# Connections of the skull (juncturae cranii)

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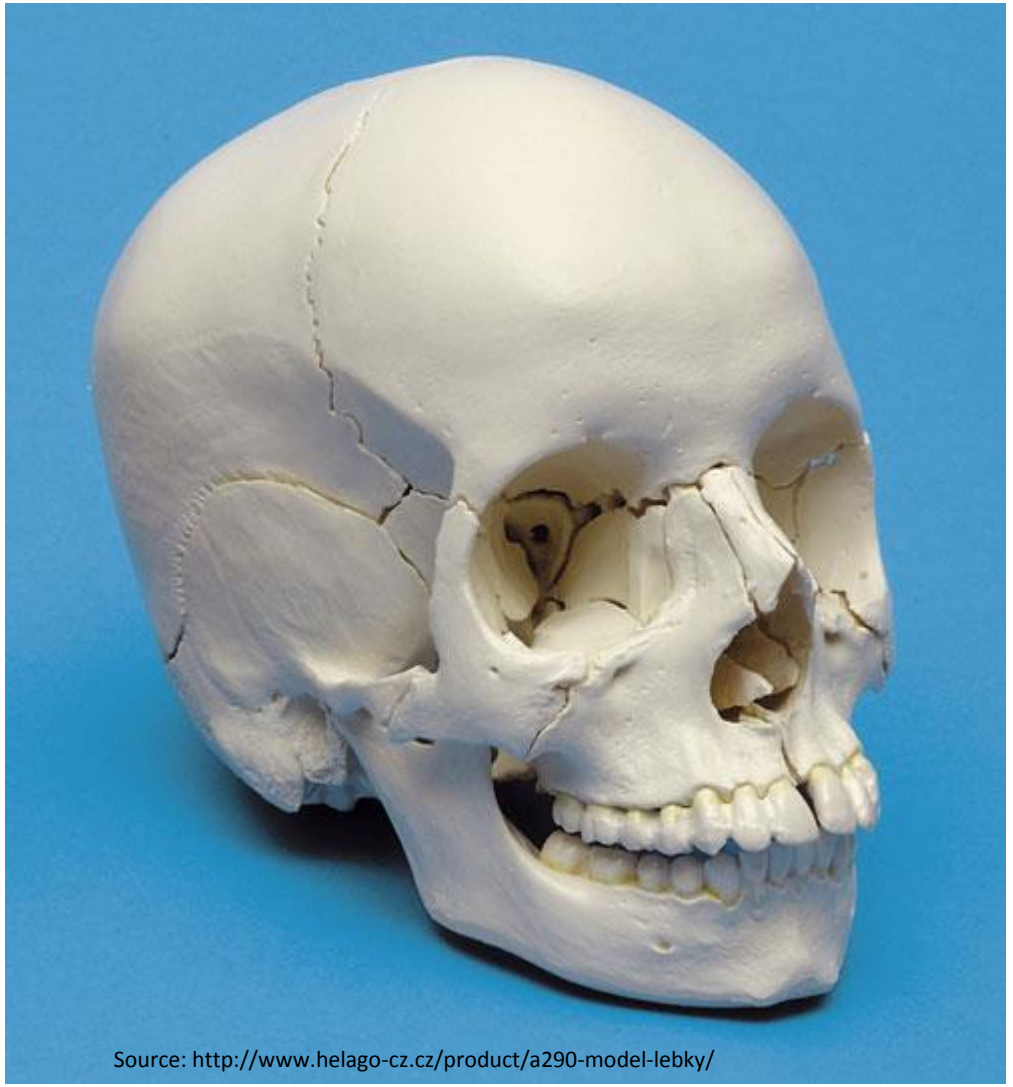
Lecture 8 – DENTISTRY – Autumn 2013

# Junctions of the skull

- craniovetebral junctions
- syndesmoses
- synchondroses
- temporomandibular joint
- hyoid junctions



Source: http://www.helago-cz.cz/product/a290-model-lebky/

## Craniovertebral junctiones

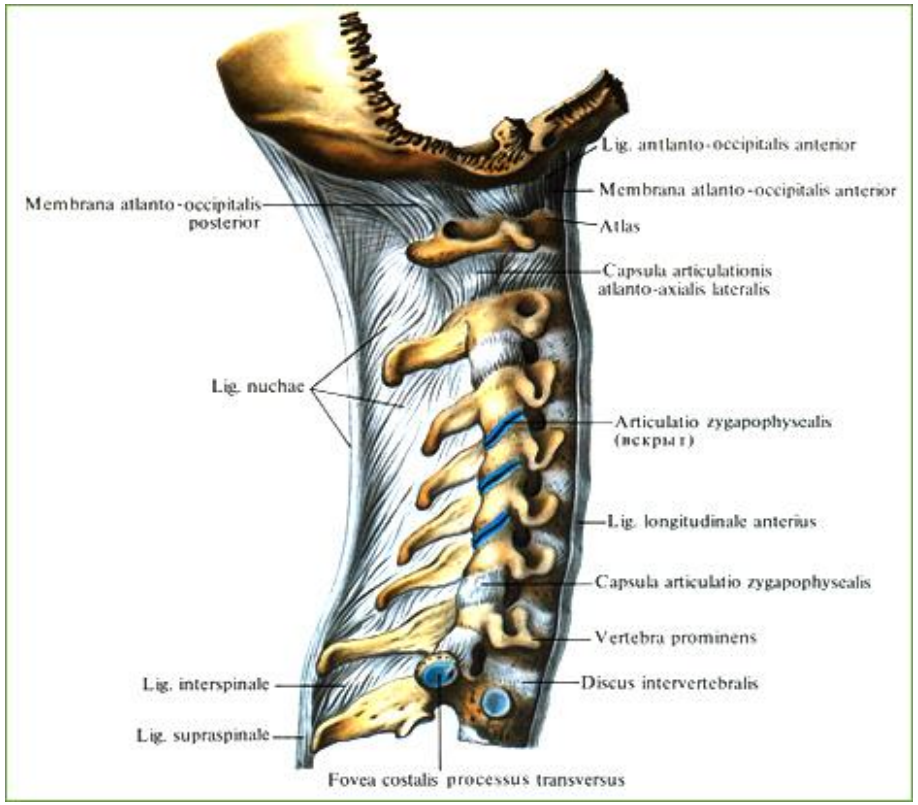
- Connection of the skull with the C1 and C2

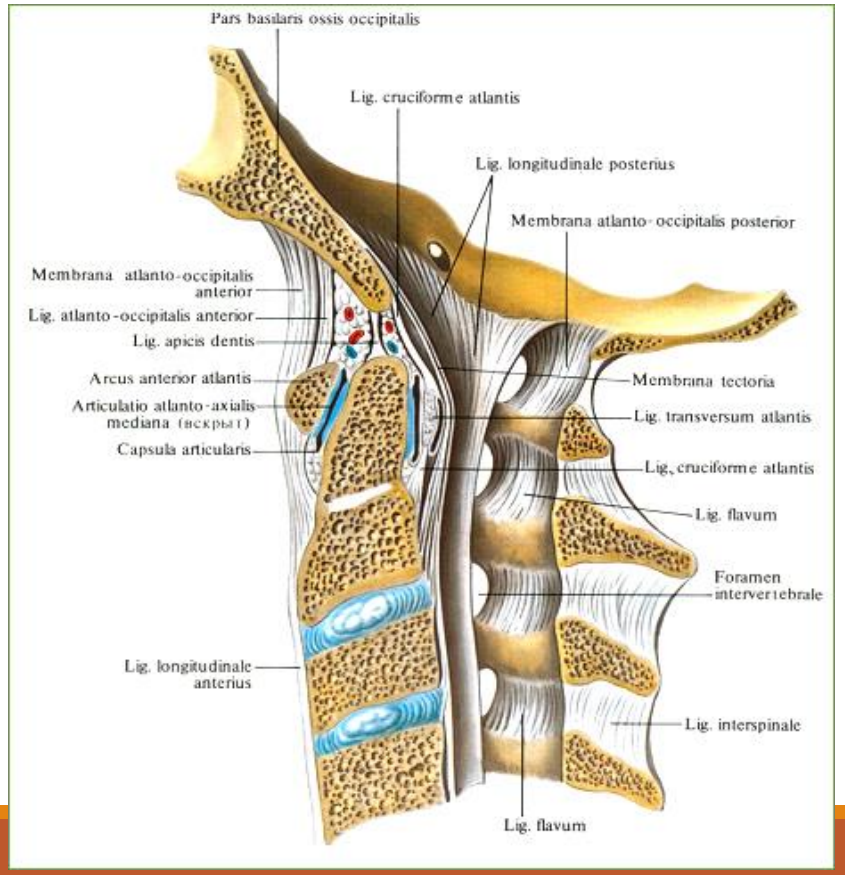
### 1. *Articulatio atlantooccipitalis*

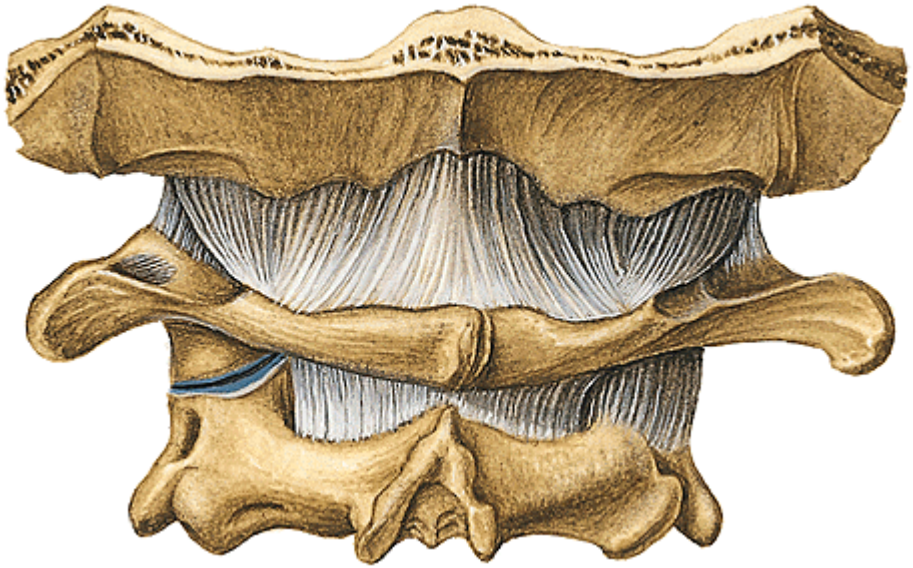
Paired joint

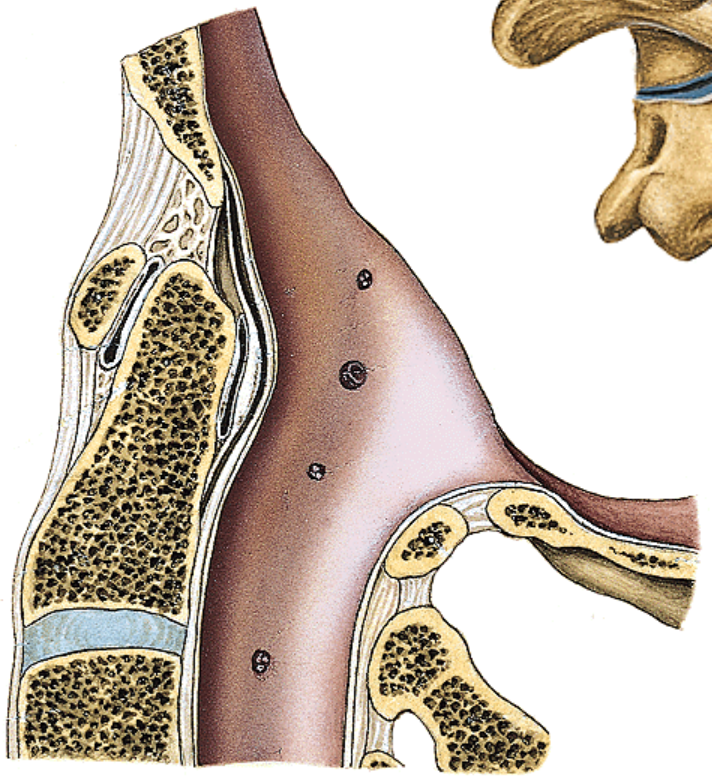
AS:
***condyli occipitales*** and
***foveae articulares superiores***
**of atlas**
AS:
Is attached to the margins of the articular surfaces

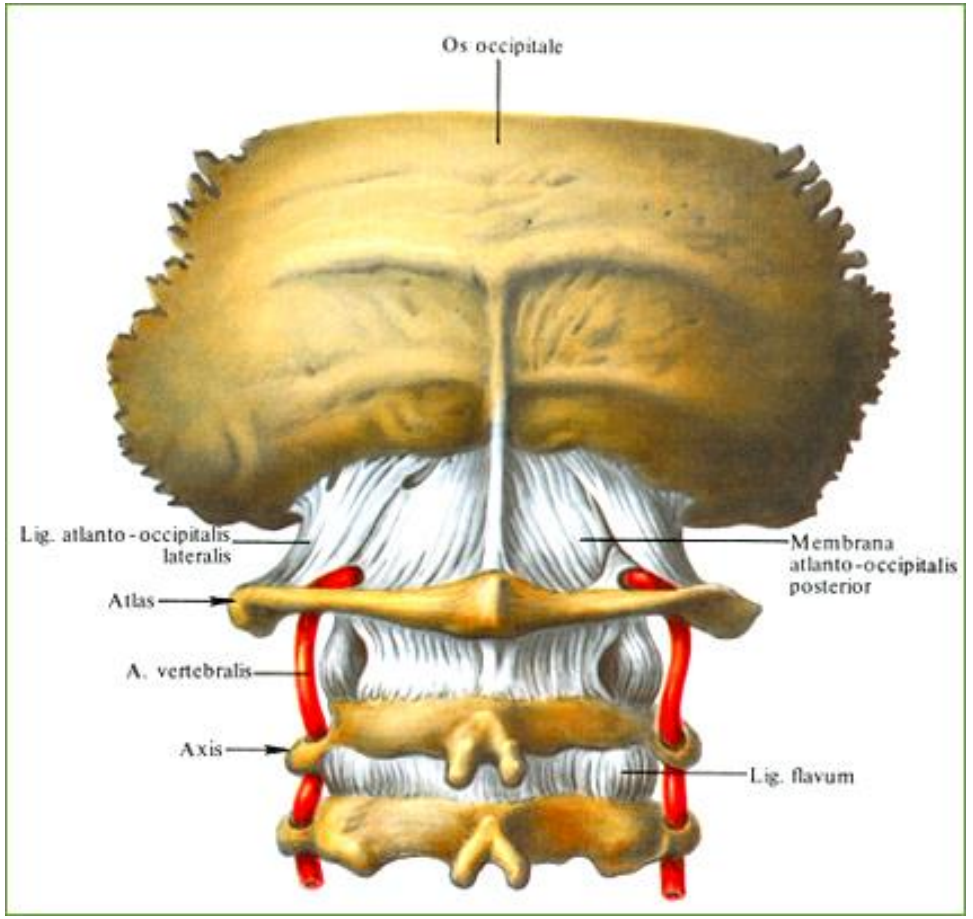
Special apparatus:
***membrana atlantooccipitalis anterior*** and ***posterior***
(between arches of atlas and occipital bone)
***membrana tectoria***
(cranial continuation of ***lig. longitudinale posterius,*** it reaches to *clivus)*
Type of joint: **elipsoidal** with possibility of flexion and extension of the head and there are also possible smaller movements sideways








Os occipitale
Lig. atlanto-occipitalis lateralis
Membrana atlanto-occipitalis posterior
Atlas
A. vertebralis
Axis
Lig. flavum

## 2. *Articulatio atlantoaxialis*

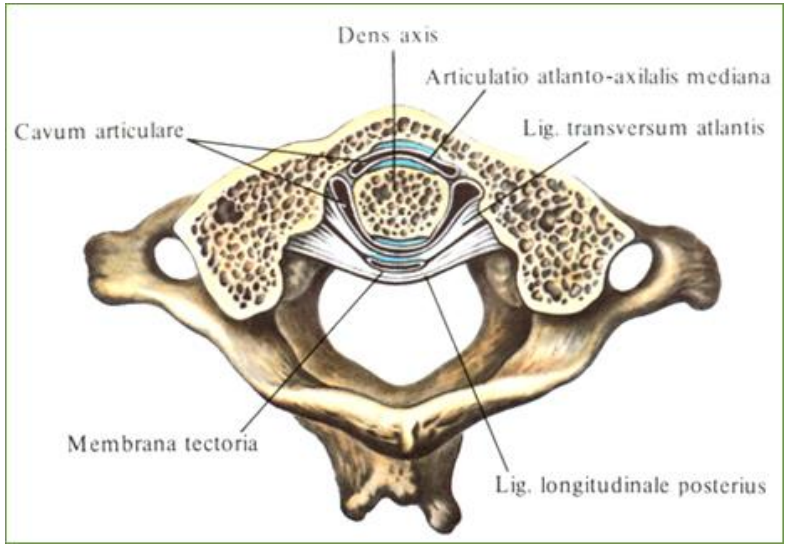
### *a) articulatio atlantoaxialis lateralis*

- Paired joint

AS:

***facies articulares inferiores*** of atlas

***facies articulares superiores*** of axis




### b) *articulatio atlantoaxialis mediana*

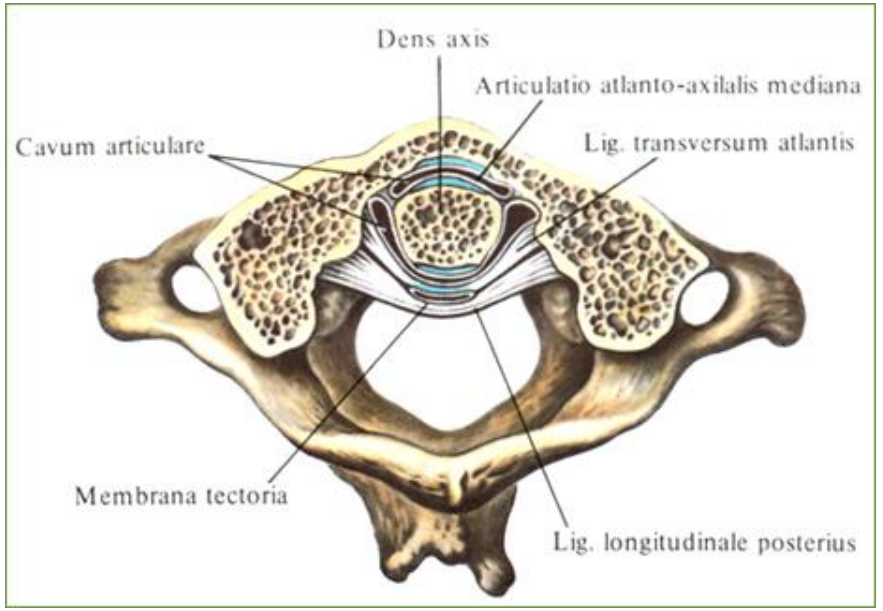
- Unpaired joint

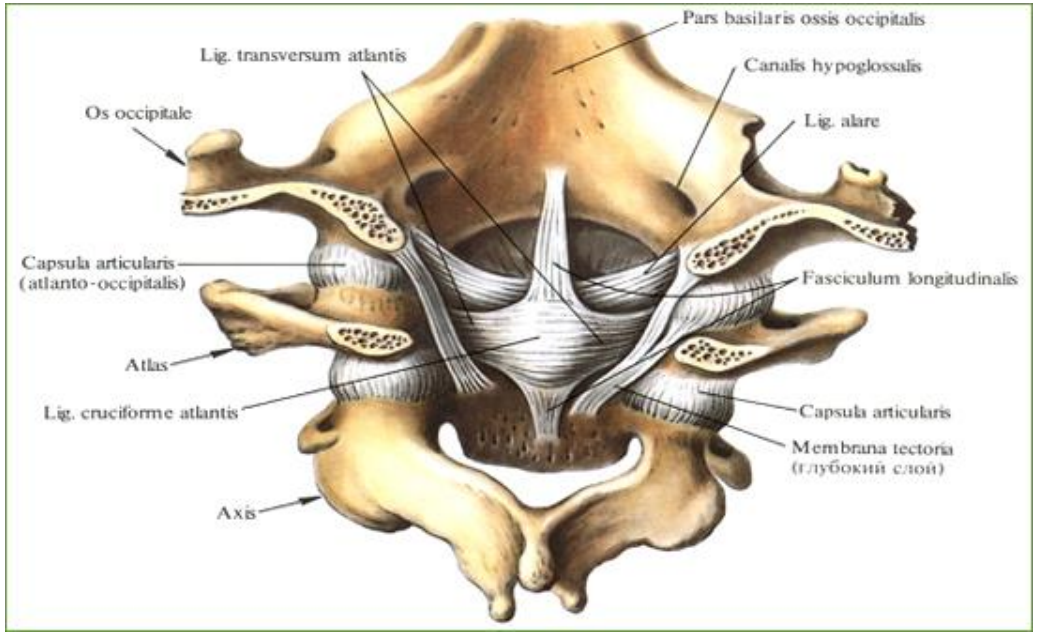
AS:

