

# JOINTS OF THE UPPER LIMB



# Connection of the upper limb

## Connection of the shoulder girdle

*(juncturae ossium cinguli extremitatis superioris)*

### 1. *Articulatio sternoclavicularis* (compound joint)

**Articular surfaces:** *incisura clavicularis sterni* and *facies articularis sternalis* of *clavicula*.

**Articular capsule:** is stiff and is attached to margins of articular surfaces

**Auxiliary features:** *discus articularis*, *lig. sternoclaviculare anterius* and *posterius.*, *lig. interclaviculare*, *lig. costoclaviculare*

**Type of joint:** ball–and–socket joint with movements to all directions but movement are limited, a component of movements of scapula and shoulder joint.

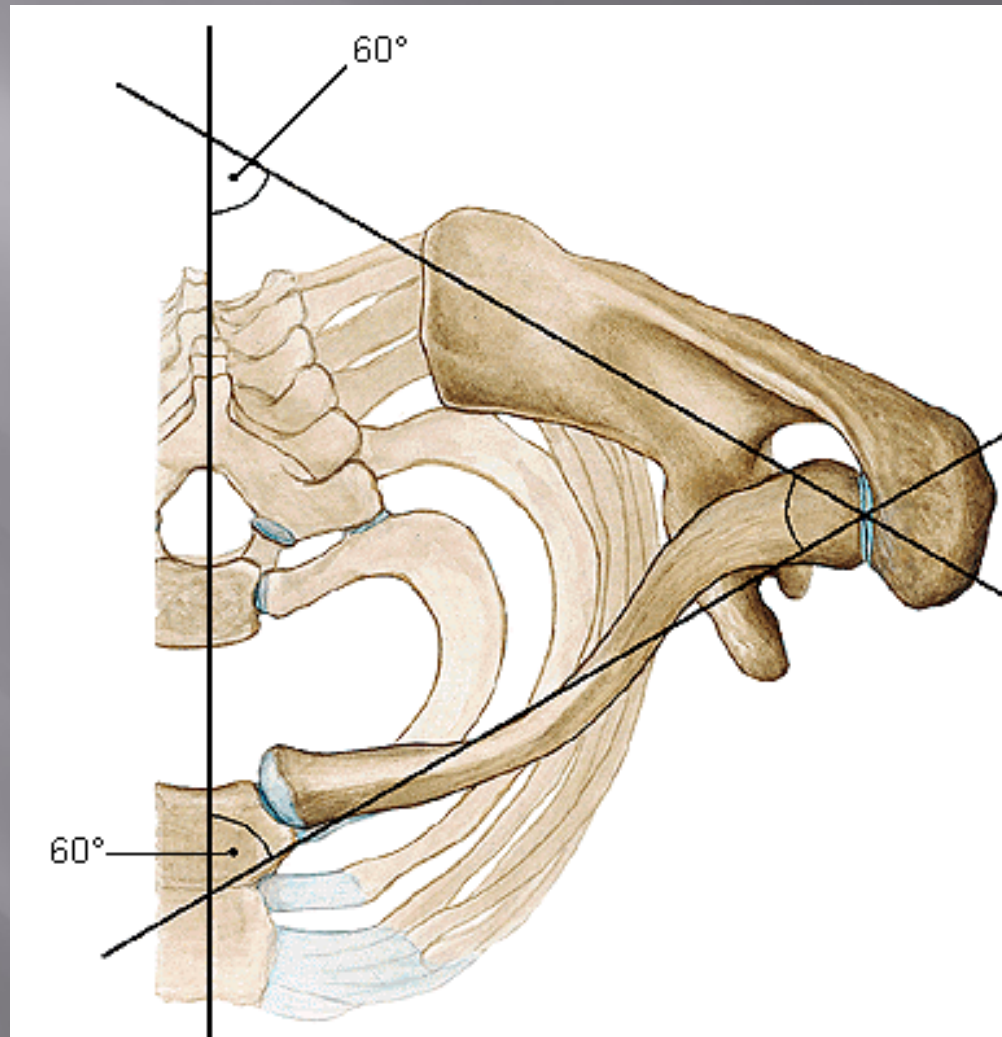
### 2. *Articulatio acromioclavicularis* (usually a compound joint)

