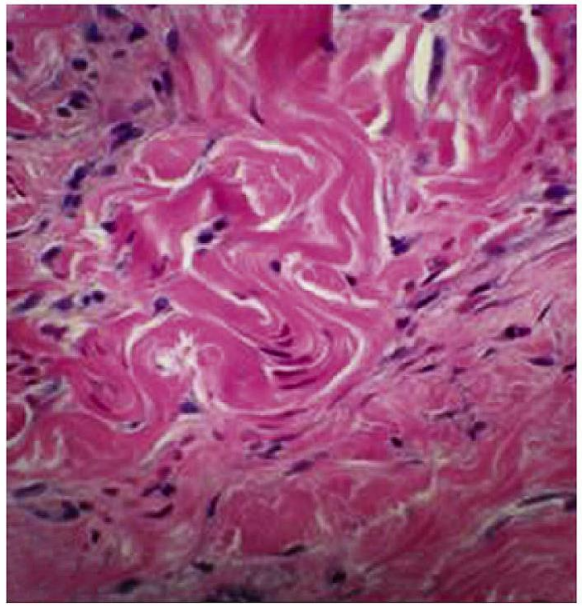
Fascia cruris, crural fascia

Skeletal muscles

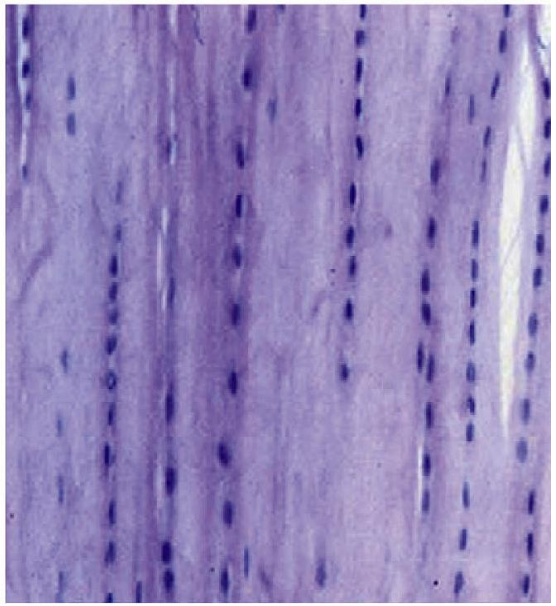
Tendon or ligament?!



Differences in collagen fiber organization



Ligament



Tendon

Tendons and ligaments show a similar construction pattern. They are composed of dense regular connective tissue, with collagen fibers being the primary building block. **Tendons demonstrate uniform patterns of collagen organization around stress; collagen organization in ligaments is more varied.**

Define the APONEUROSIS