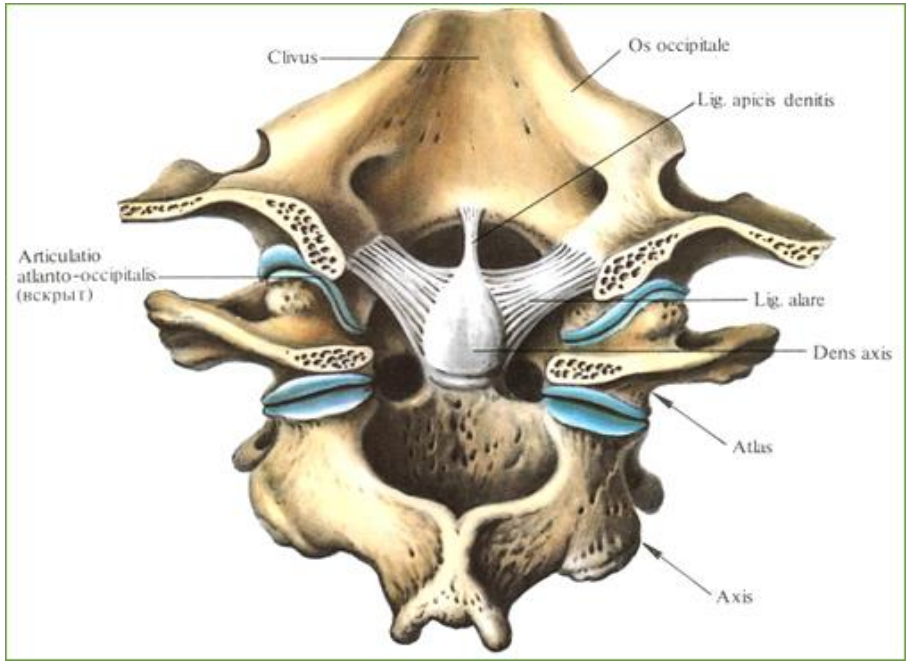
***facies articularis anterior*** on frontal side of *dens axis* with ***fovea dentis*** of atlas and ***facies articularis posterior*** on dorsal side of *dens axis* with ***lig. transversum atlantis***

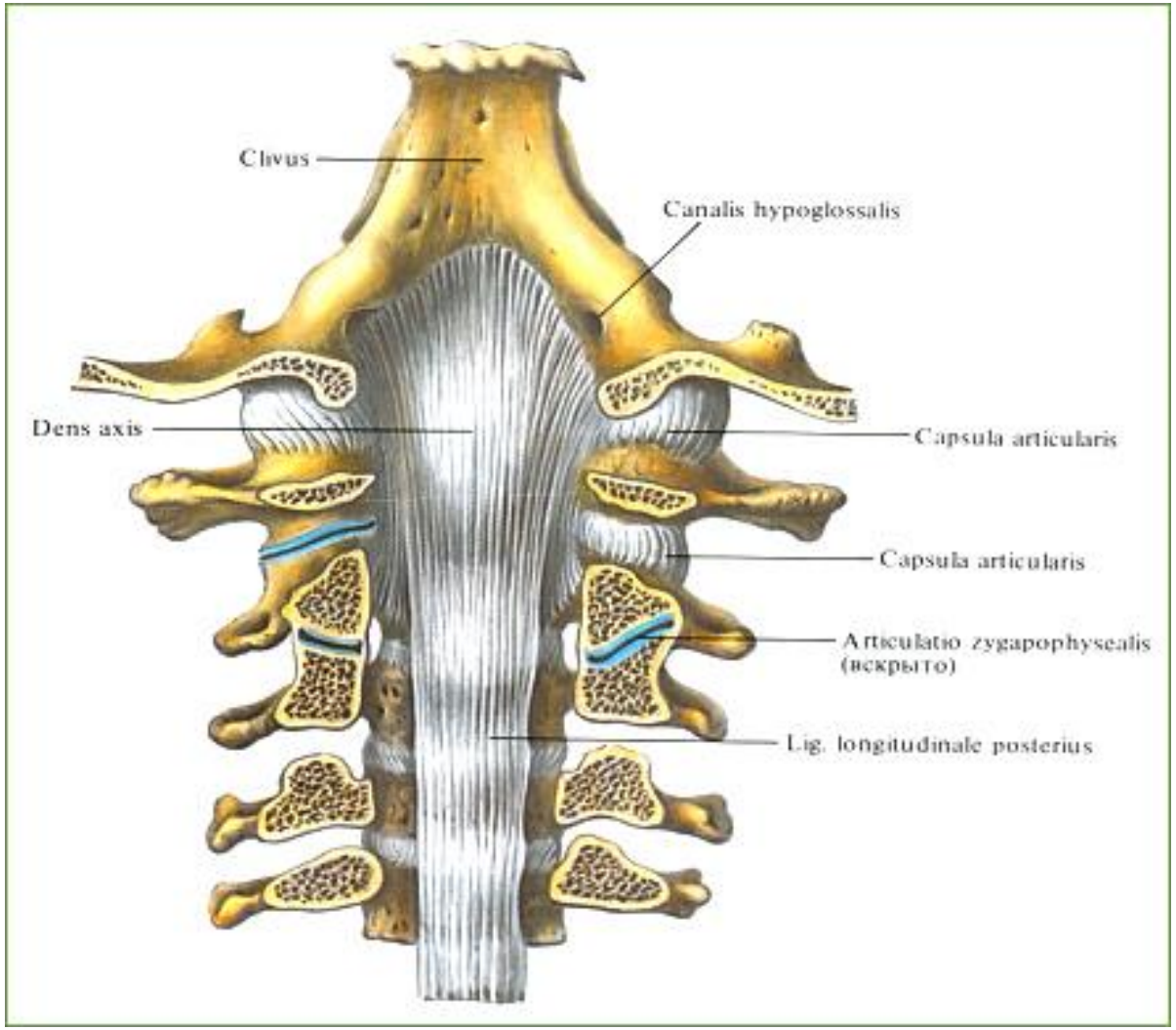
AC: is common and is attached to the margins of the articular surfaces

Special apparatus:
*lig. apicis dentis, ligg. alaria,*
*lig. cruciforme atlantis,* formed by
*lig. transversum atlantis* and *fasciculi longitudinales (*vertical fibrous bands going from axis to occipital bone*)*
Type of joint: both joints form one mechanical unit, atlas is rotating along *dens axis* in range of 60°



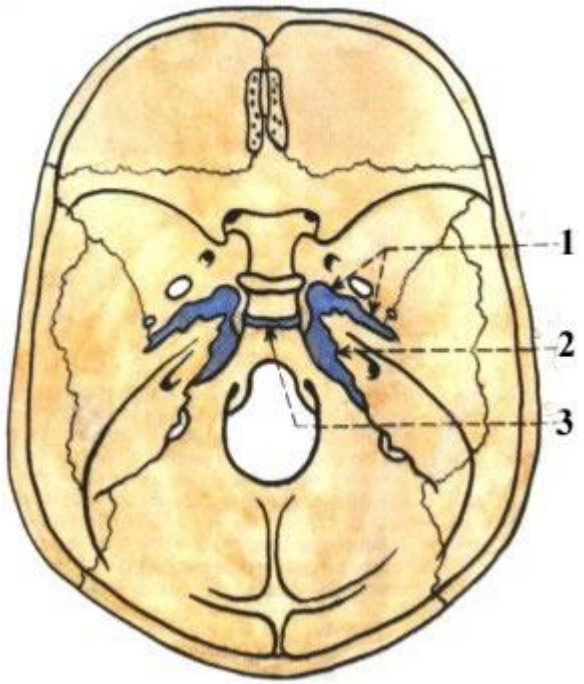

Clivus
Canalis hypoglossalis
Dens axis
Capsula articularis
Capsula articularis
Articulatio zygapophysealis
(вскрыто)
Lig. longitudinale posterius

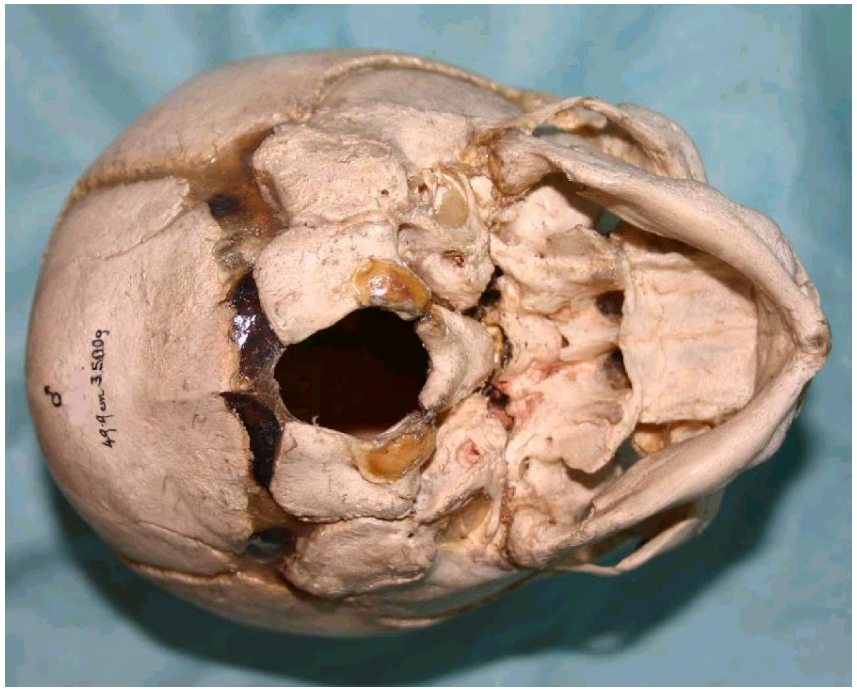
## Skull syndesmoses

Present sutures ***(suturae)***, between the margins of the bones, there is a layer of fibrous tissue

## Skull synchondroses

s. sphenopetrosa
s. petrooccipitalis
s.Interoccipitalis - anterior et posterior
s. intersphenoidalis,
s. sphenooccipitalis
synchrondrosis sphenooccipitalis

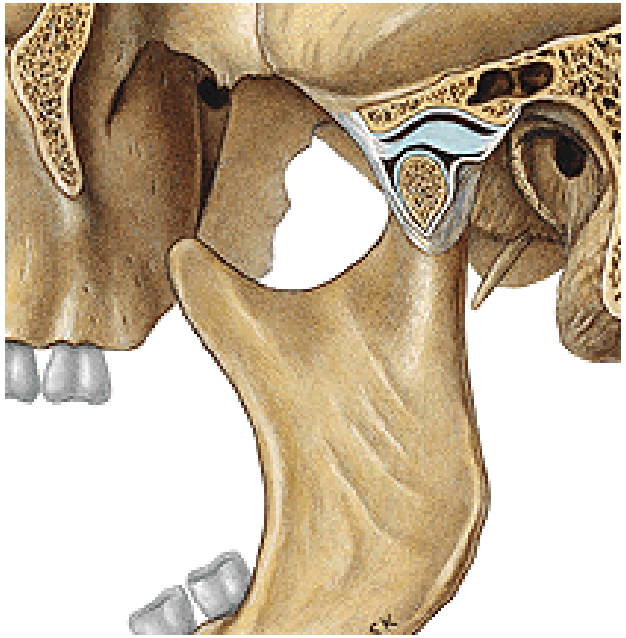


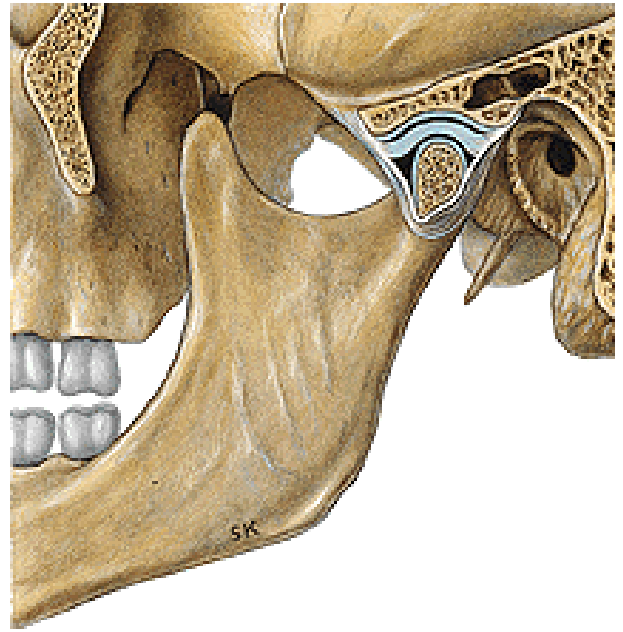



# Temporomandibular joint
## *(articulatio temporomandibularis)*

AS: ***caput mandibulae*** connects with ***fossa mandibularis*** and ***tuberculum articulare*** of temporal bone

AC: is attached to the margins of the articular surfaces, its medial part is very strong, it rows together with *discus articularis*





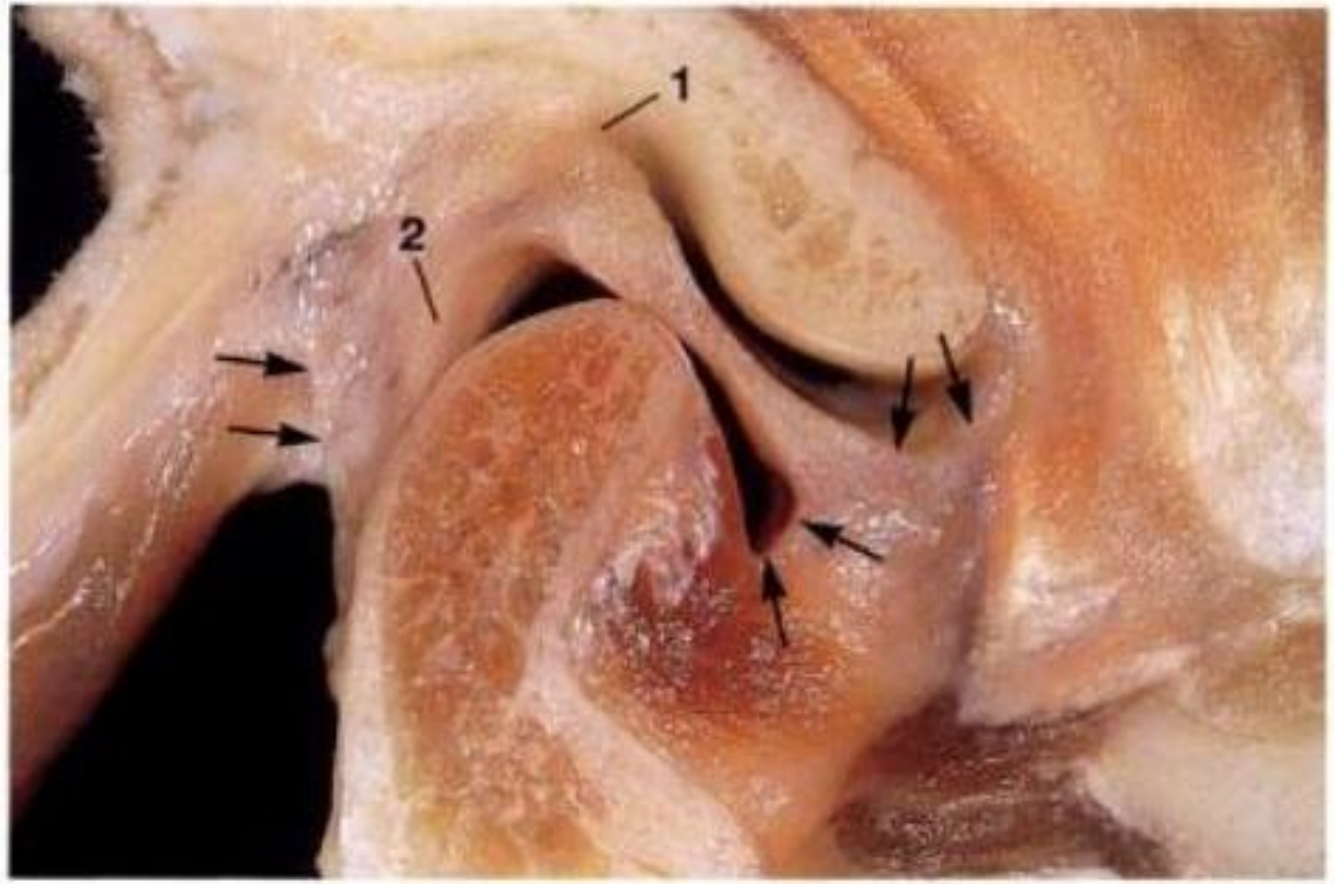
Type of joint: gynglimus (hinge)

Elevation – closing of the mouth
Depresion – opening of the mouth
Protraction – shifting od the chin forwards
Retraction – shifting od the chin backwards

# Special apparatus:

***discus articularis*** (fibrous cartilage):

- its middle part is thiner and the margins are thicker,
- it grows together with articular capsule,
- It reduce sliding friction
- allow the mouth open and close
- it divides articular cavity into:
- upper compartment : ***pars discotemporalis*** – between the condyle and disc (1,2ml)
- lower compartment - ***discomandibularis -*** between the disc and mand. fossa (0,9ml)

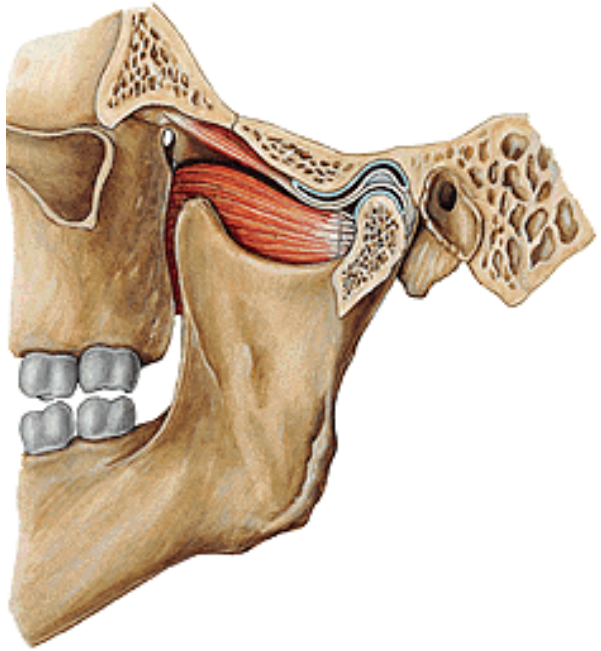


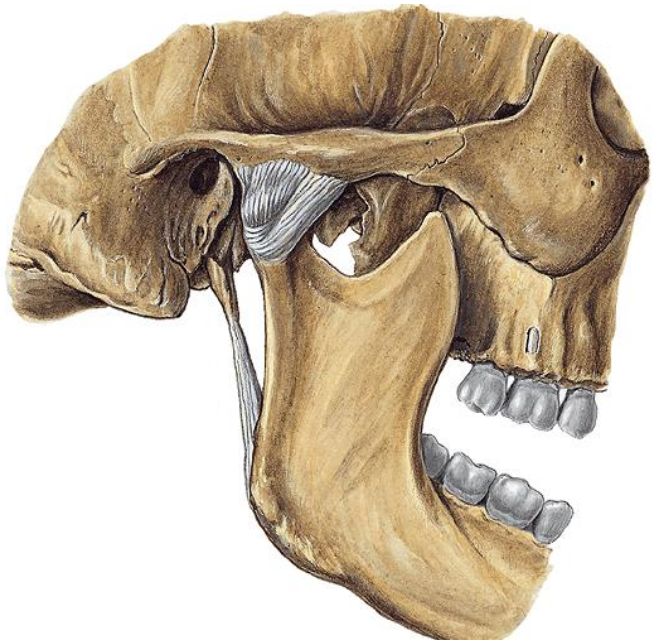
## Ligaments - extraarticular

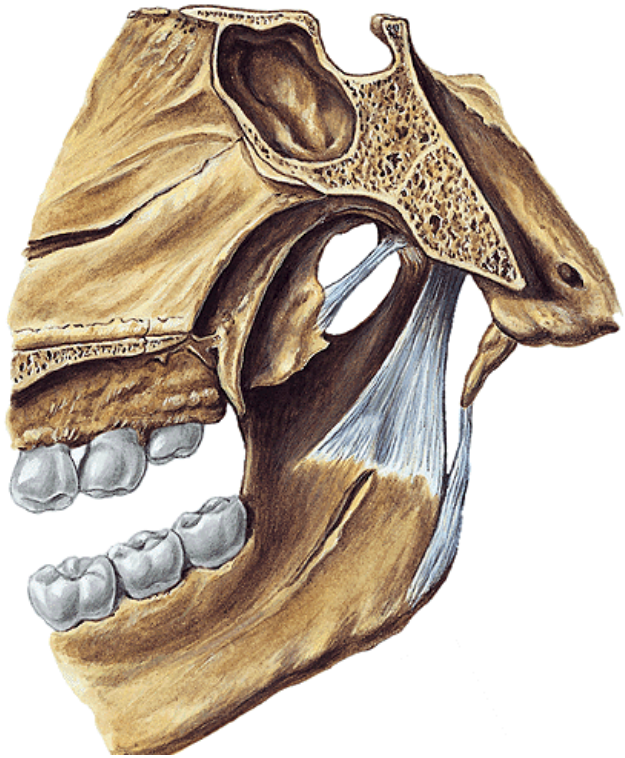
on lateral side: ***lig. laterale***

around the joint: ***lig. sphenomandibulare (***runs from the styloid process → the posterior edge of the angle of the mandible)

***lig. stylomandibulare (***runs from the styloid process → the posterio edge of the angle of the mandible)







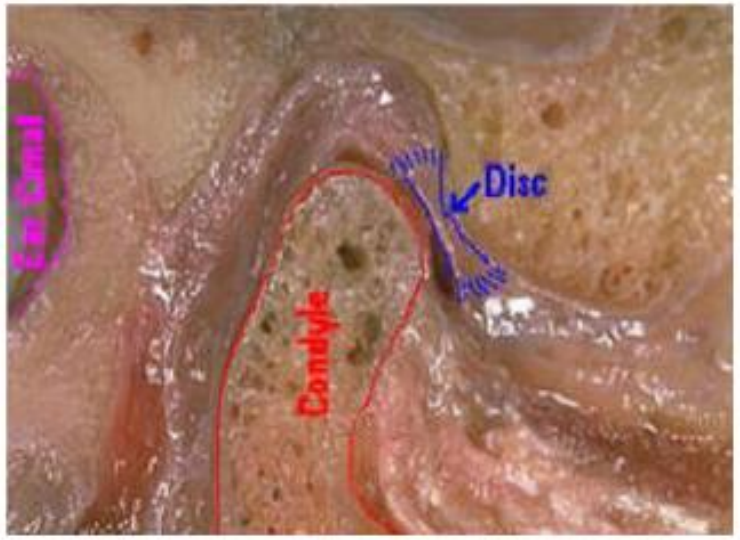
# Movements at the TMJ

## Hinge movement

- type of rotation takes place in the lower compartment between the stationary disc and the moving condyle

## Gliding movement

- takes place in the upper compartment between the superior surface of the disc, which is moving, and mandibular fossa




## Depression - the opening

- with simple rotation at the joint can be achieved 15 - 20mm intericisor distance
- during translation, the disc and condyle move under the articular eminence

## Elevation – the closing

- translation - the condyles move backward and upward along the articular eminence
- rotation upward to attain final position

## Protrusion

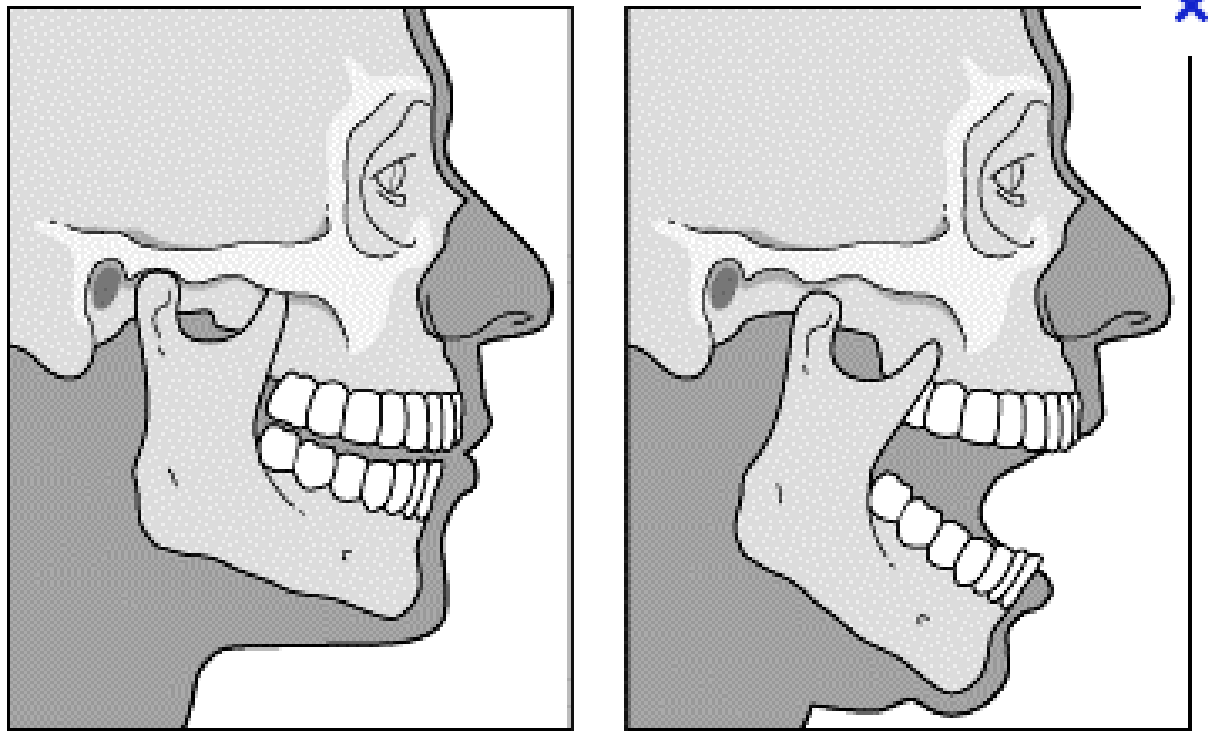
- slide the mandible forward
- maximal protrusion results in the lower incisors being a few mm anterior to the maxillary incisors

## Retrusion

- move the mandible posteriorly
- condyles move backward and upward and reoccupy the mandibular fossa

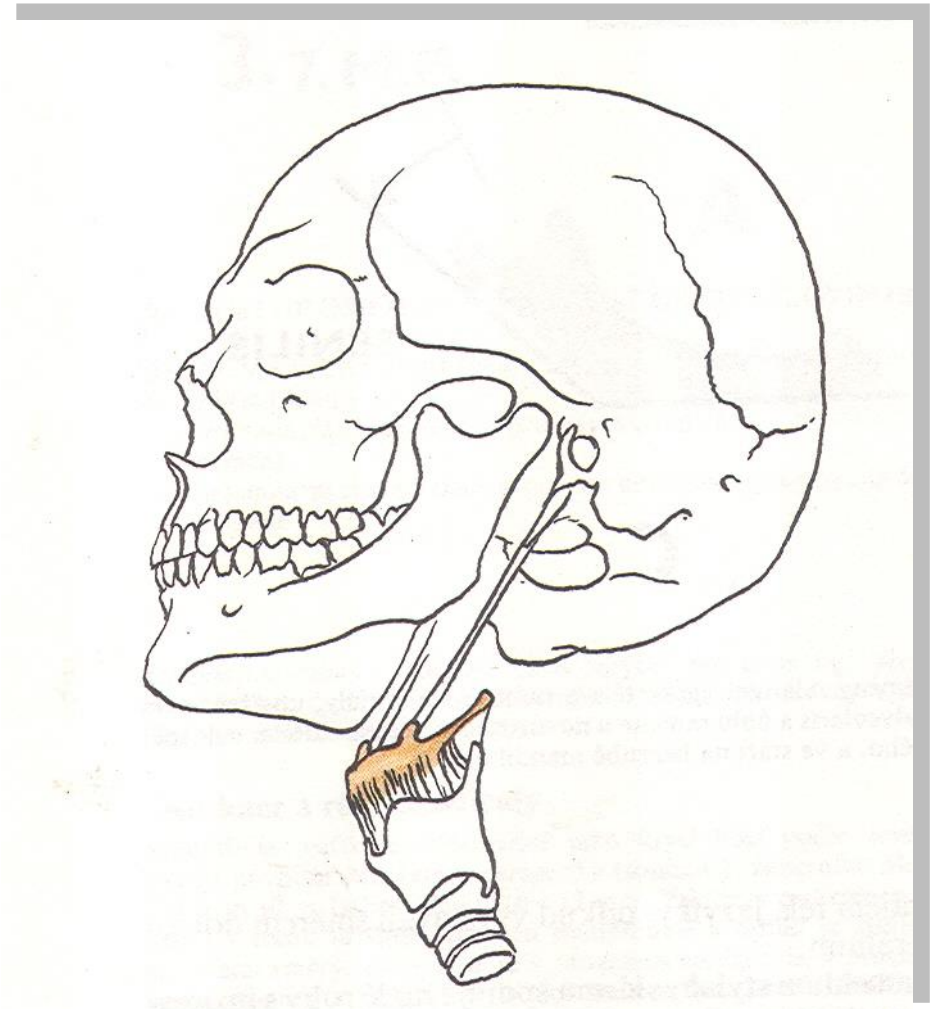
## Laterotrusion

- the condyle move to the right or to the left side



# Hyoid junctions

The skull and hyoid bone connects using muscle and ***lig. stylohyoideum***

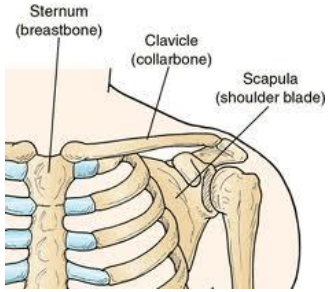


X-ray picture of skull of Maxmilián the 2nd with good visible processus styloideus elongatus, 7 cm long

# Connections of the upper limb
## (juncturae ossium membri superioris)

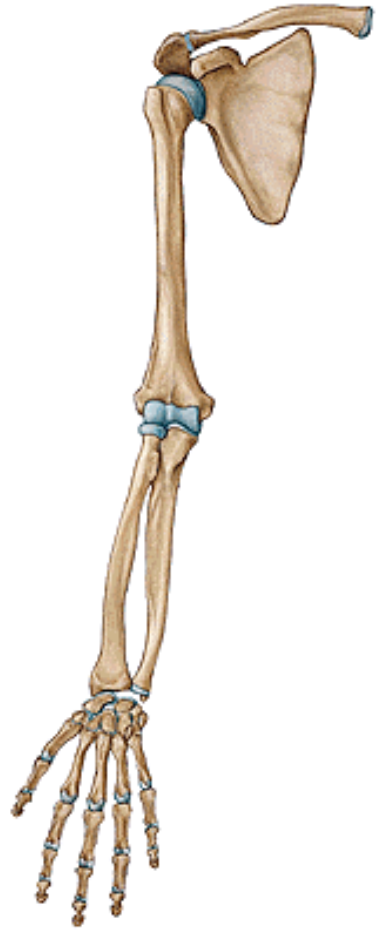
## Connections of the girdle:

scapula + clavicle – **art. acromioclavicularis**
clavicle + sternum – **art. sternoclavicularis**
**Syndesmoses of the shoulder blade**




## Connections of the free upper limb:

Humerus + scapula – **art. humeri**
Humerus + radius + ulna – **art. cubiti**
Radius + ulna – **membrana interossea antebrachii**
– **art. radioulnaris distalis**
Radius + carpal bones– **art. radiocarpea**
Carpal bones – **art. mediocarpea**
carpal + metacarpal bones– **art. carpometacarpea**
Metacarpal bones + phalanges proximales – **art. metacarpophalangea**
Phalanges – **art. interphalangea manus**

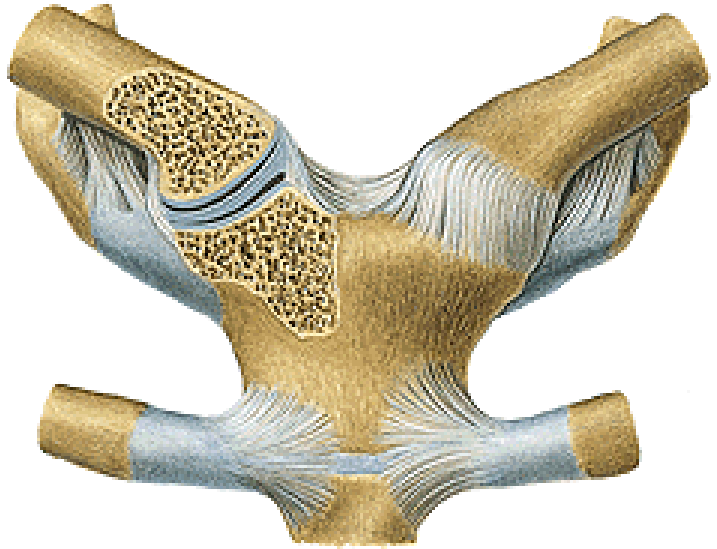


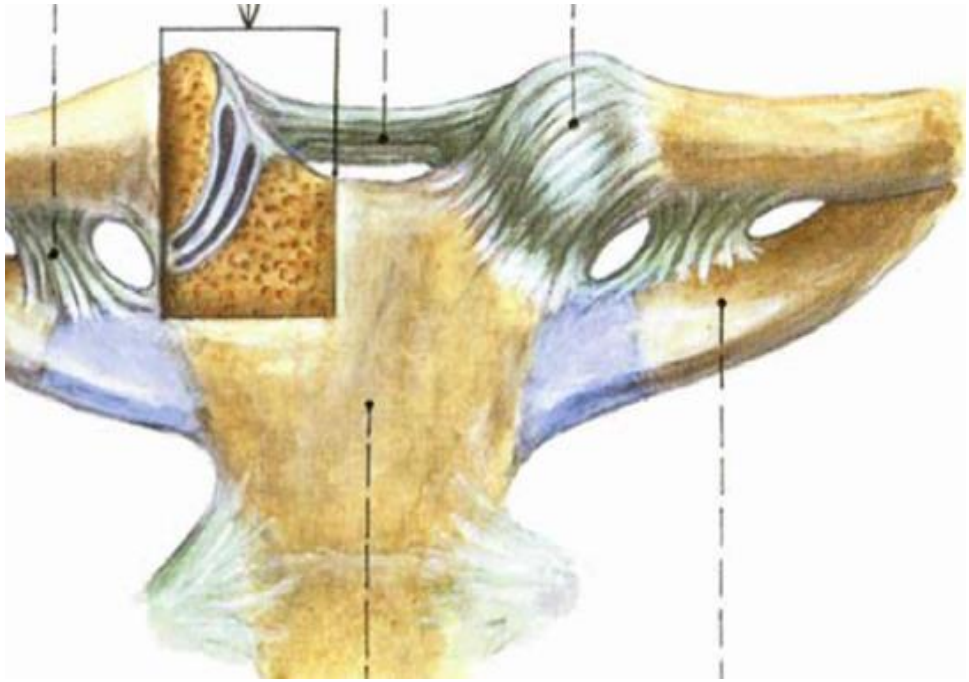
# I. Articulatio sternoclavicularis

*Type:* compound joint- discus articularis
ball and socket (movements in connection to the scapula movements)
*A. head:* facies articularis sternalis claviculae
*A. fossa:* incisura clavicularis manubrii sterni
*AC:* tough, short
*Ligaments:*

lig. sternoclaviculare anterius
lig. sternoclaviculare posterius
lig. interclaviculare
lig. costoclaviculare

*Movements:* ***small,*** to all direction

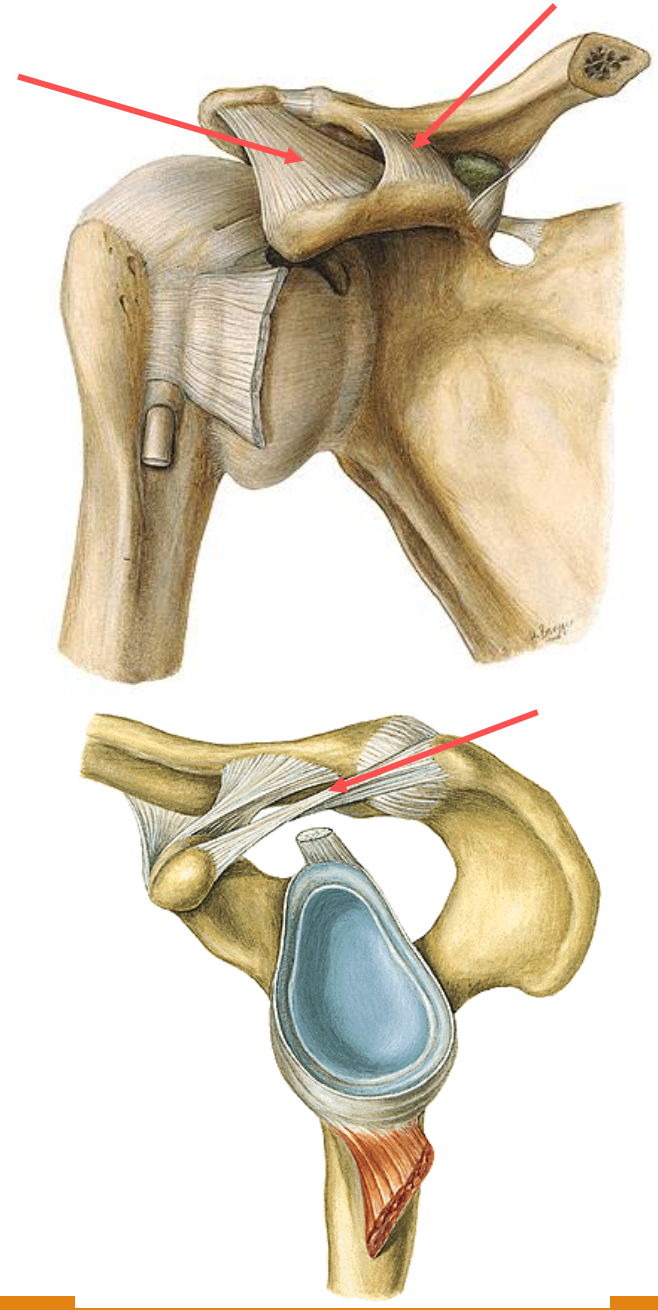


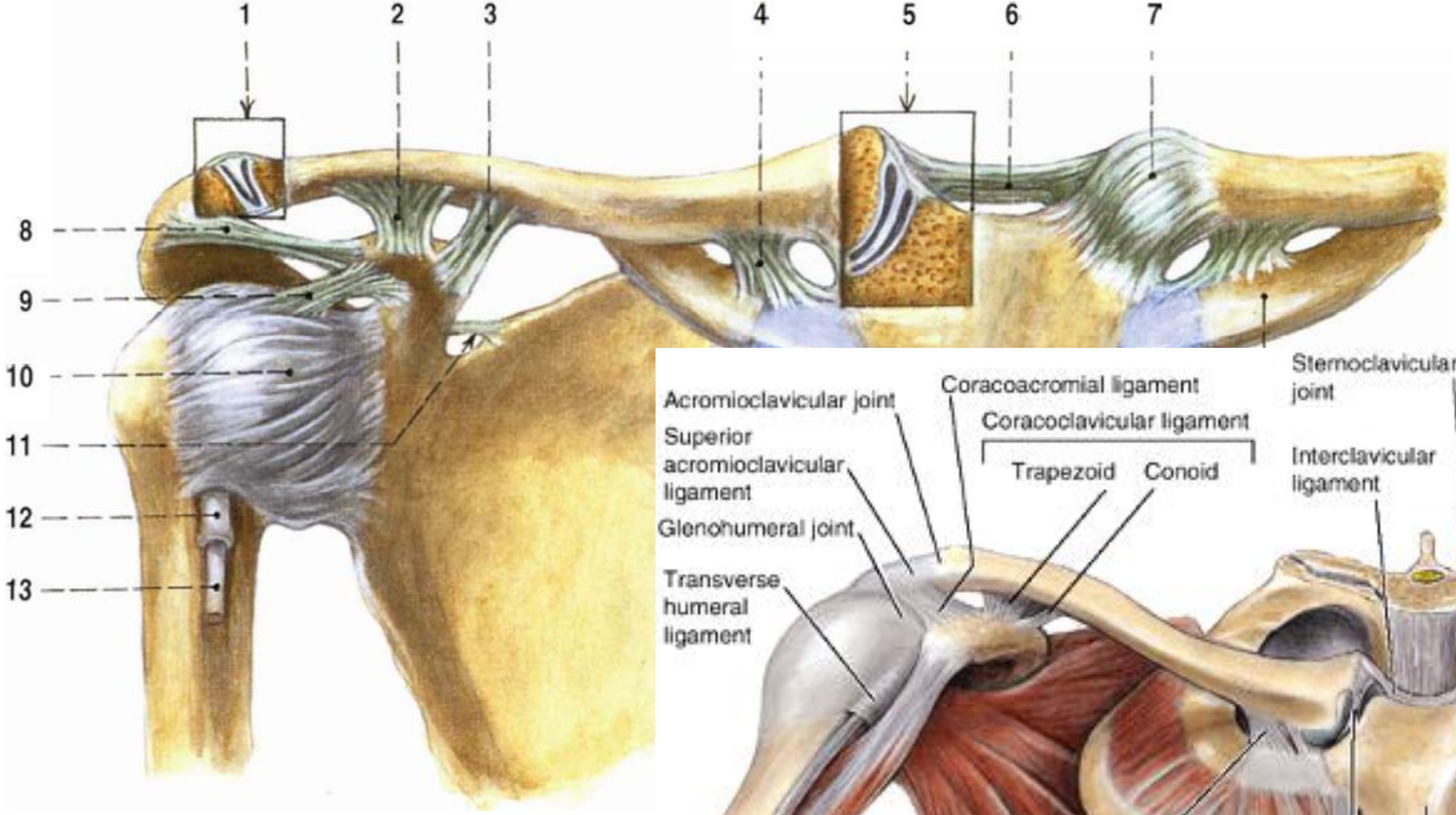


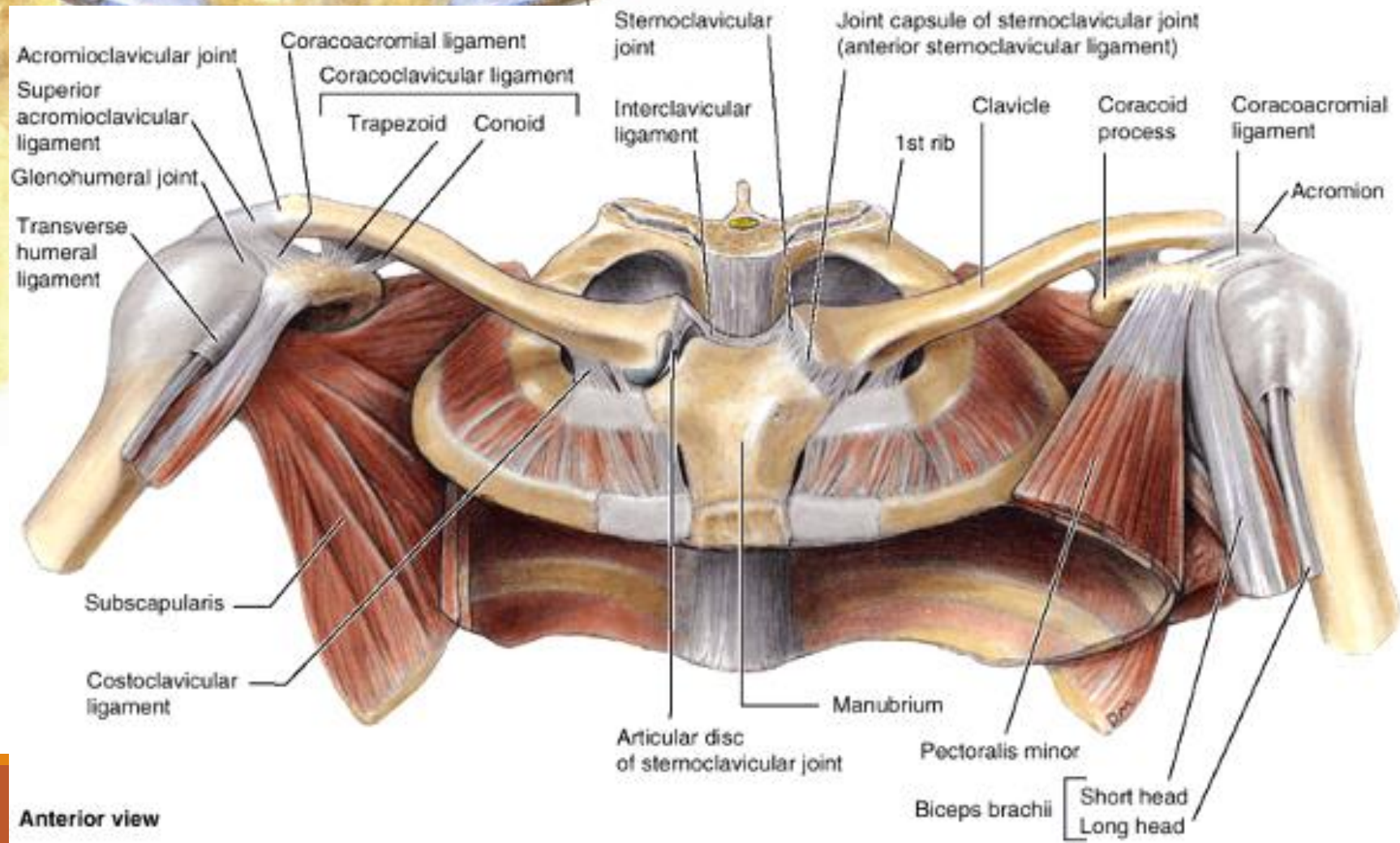
# II. Articulatio acromioclavicularis

*Type:* ball and socket, sometimes discus articularis
*AS:* facies art. acromialis (clavicula) + facies art. acromii (scapula)
*AC:* tough, short
*ligaments:*
lig. acromioclaviculare
lig. coracoclaviculare (lig. trapezoideum + lig. conoideum)
lig. coracoacromiale - fornix humeri
lig. transversum scapulae

*movements:*
restricted, in connections with movements in sternoclavicular joint






**Anterior view**

## Syndesmoses of the shoulder blade:

lig. transversum scapulae

lig. coracoacromiale - fornix humeri

## Movements of the scapula:

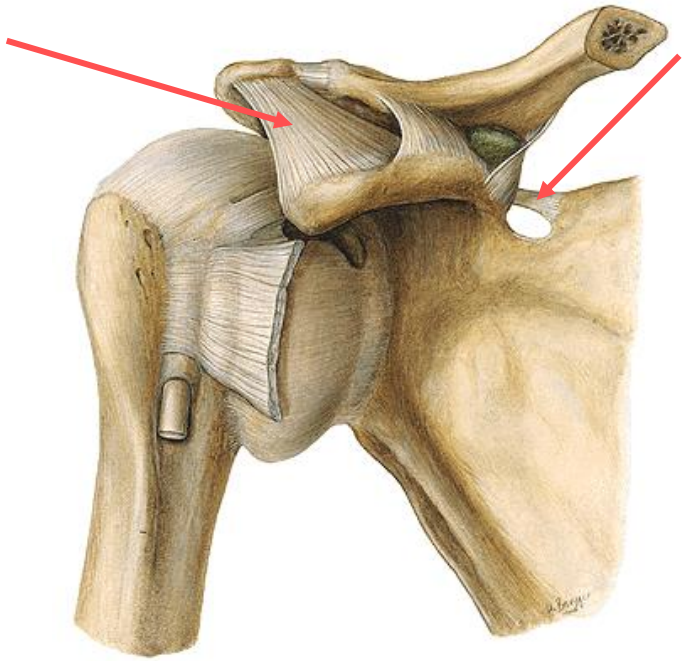
Retraktion

Protraktion

Elevation

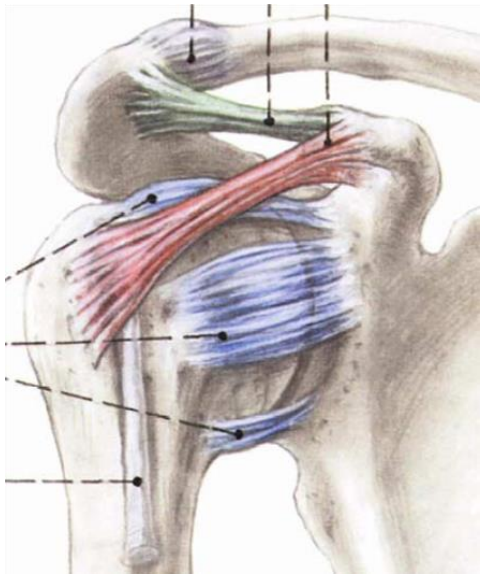
Depresion

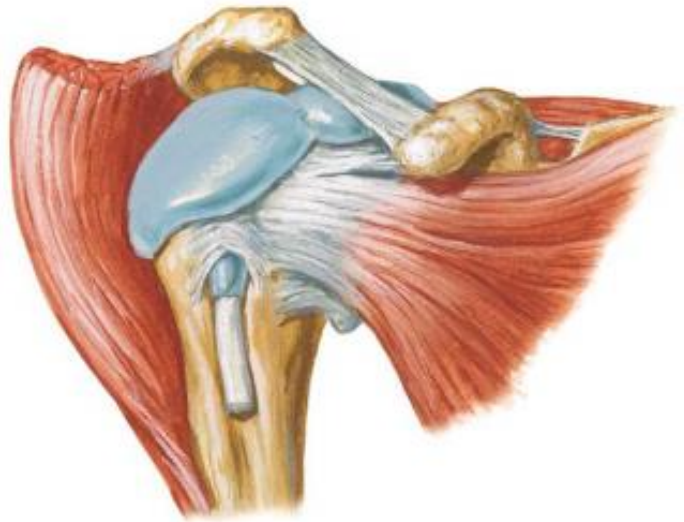
Rotation

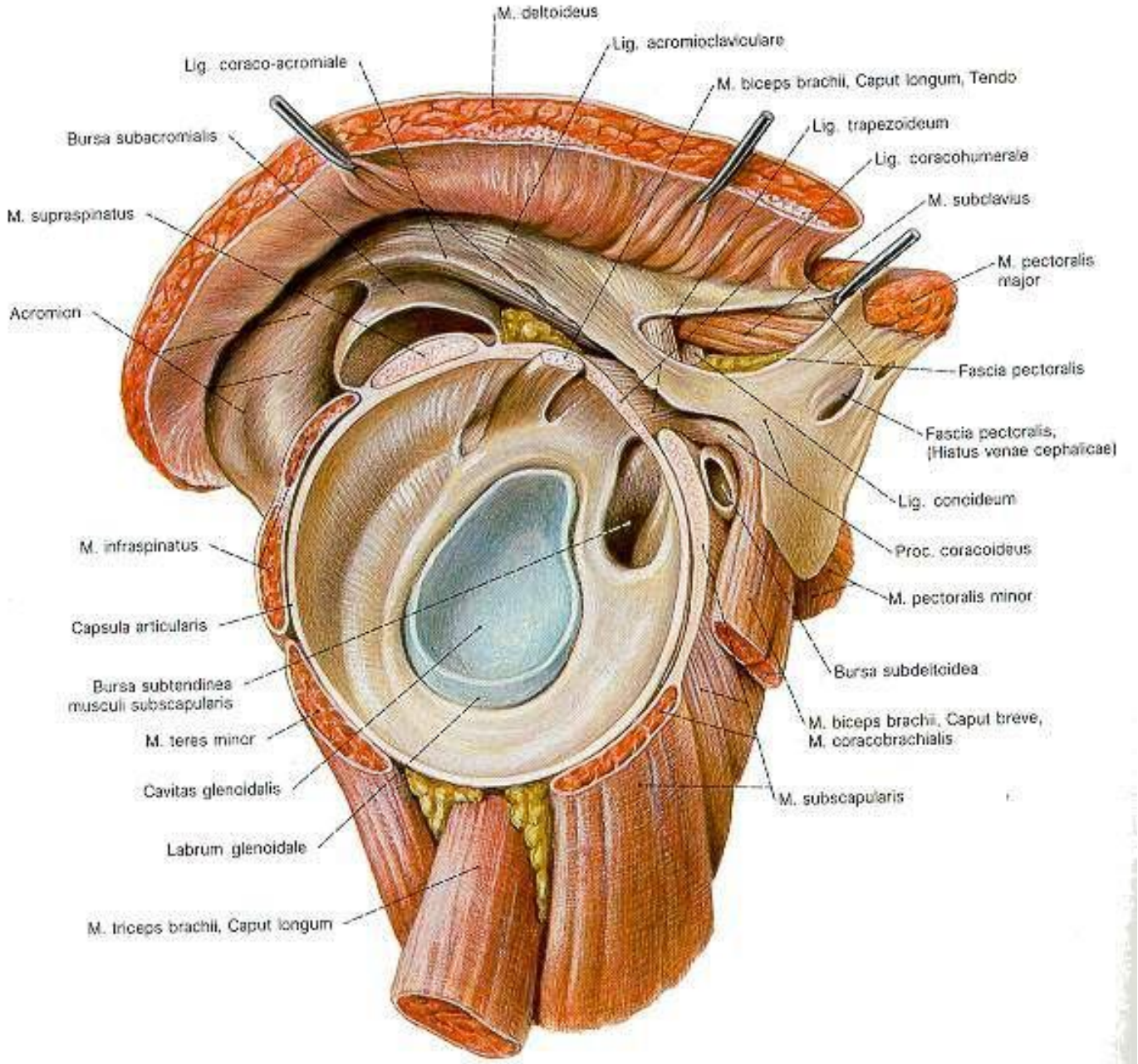


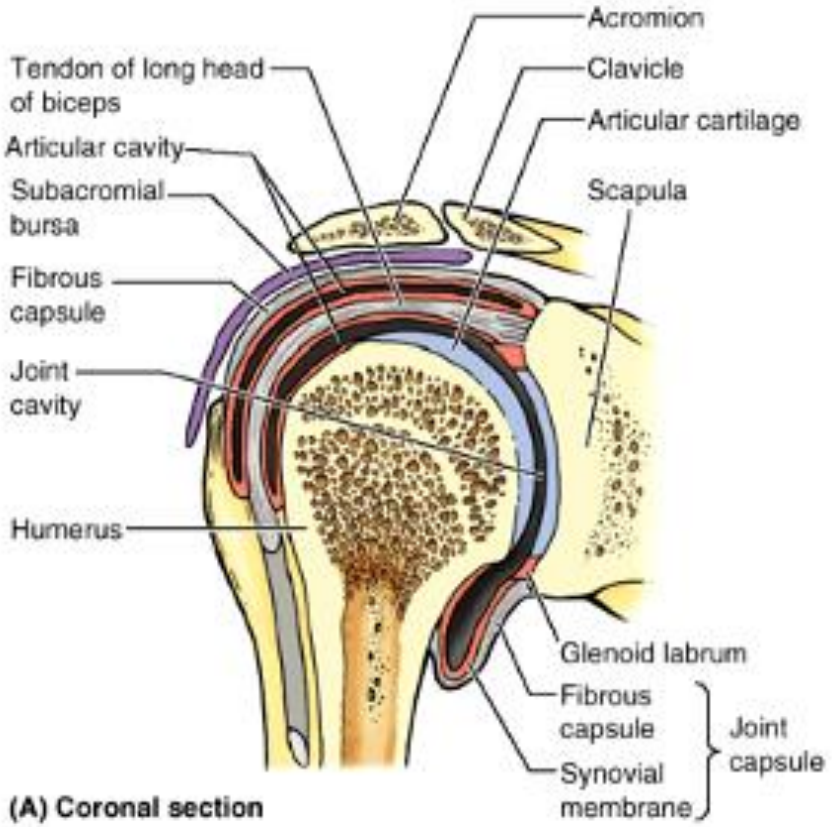
# Glenohumeral joint (art. humeri)

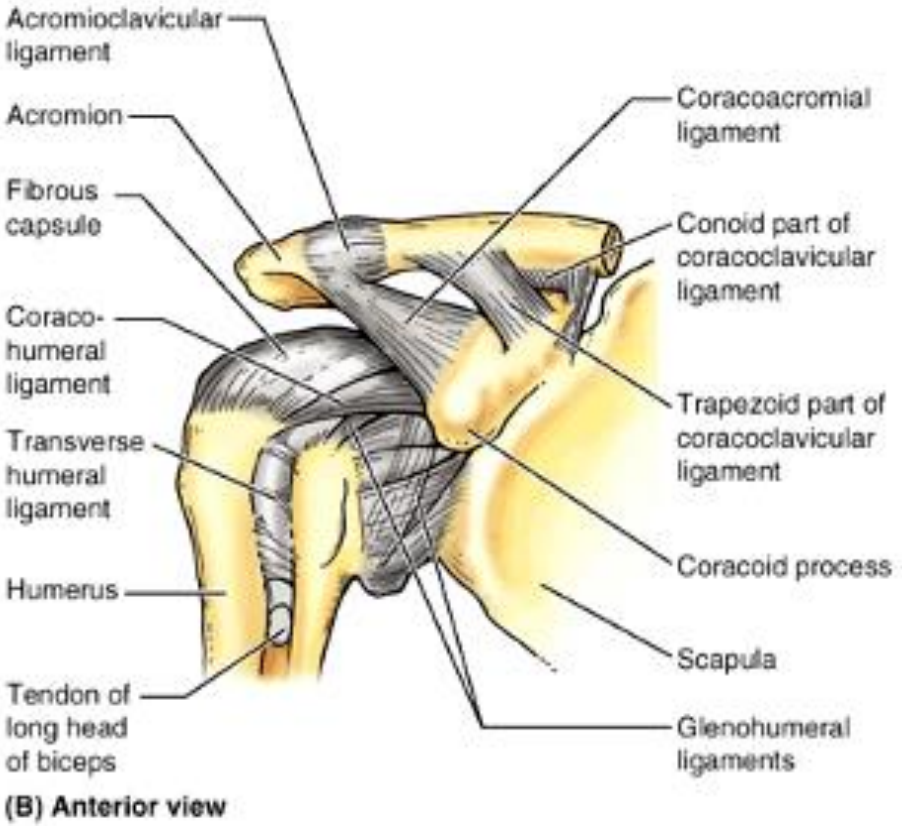
- Ball-and-socket type of joint → wide range of movement  ARTHRODIA (its mobility makes the joint relatively unstable)
- AS: humeral head articulates with the relatively shallow glenoid cavity of the scapula – deepened by the ring-like fibrocartilaginous glenoid labrum
- AC: from the margins of the pits to the collum anatomicum humeri, at the ventral side makes synovial layer around the long head of biceps
- Ligaments:
  - **lig. coracohumerale**
  - **ligg. glenohumeralia**
  - **lig. coracoacromiale  (fornix humeri)**
  - **Bursa subacromialis, subcoracoidea, subdeltoidea**






M. deltoideus
Lig. acromioclaviculare
Lig. coraco-acromiale
M. biceps brachii, Caput longum, Tendo
Bursa subacromialis
Lig. trapezoideum
Lig. coracohumerale
M. subclavius
M. supraspinatus
M. pectoralis major
Acromion
Fascia pectoralis
Fascia pectoralis, (Hiatus venae cephalicae)
Lig. coracoideum
M. infraspinatus
Proc. coracoideus
M. pectoralis minor
Capsula articularis
Bursa subdeltoidea
Bursa subtendinea musculi subscapularis
M. biceps brachii, Caput breve, M. coracobrachialis
M. teres minor
Cavitas glenoidalis
M. subscapularis
Labrum glenoidale
M. triceps brachii, Caput longum


Acromion
Clavicle
Articular cartilage
Scapula
Tendon of long head of biceps
Articular cavity
Subacromial bursa
Fibrous capsule
Joint cavity
Humerus
Glenoid labrum
Fibrous capsule
Synovial membrane
Joint capsule
(A) Coronal section


Acromioclavicular ligament
Acromion
Fibrous capsule
Coraco-humeral ligament
Transverse humeral ligament
Humerus
Tendon of long head of biceps
Coracoacromial ligament
Conoid part of coracoclavicular ligament
Trapezoid part of coracoclavicular ligament
Coracoid process
Scapula
Glenohumeral ligaments
(B) Anterior view

MOVEMENTS:

**Ventral and dorsal flexion**

**abduktion**

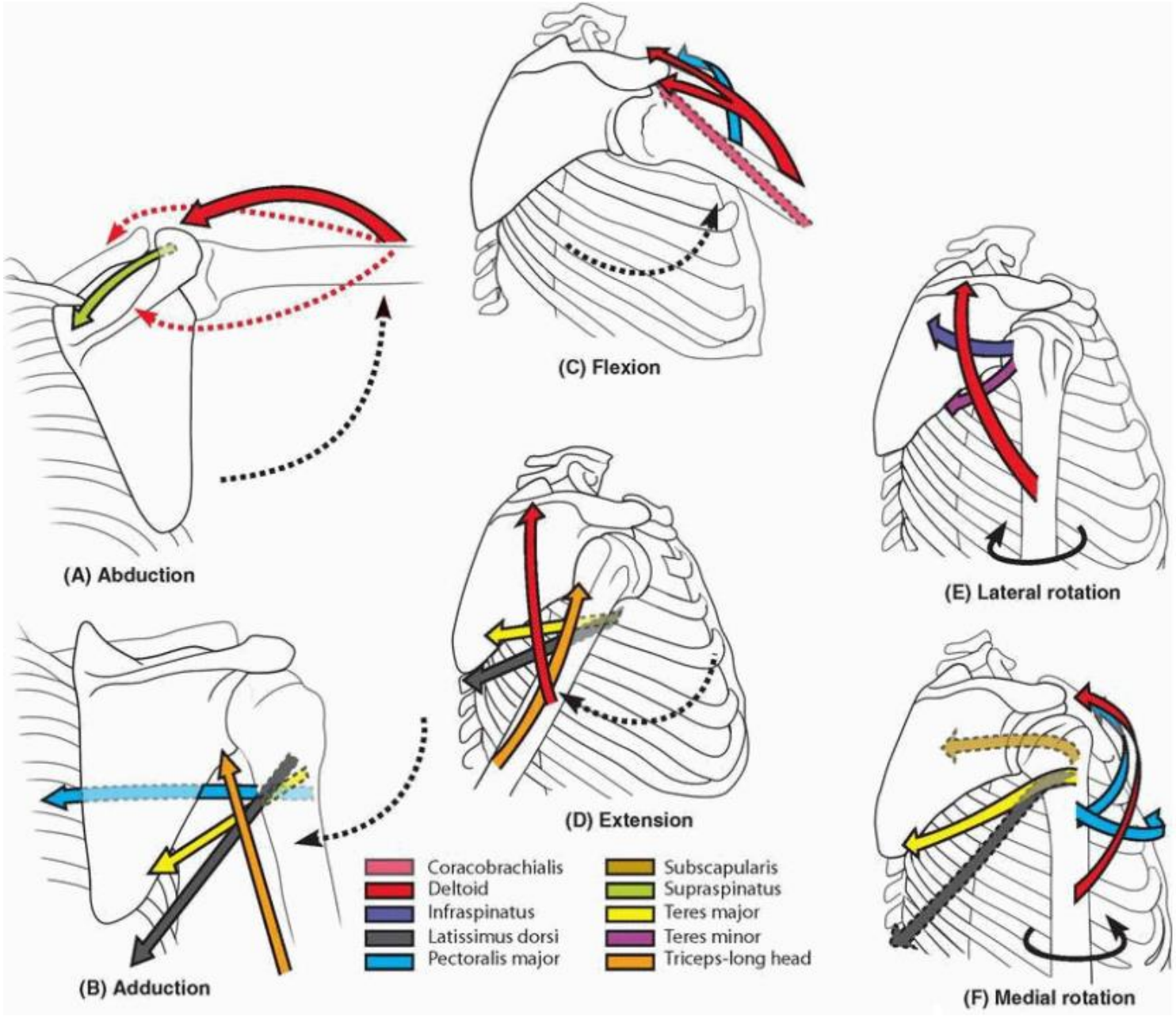
**(from the horizontal plane together with movements of the scapula)**

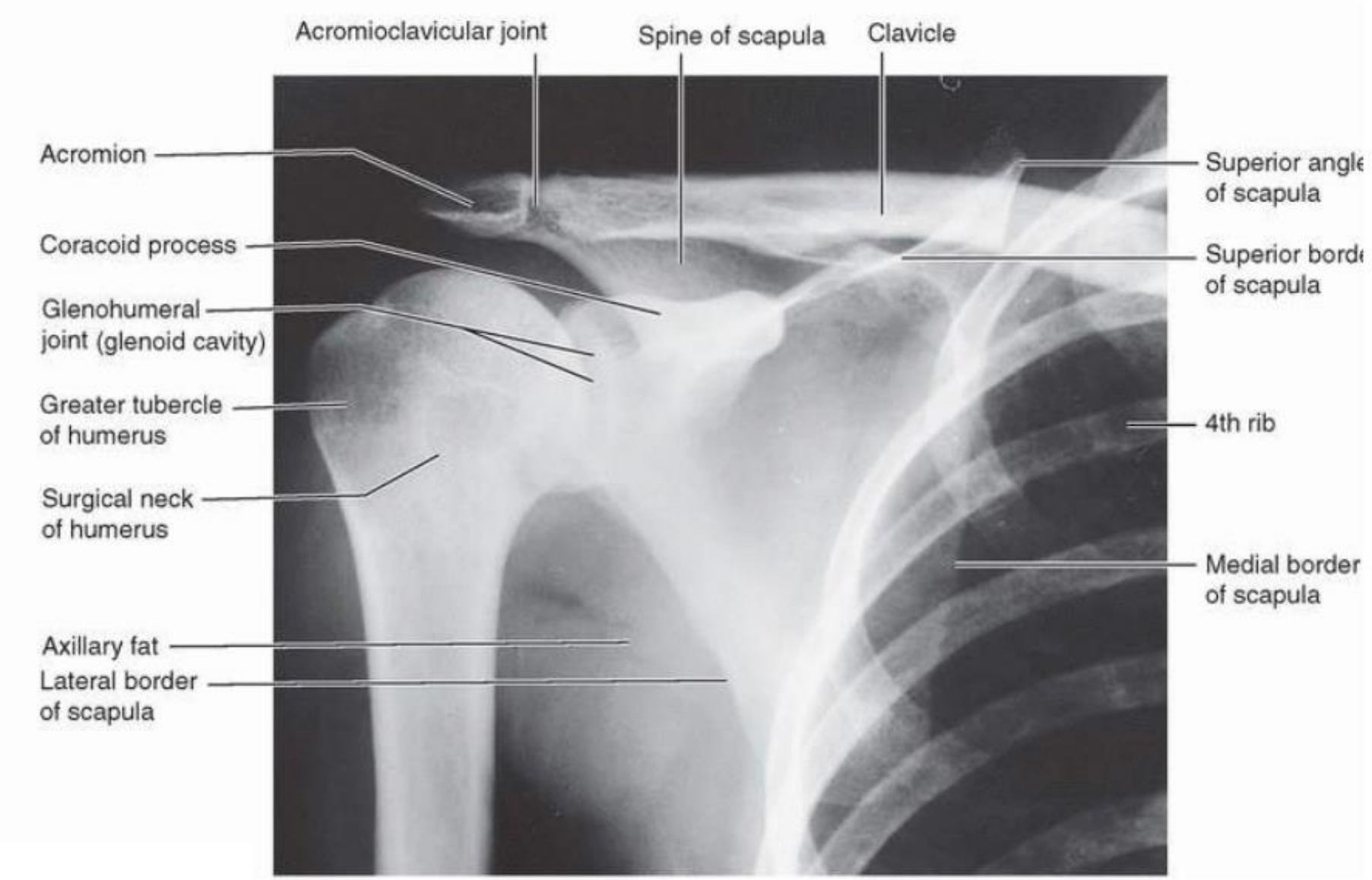
**adduktion**

**rotation - supination, pronation**

*Middle position:*

**Slow flexion and small abduktion**




Acromioclavicular joint
Spine of scapula
Clavicle
Acromion
Coracoid process
Glenohumeral joint (glenoid cavity)
Greater tubercle of humerus
Surgical neck of humerus
Axillary fat
Lateral border of scapula
Superior angle of scapula
Superior borde of scapula
4th rib
Medial border of scapula

# Articulations of the forearm

## *ELBOW JOINT (ART. CUBITI)*

*Type: compound joint*

### Articulatio humeroulnaris

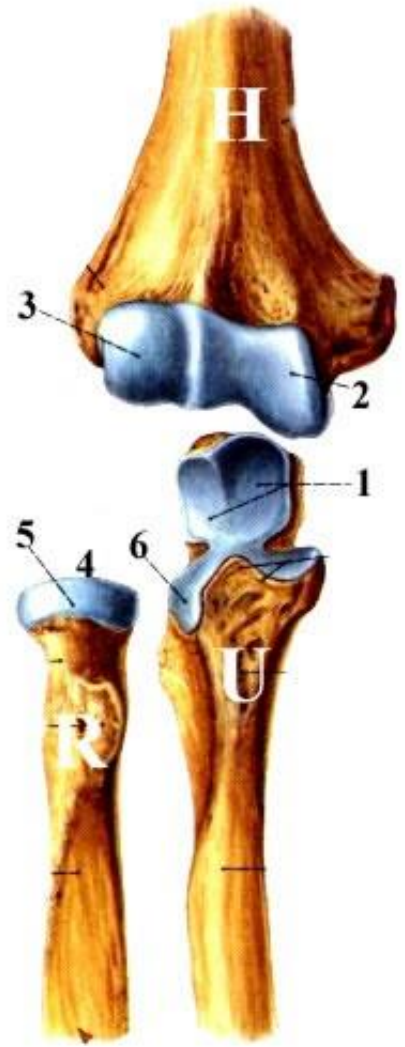
*Type:* hinge
*A. head:* trochlea humeri
*A. fossa:* incisura trochlearis ulnae

### Articulatio humeroradialis

*Type:* ball and socket
A. head: capitulum humeri
*A. fossa:* fovea articularis radii

### Articulatio radioulnaris proximalis

*Type:* pivot
*A. head:* circumferentia articularis radii
*A. fossa:* incisura radialis ulnae



*AC:* common for all three parts, attach to the margins of AS, at radius to the collum - recessus sacciformis

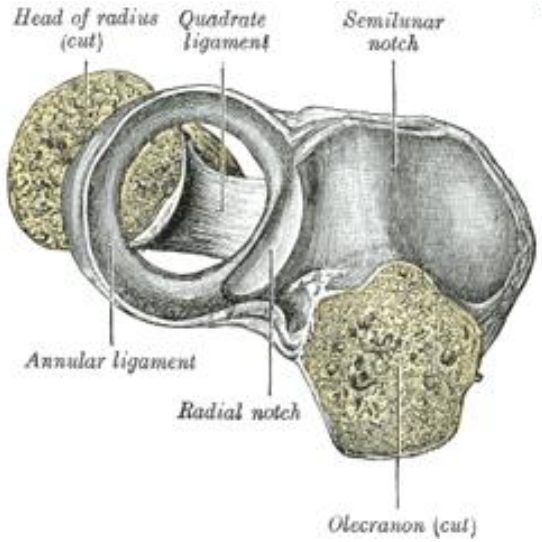
*Ligamnets:*

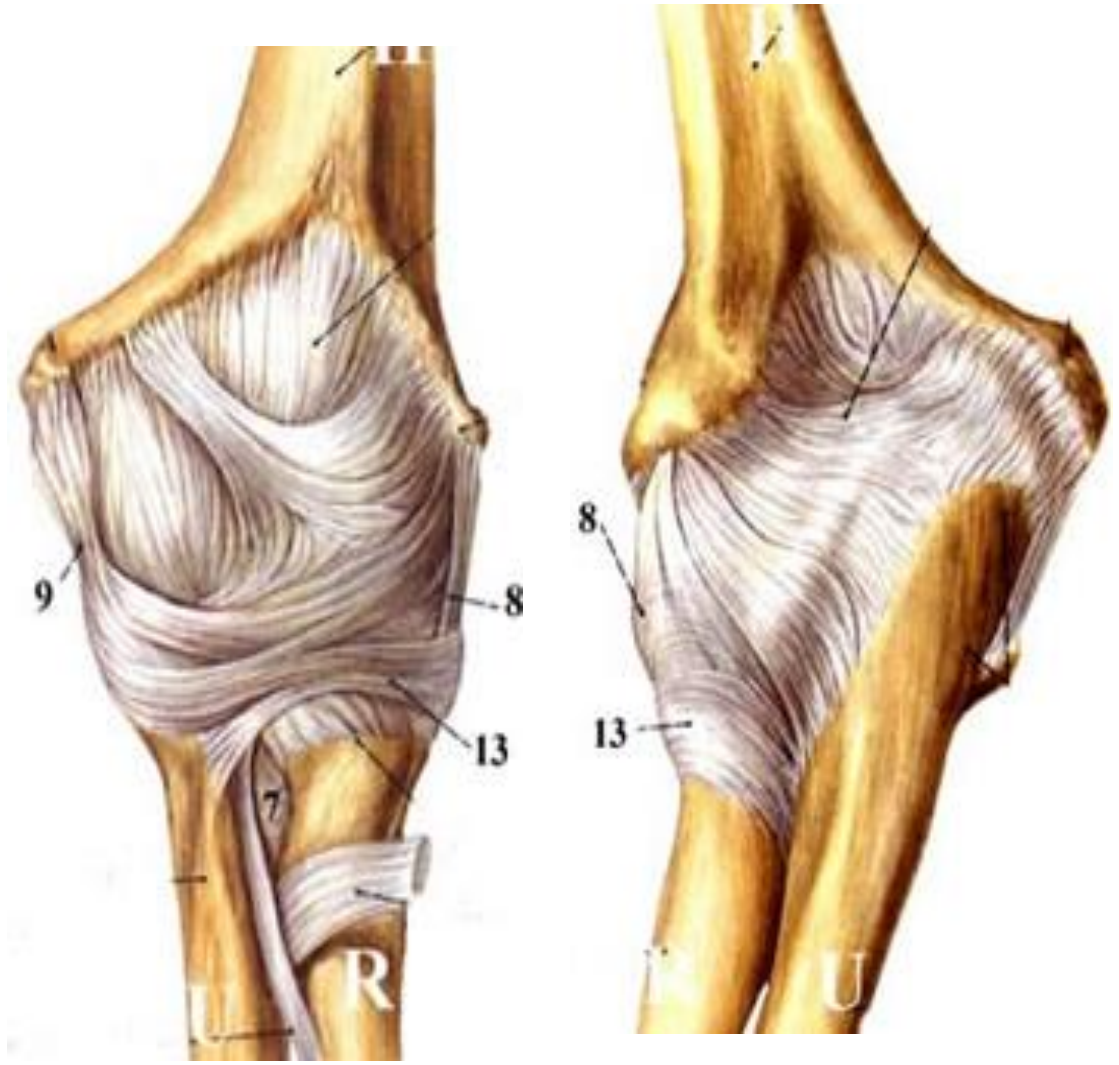
lig. collaterale radiale

lig. collaterale ulnare

lig. obliquum

lig. anulare radii



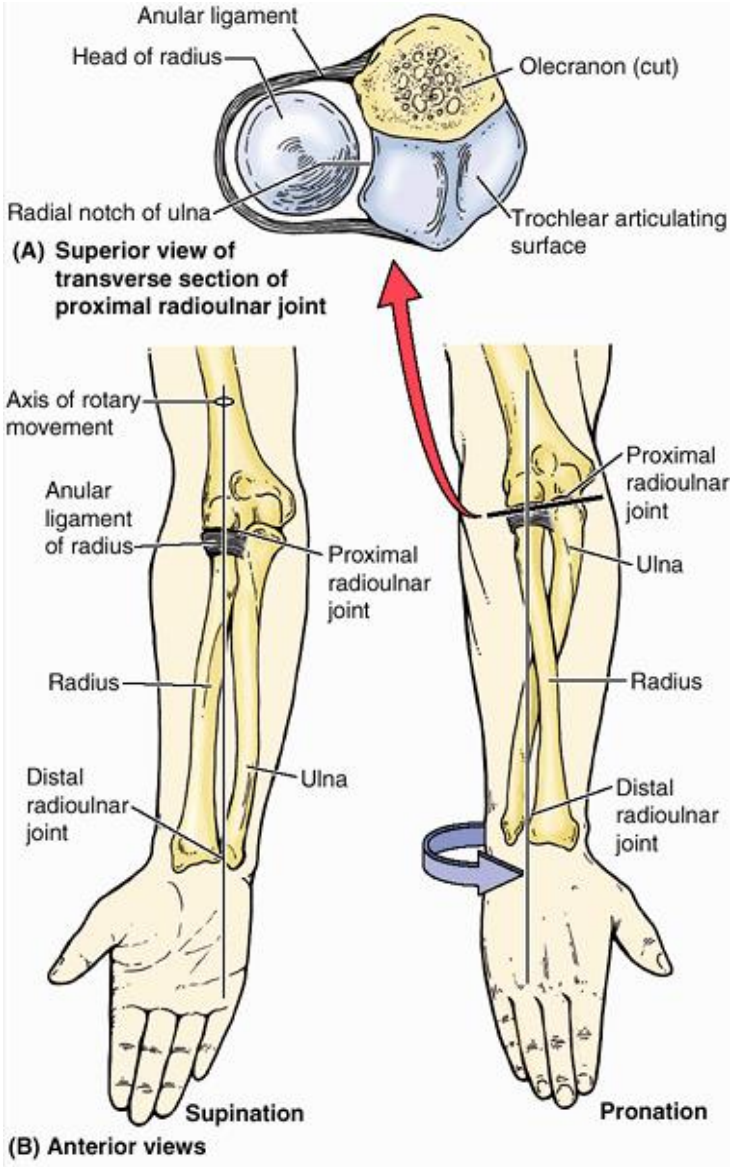



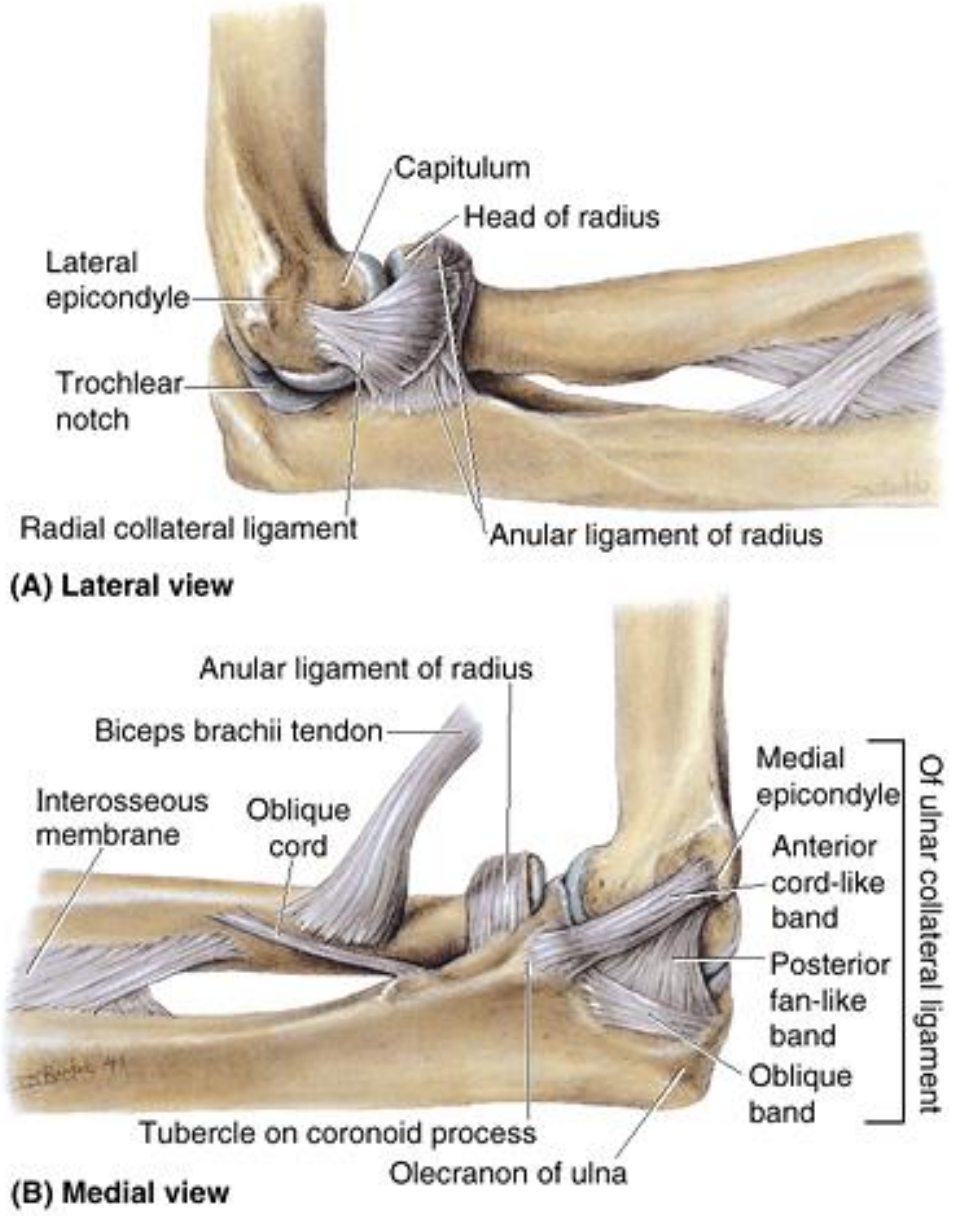

*Movements:* flexion, extension

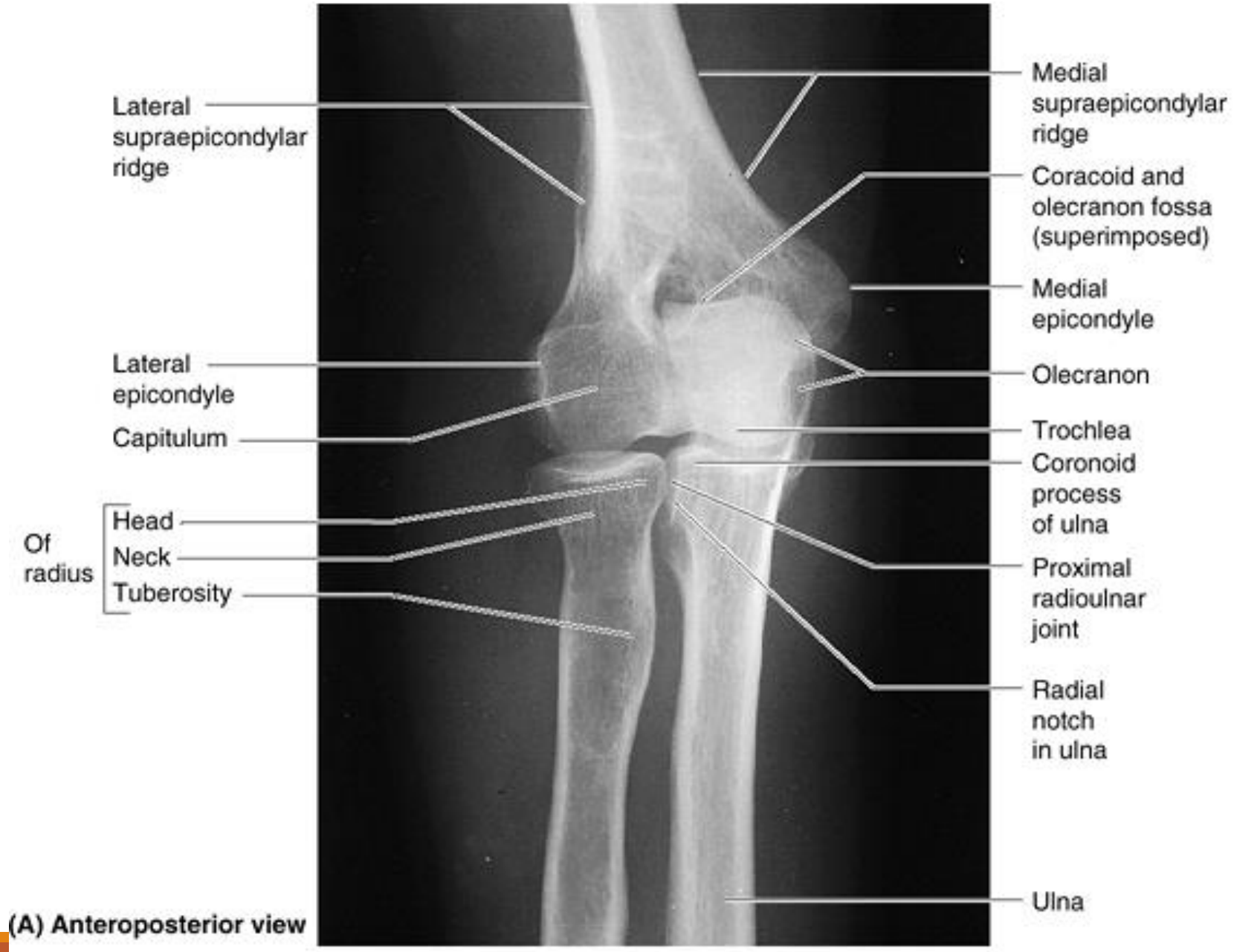
Art. radioulnaris proximalis together

With art. radioulnaris distalis – pronation and supination

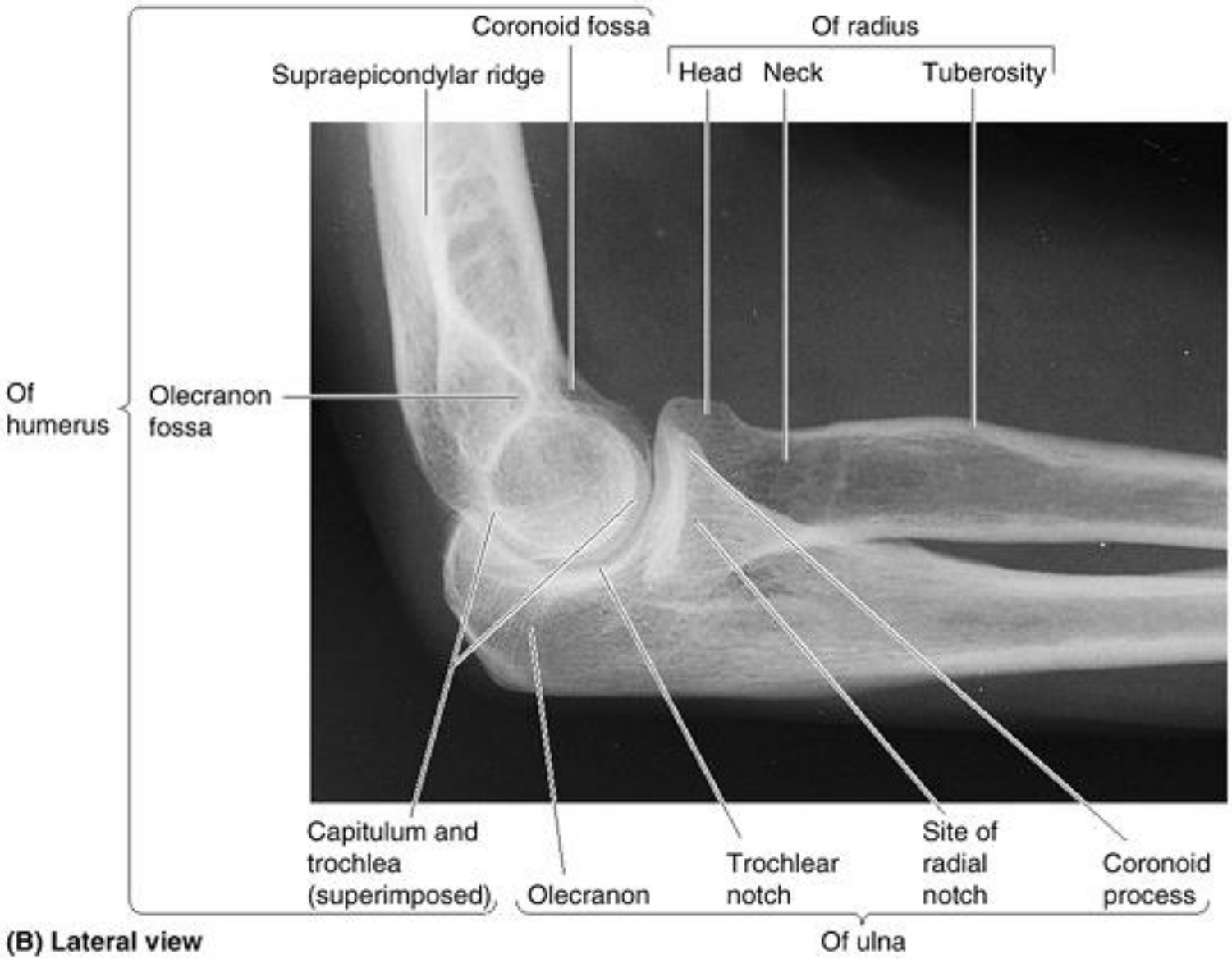
*Middle position:* in slight flexion and pronation


Anular ligament
Head of radius
Olecranon (cut)
Radial notch of ulna
Trochlear articulating surface
(A) Superior view of transverse section of proximal radioulnar joint
Axis of rotary movement
Anular ligament of radius
Proximal radioulnar joint
Radius
Ulna
Distal radioulnar joint
Supination
Proximal radioulnar joint
Ulna
Radius
Distal radioulnar joint
Pronation
(B) Anterior views


Capitulum
Head of radius
Lateral epicondyle
Trochlear notch
Radial collateral ligament
Anular ligament of radius
(A) Lateral view
Anular ligament of radius
Biceps brachii tendon
Interosseous membrane
Oblique cord
Medial epicondyle
Anterior cord-like band
Posterior fan-like band
Oblique band
Of ulnar collateral ligament
Tubercle on coronoid process
Olecranon of ulna
(B) Medial view



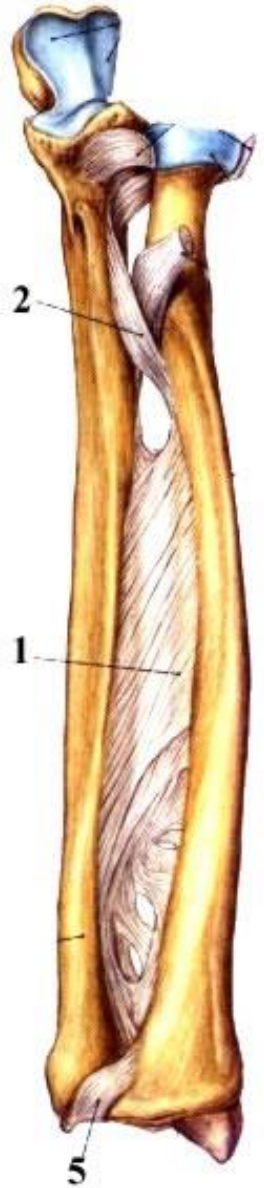

**(A) Anteroposterior view**




**(B) Lateral view**

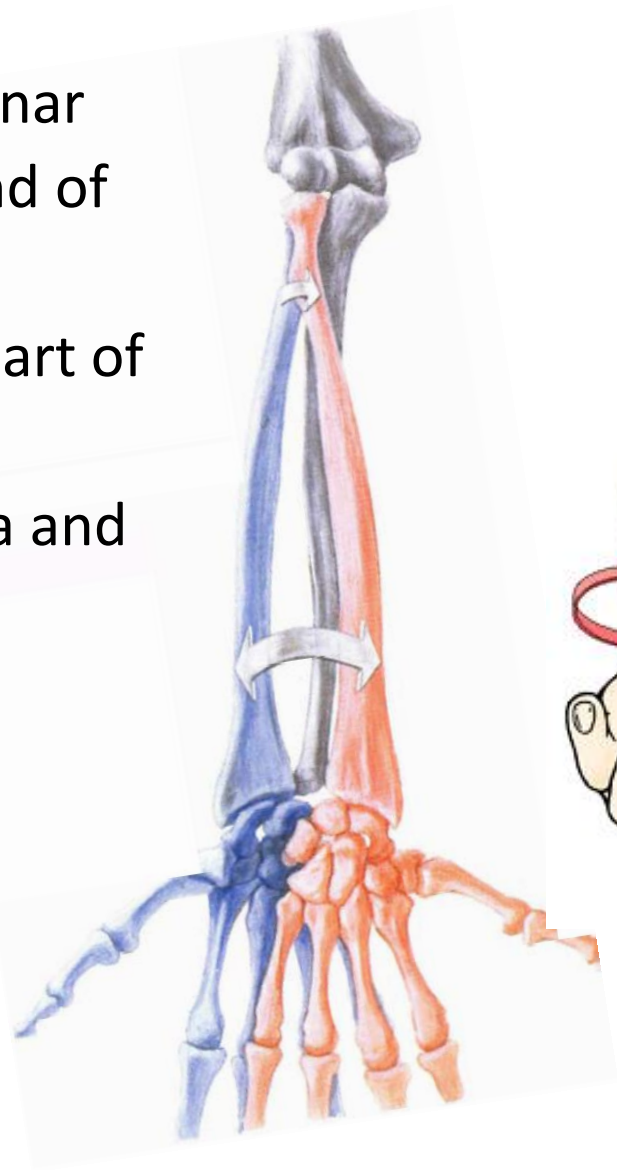
## SYNDESMOSES RADIOULNARIS

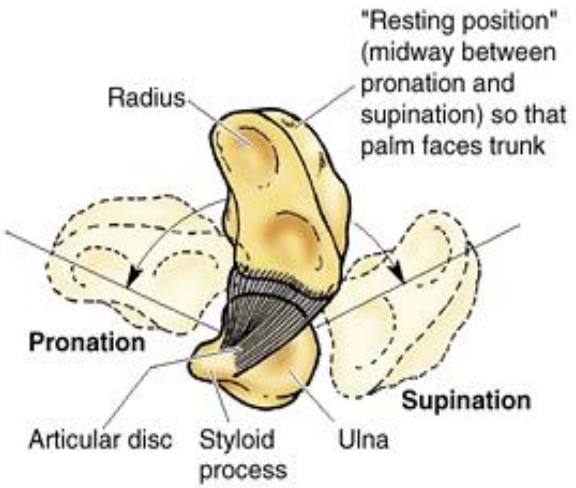
Interosseous membrane (chorda obliqua)

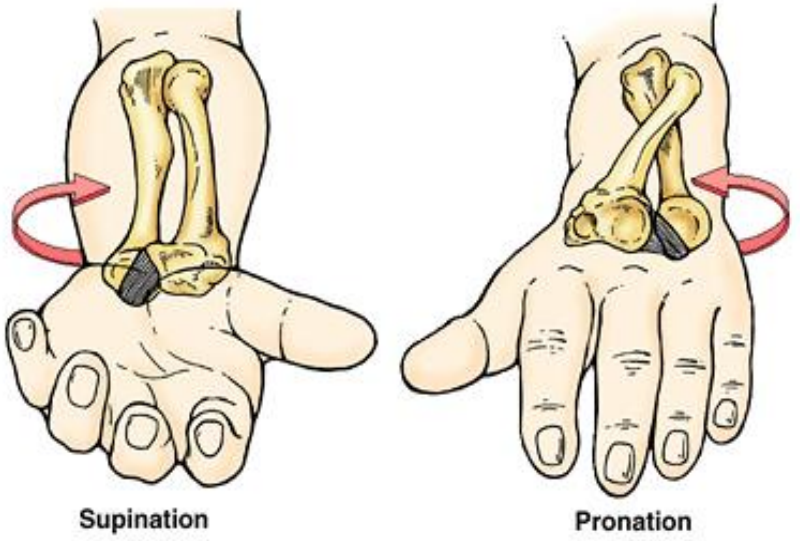



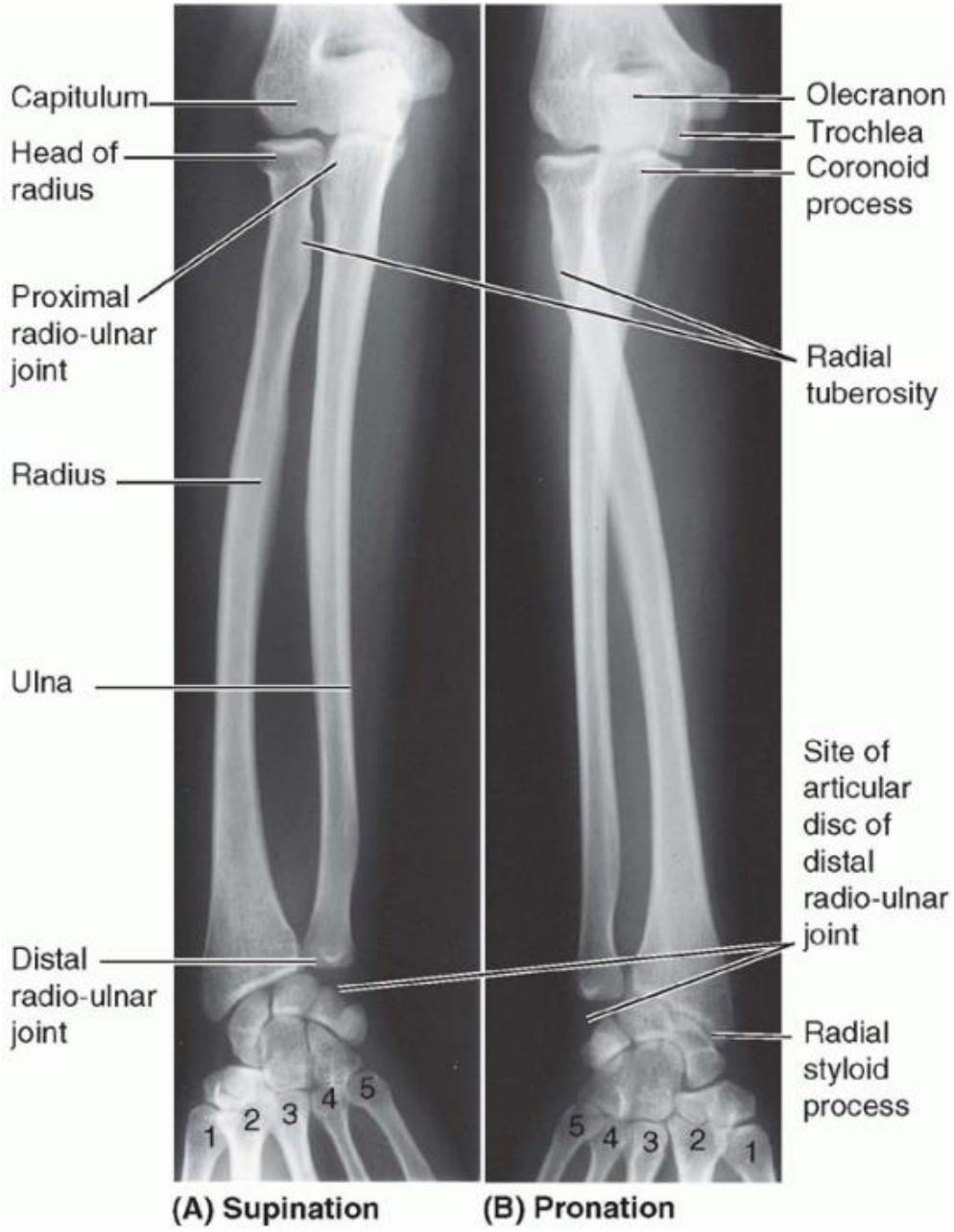
**Distal Radioulnar Joint** (pivot)

- head of the ulna articulates with the ulnar notch on the medial side of the distal end of the radius
- AC: free, anables rotaion of the distal part of the radius around the head of the ulna
- articular disc binds the ends of the ulna and radius together
- movements - supination and pronation






Capitulum
Head of radius
Proximal radio-ulnar joint
Radius
Ulna
Distal radio-ulnar joint
1 2 3 4 5
Olecranon
Trochlea
Coronoid process
Radial tuberosity
Site of articular disc of distal radio-ulnar joint
Radial styloid process
5 4 3 2 1
(A) Supination
(B) Pronation

# Articulationes manus

## ARTICULATIO RADIOCARPALIS
Radius and carpal bones

## ARTICULATIO MEDIOCARPALIS
between proximal and distal row of carpal bones

## ARTICULATIONES INTERCARPALES
conestions between carpal bones

## ARTICULATIONES CARPOMETACARPALES
distal row of carpal bones with metacarpals

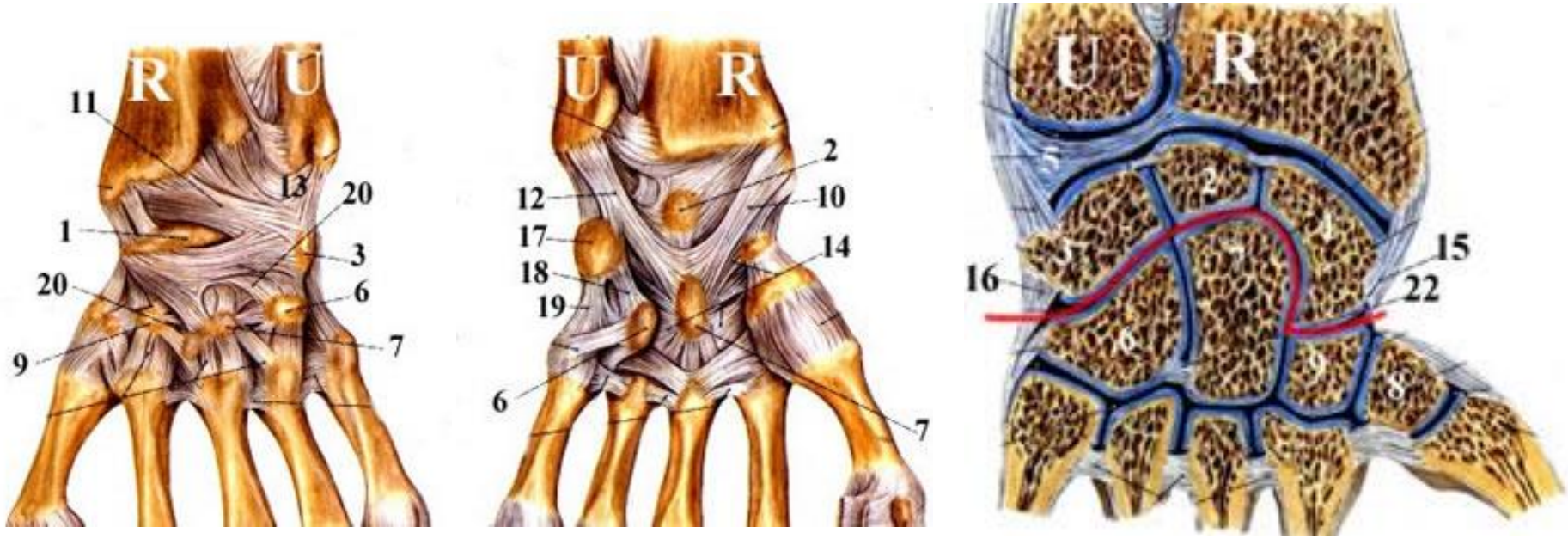
## ARTICULATIONES INTERMETACARPALES
between bases of metacarpal bones

## ARTICULATIONES METACARPOPHALANGEALES
heads of the metacarpals with the proximal row of phalanges

## ARTICULATIONES INTERPHALANGEALES
Between phalanges
retinaculum musculorum flexorum
(lig. carpi transversum)
between eminentia carpi radialis et ulnaris -> canalis carpi

# Articulatio radiocarpalis

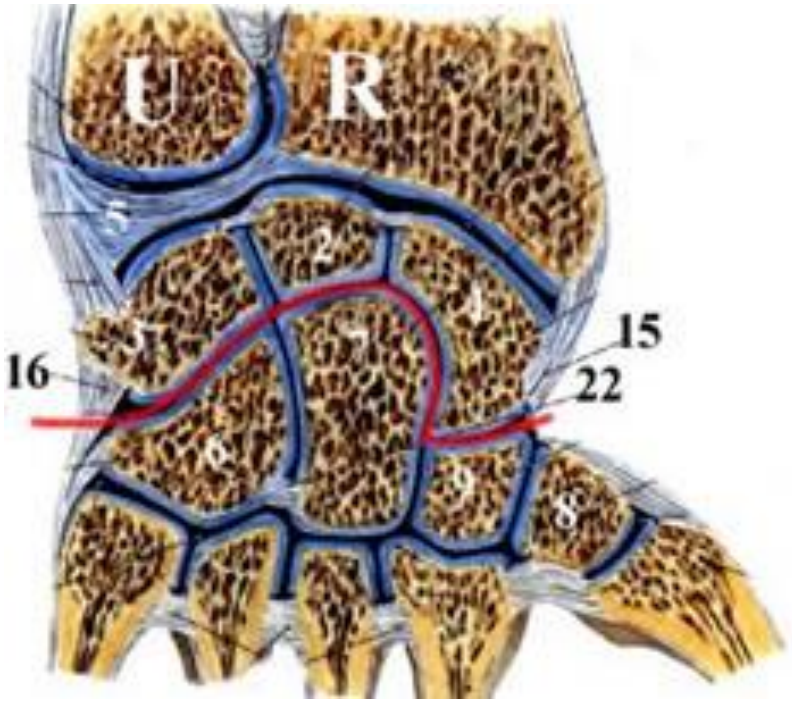
*Type:* compound, ellipsoid
*A. head:* os scaphoideum, os lunatum, os triquetrum
*A. fossa:* facies articularis carpalis radii, discus articularis
*AC:* firm and short
***Ligaments:*** common with art. mediocarpalis
*Movements:* functional unit with medicarpal, intercarpal, carpometacarpal joints
Palmar and dorsal flexion
radial and ulnar duktion
circumduktion

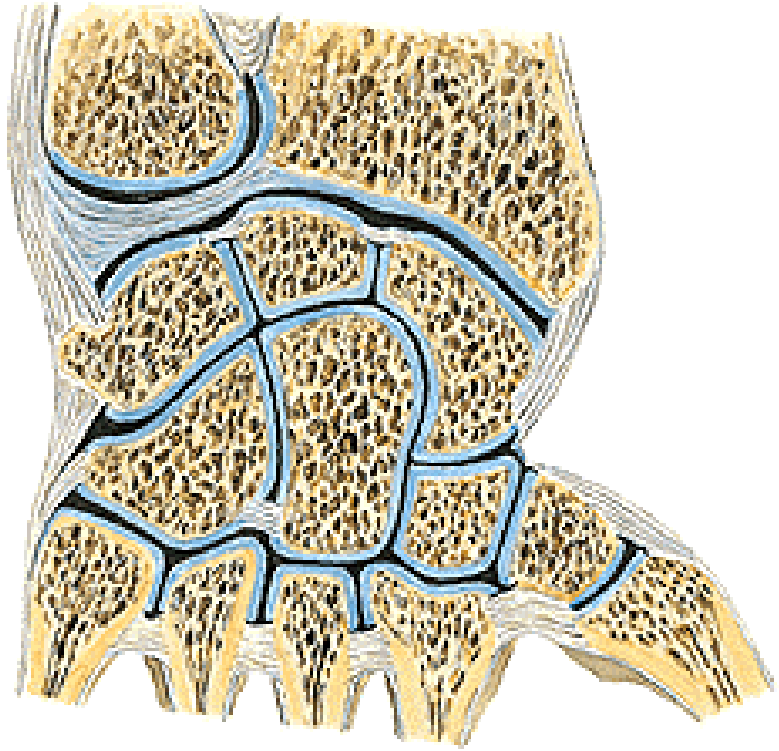


# Articulatio mediocarpalis

*Type:* ***elipsoid,*** compound, in the shape of horizontaly placed "S"
*A. head, ulnar side:* os hamatum, os capitatum
*A. head, Radial side:* os scaphoideum

*A. fossa, ulnar side:* os scaphoideum, os lunatum, os triquetrum
*A. fossa, radila side:* os trapezium, os trapezoideum
*AC:* firm and short

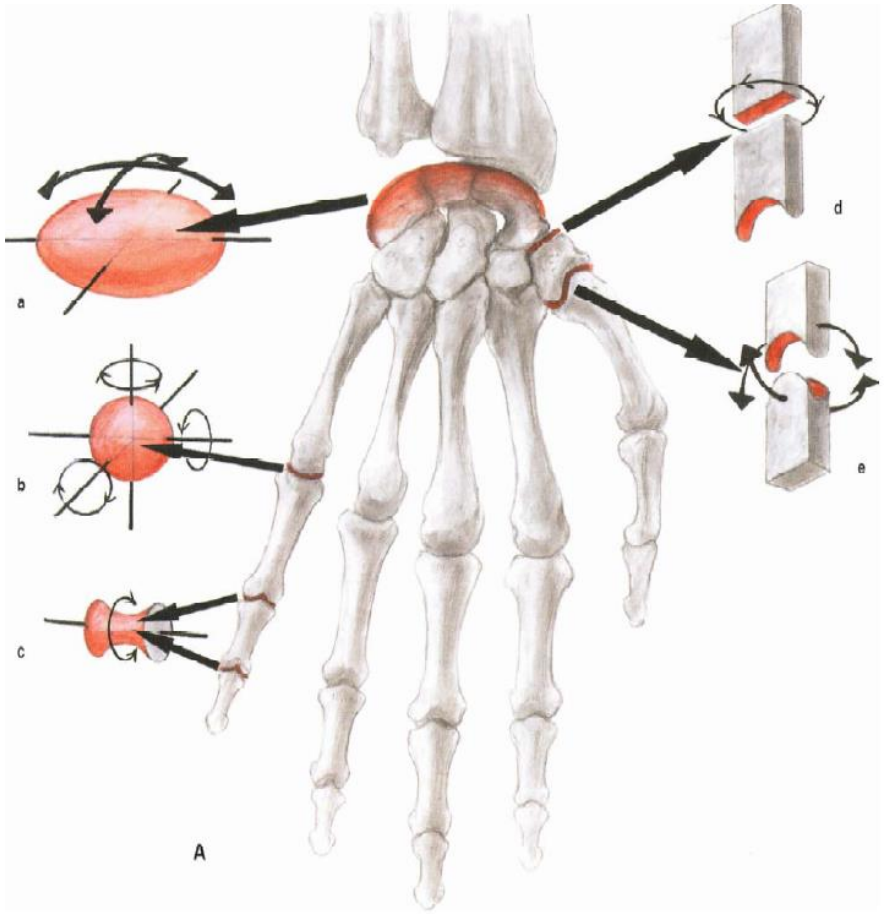


*ligaments:*
lig. intercarpea dors., ventr., interossea
lig. radiocarpale palmare et dorsale
lig. ulnocarpale palmare et dorsale
lig. carpi radiatum
lig. collaterale carpi radiale et ulnare

*Movements:*
functional unit with mediocarpal, intercarpal and carpometacrapal joints

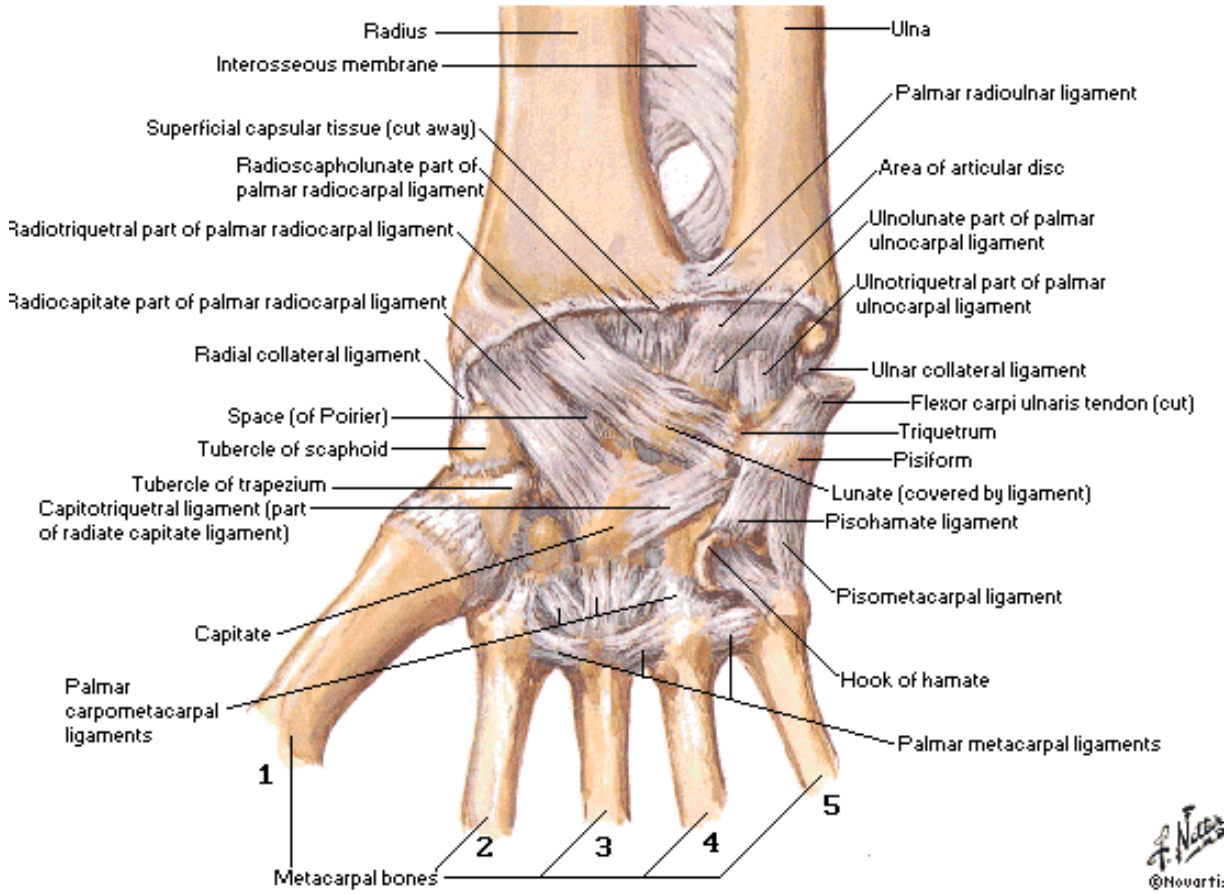
Palmar and dorsal flexion,
Radial and ulnar duktion, cirkumduktion




*Smidle position:* same as the anatomical one
- Wrist and digits are in continuation of the forarm long axes

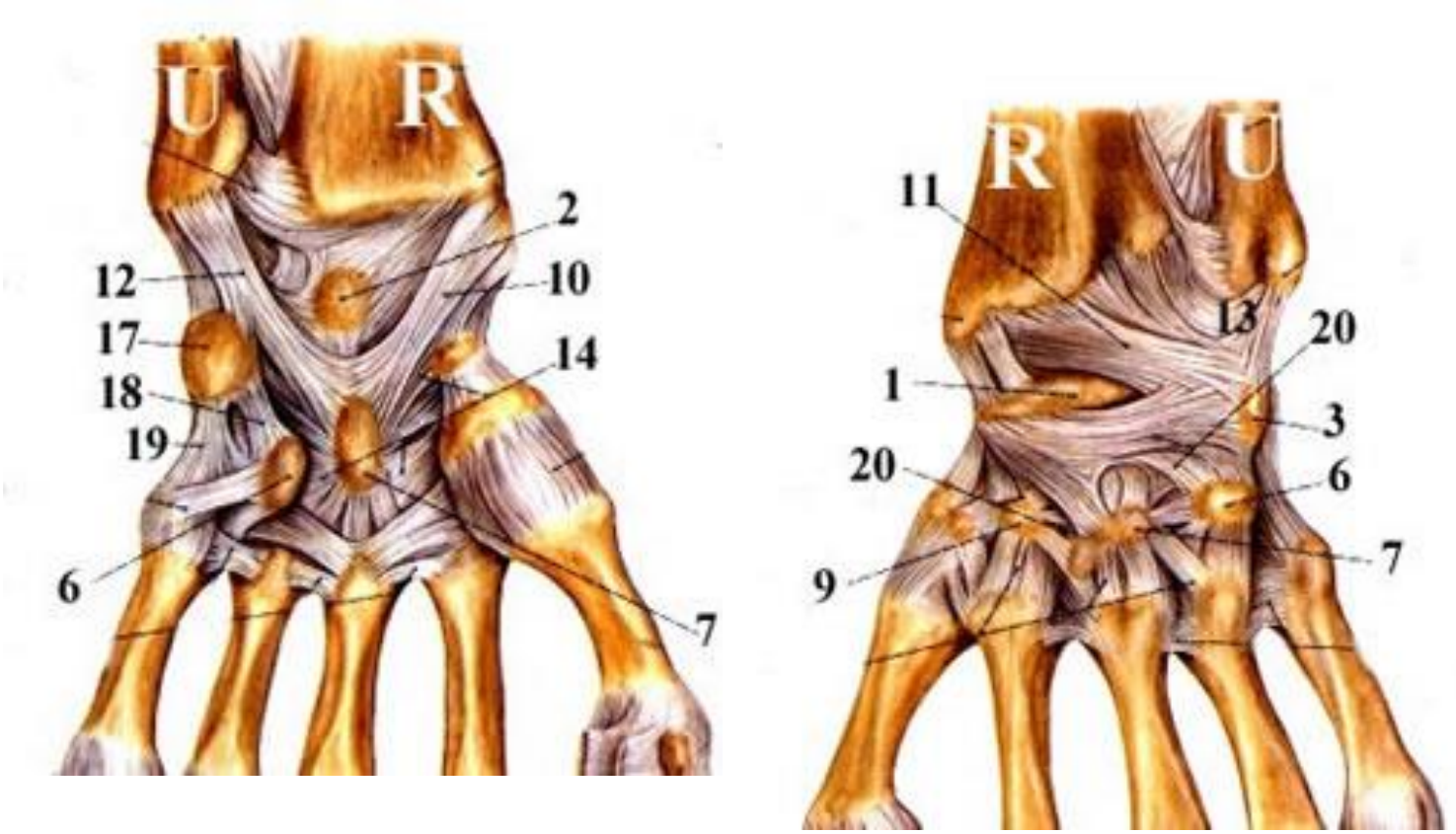
# Articulatio ossis pisiformis:

os pisiforme  and os triquetrum - amphiarthrosis
lig. pisohamatum
lig. pisometacarpeum
(continuation of the tendon of m. flexor carpi ulnaris)



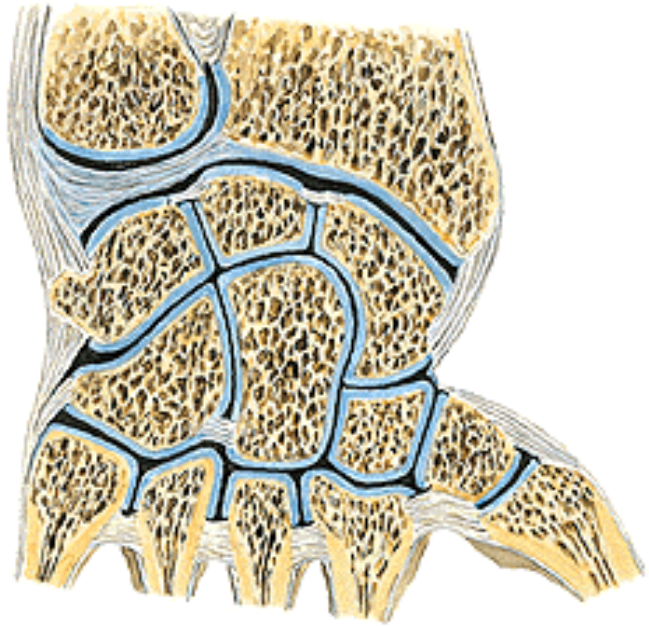
# Articulationes intercarpales

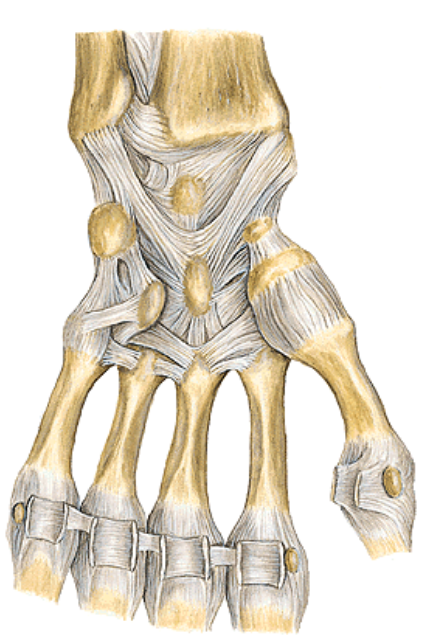
Connection of bones of the proximal and distal row of the wrist
- ligg. intercapalia dorsalia
- ligg. intercarpalia palmaria
- ligg. intercarpalis interossea

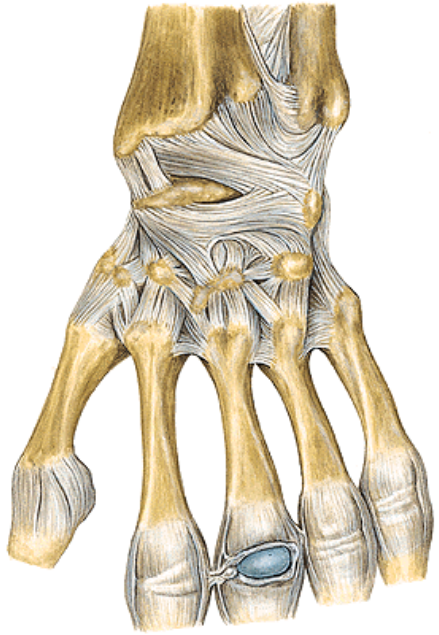


# Articulationes carpometacarpales II.-V.

*Type:* compound
*AS:* base of the MC II - os trapezium, os trapezoideum, os capitatum
base of the MC III - os capitatum
base of the MC IV and V - os hamatum
MC bases in between
*AC:* short, tough
ligaments*:*
ligg. carpometacarpalia dorsalia
ligg. carpometacarpalia palmaria
ligg. carpometacarpalia interossea
ligg. metacarpea palm., dors., interossea
*Movements:* amphiarthrosis

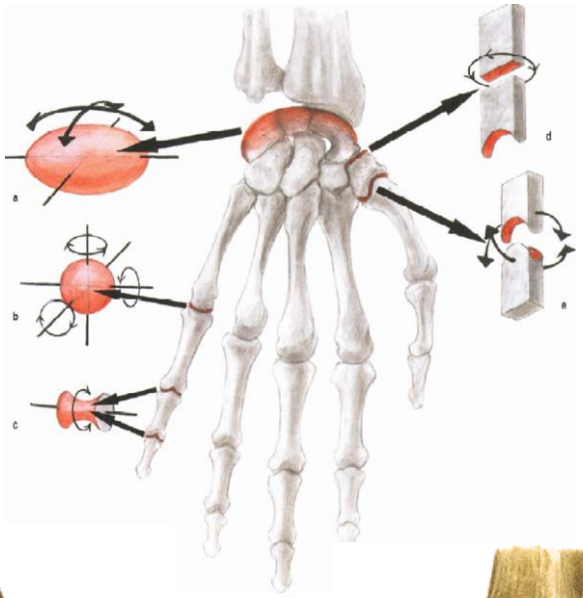


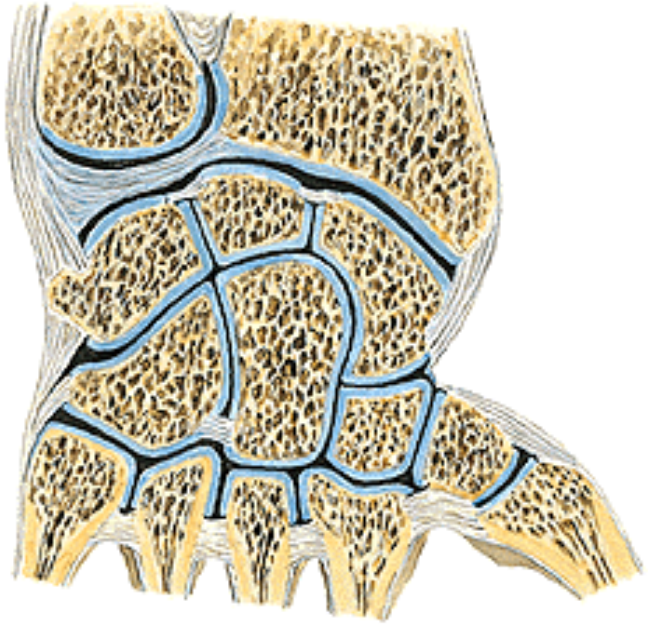


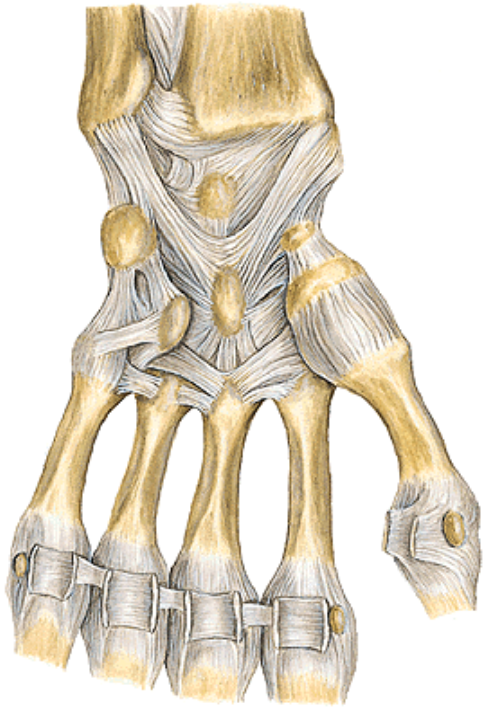


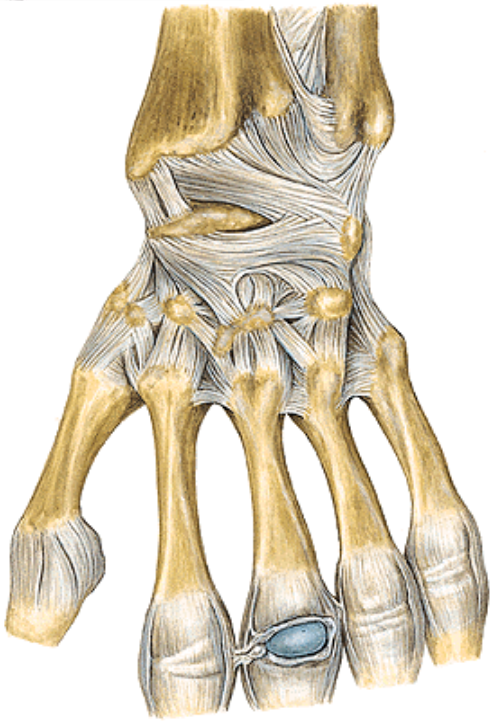
# Articulatio carpometacarpalis pollicis

*Type:* saddle
*AH:* basis ossis metacarpale I
*AF:* os trapezium
*AC:* free
*Movements:* abduktion, adduktion
oposition, reposition



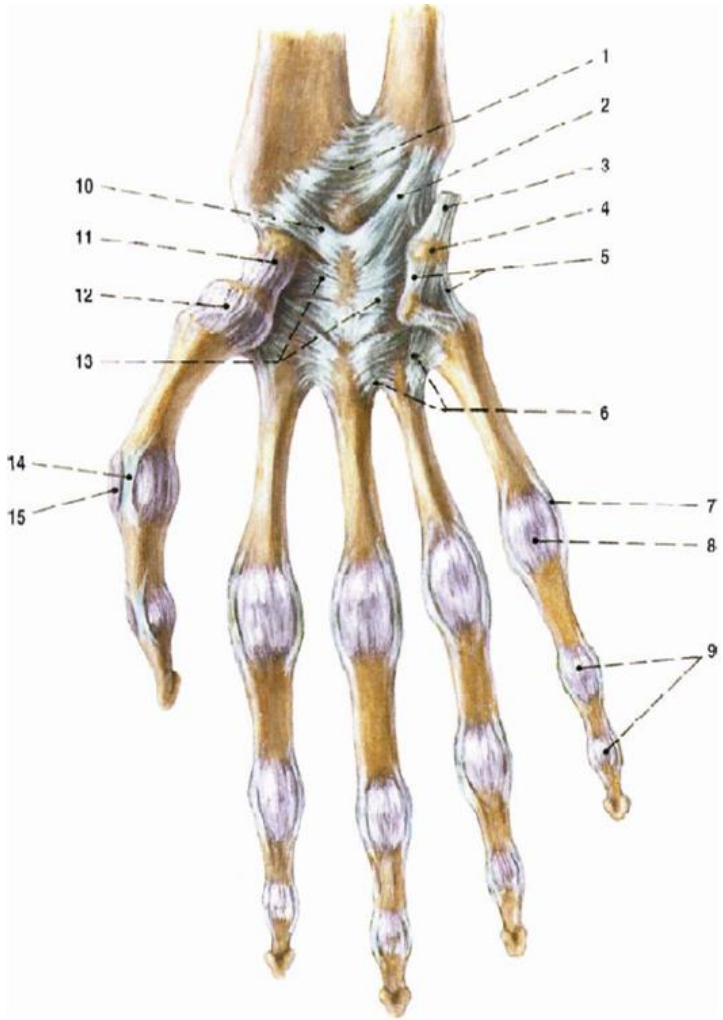


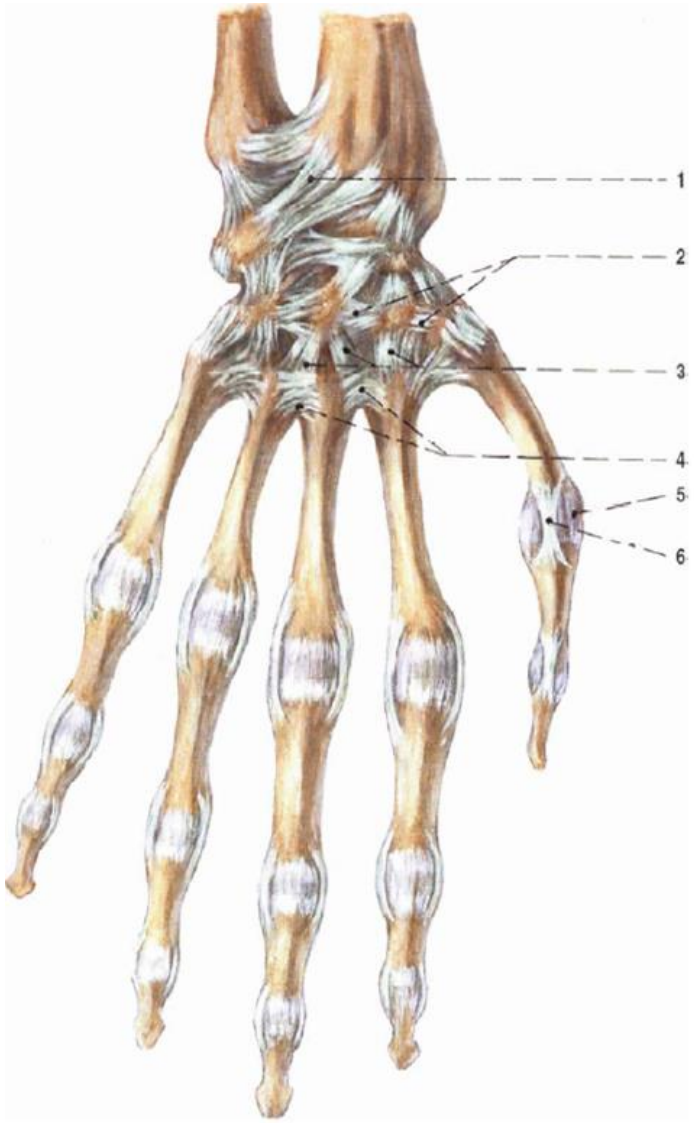




# Articulationes intermetacarpales

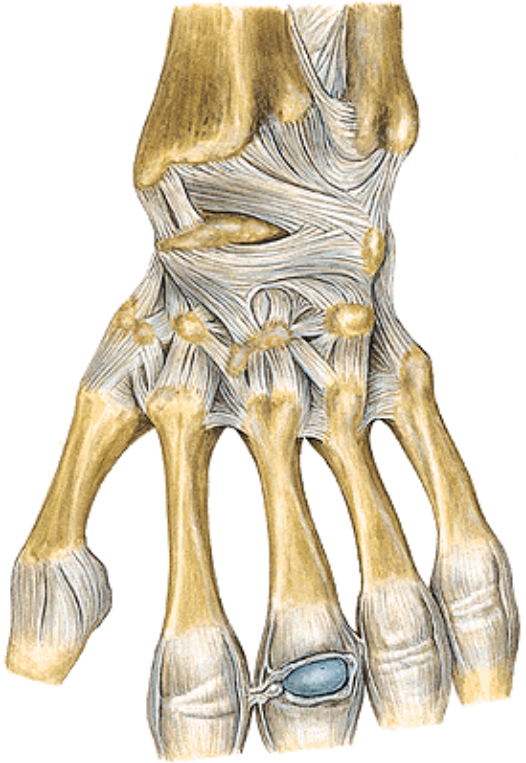
Ligg. intermetacarpalia

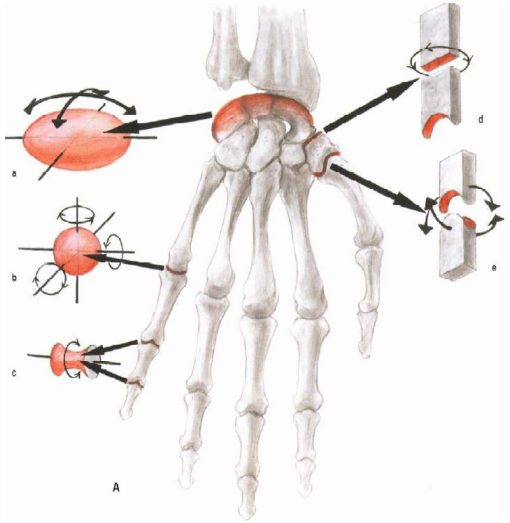


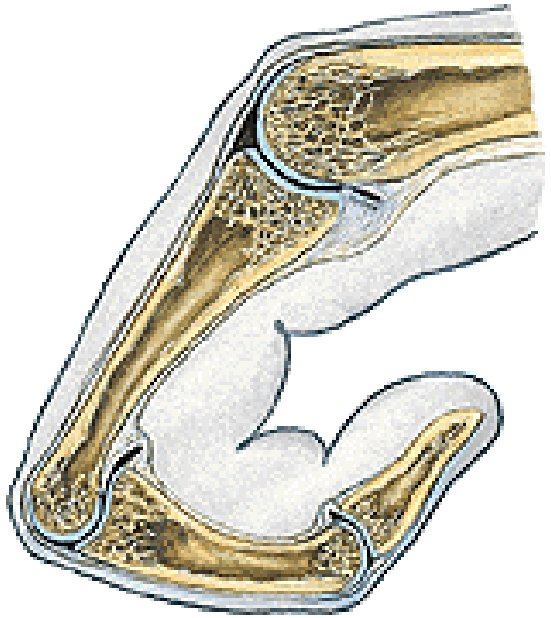



# Art. metacarpophalangeales

*Type:* ball and socket
*AH:* caput ossis metacarpalis
*AF:* basis phalangis
*AC:* free
*Ligaments:*
ligg. collateralia
ligg. palmaria - fibrocartilago palmaris
lig. metacarpale transversum profundum
*Movements:* flexion a etension
abduktion and adduktion – in not flexed finger

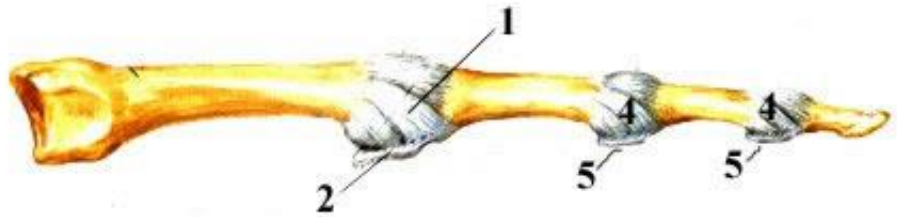


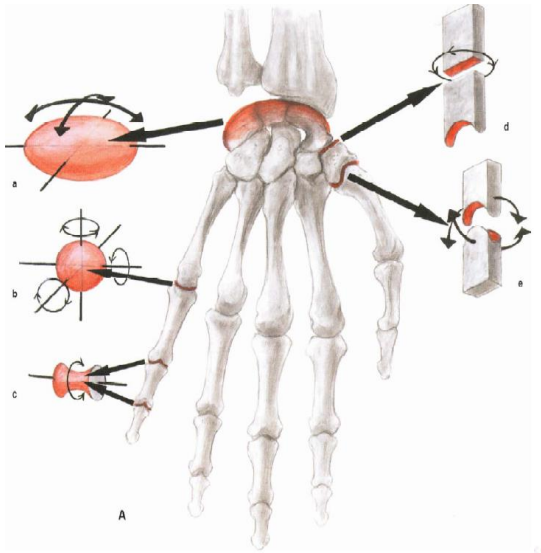


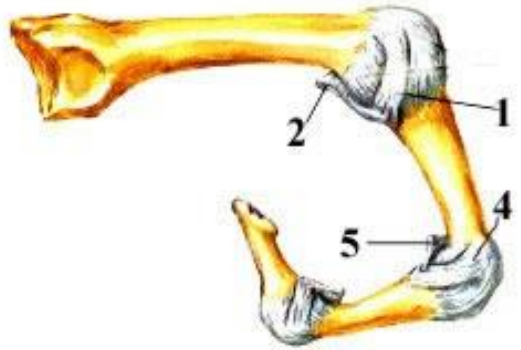


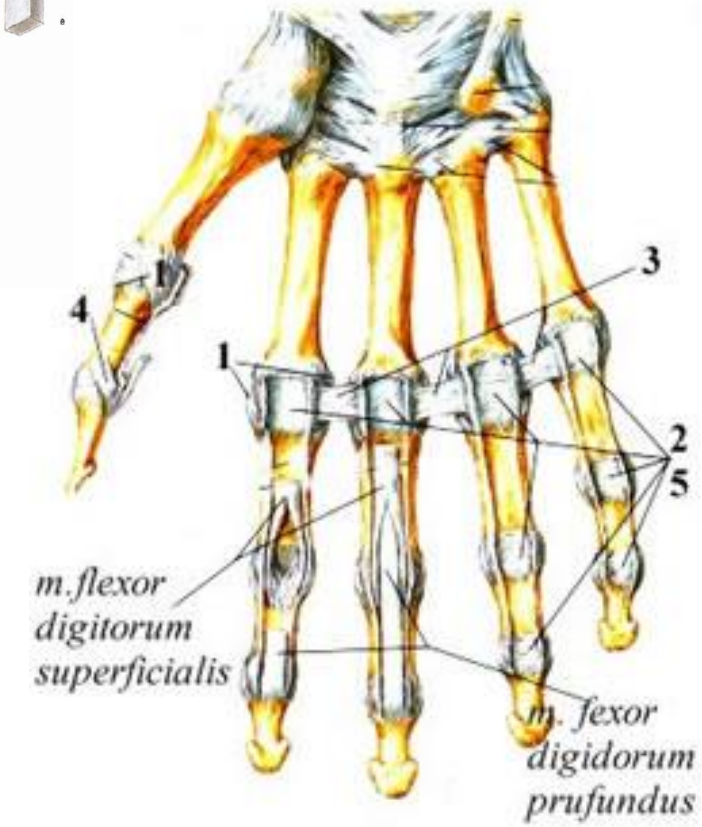
# Articulationes interphalangeales

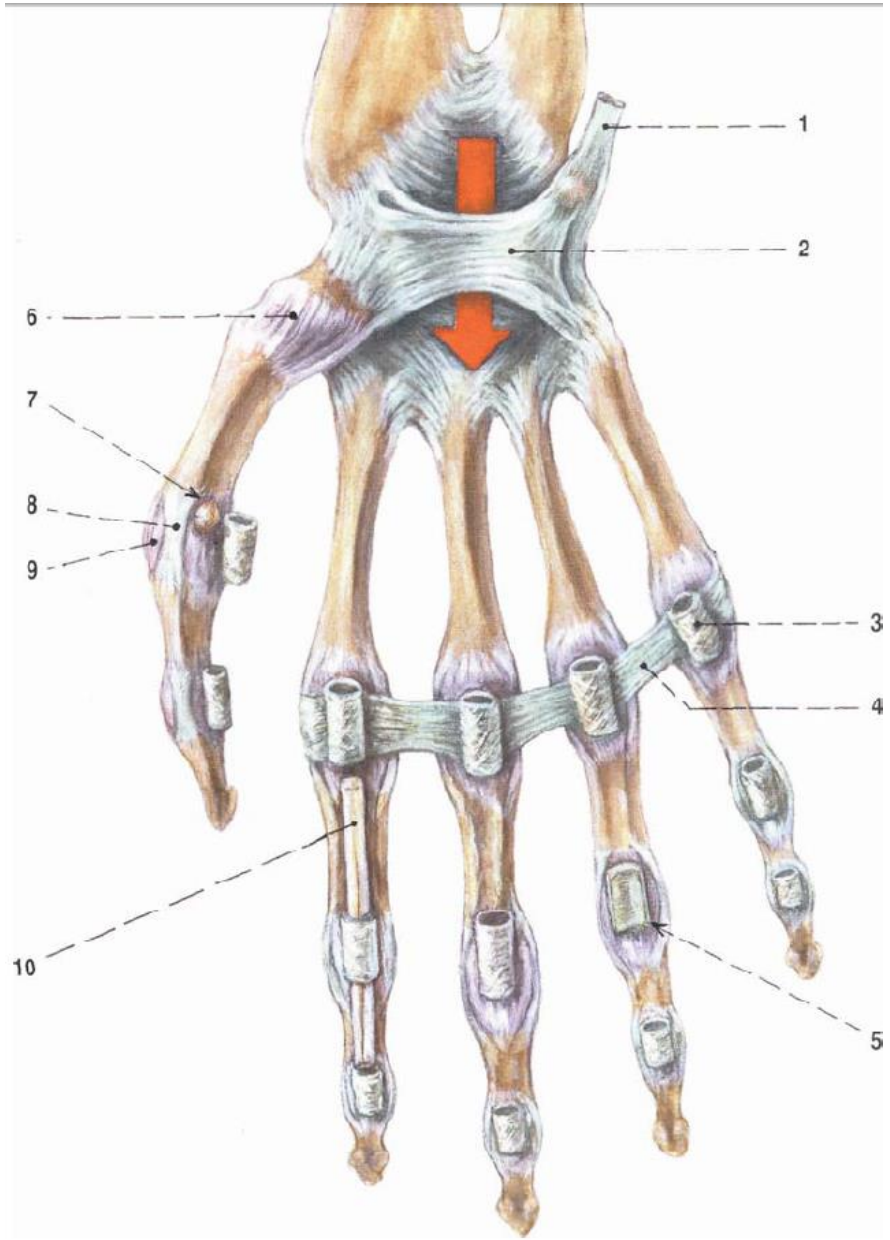
*Type:* hinge
*AH:* caput (trochlea) phalangis
*AF:* basis phalangis
*AC:* free
*Ligaments:*
ligg. collateralia
ligg. palmaria - fibrocartilagines palmares
*Movements:* flexion and extension



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# Thank you for your attention!!

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**Netter: Interactive Atlas of Human Anatomy.**
**Naňka, Elišková: Přehled anatomie. Galén, Praha 2009.**
**Čihák: Anatomie I, II, III.**
**Drake et al: Gray´s Anatomy for Students. 2010**
**Archiv of the lecturer,  archiv of the Department of Anatomy, MU, Brno**