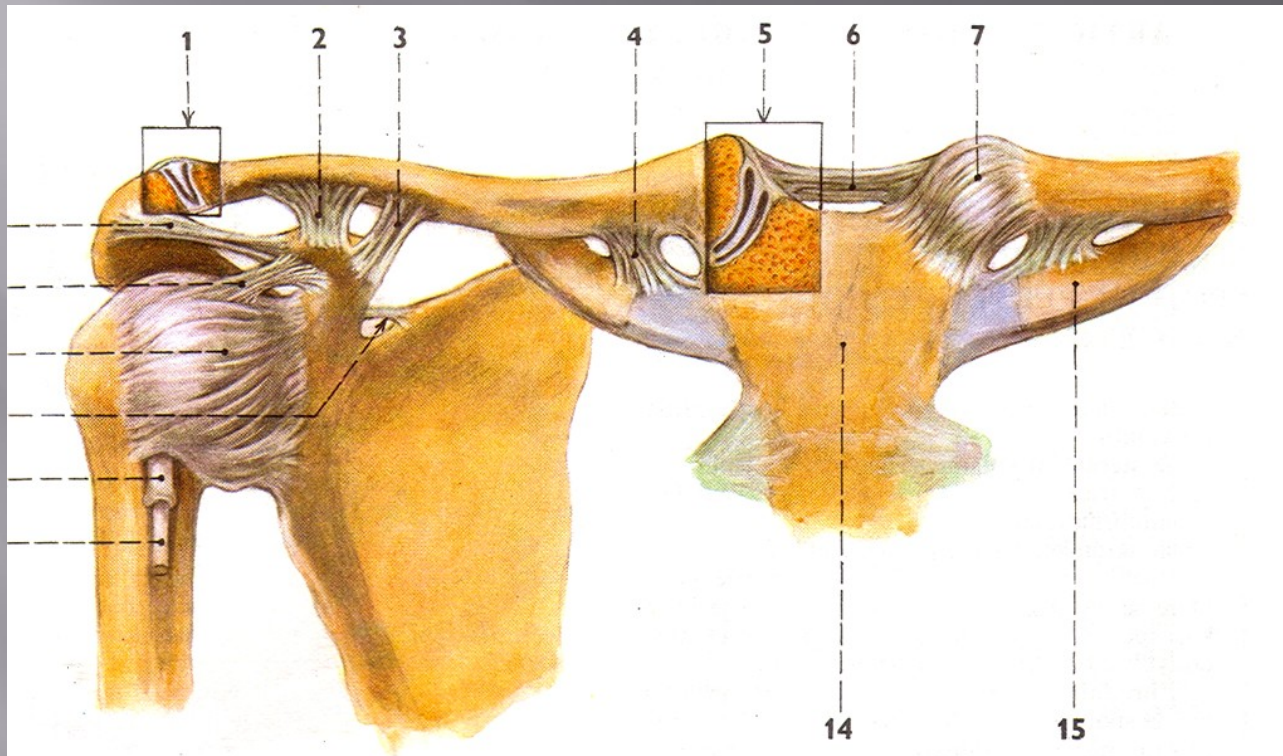
**Articular surfaces :** *facies articularis clavicularis* of acromion and *facies articularis acromialis* of *clavicula*.

**Articular capsule :** is attached to margins of articular surfaces

**Auxiliary features :** often is present *discus articularis*, *lig. acromioclaviculare*, *lig. coracoclaviculare*

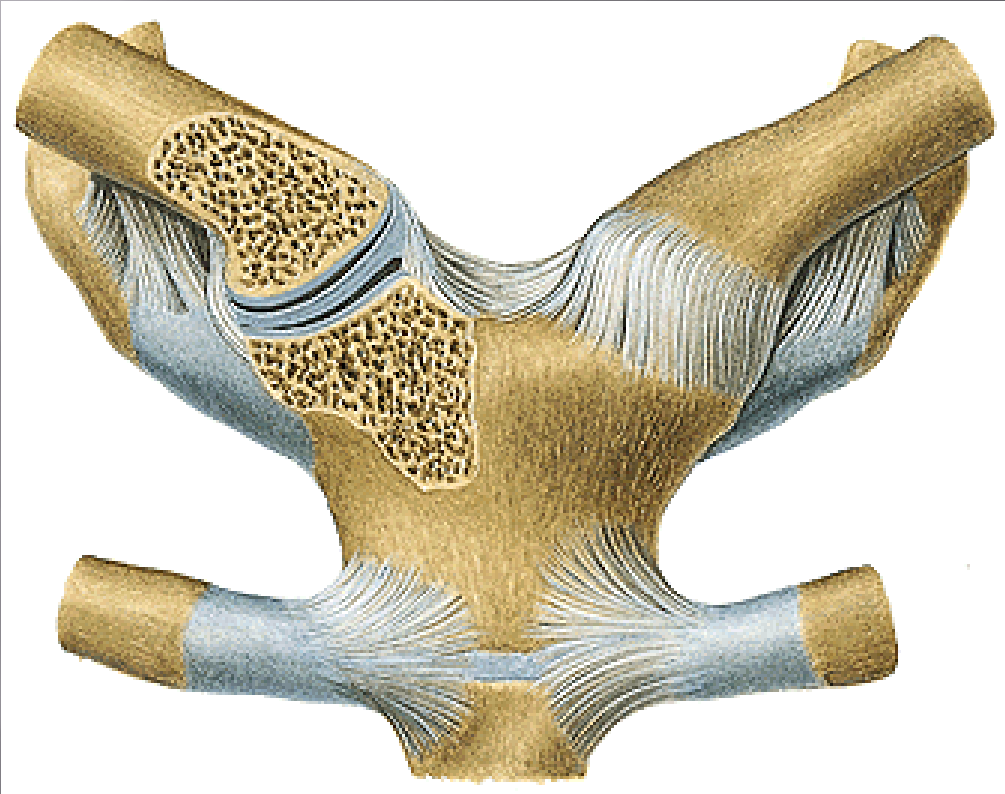
**Type of joint:** ball–and–socket joint with movements to all directions but movement are limited, a component of movements of scapula and shoulder joint.

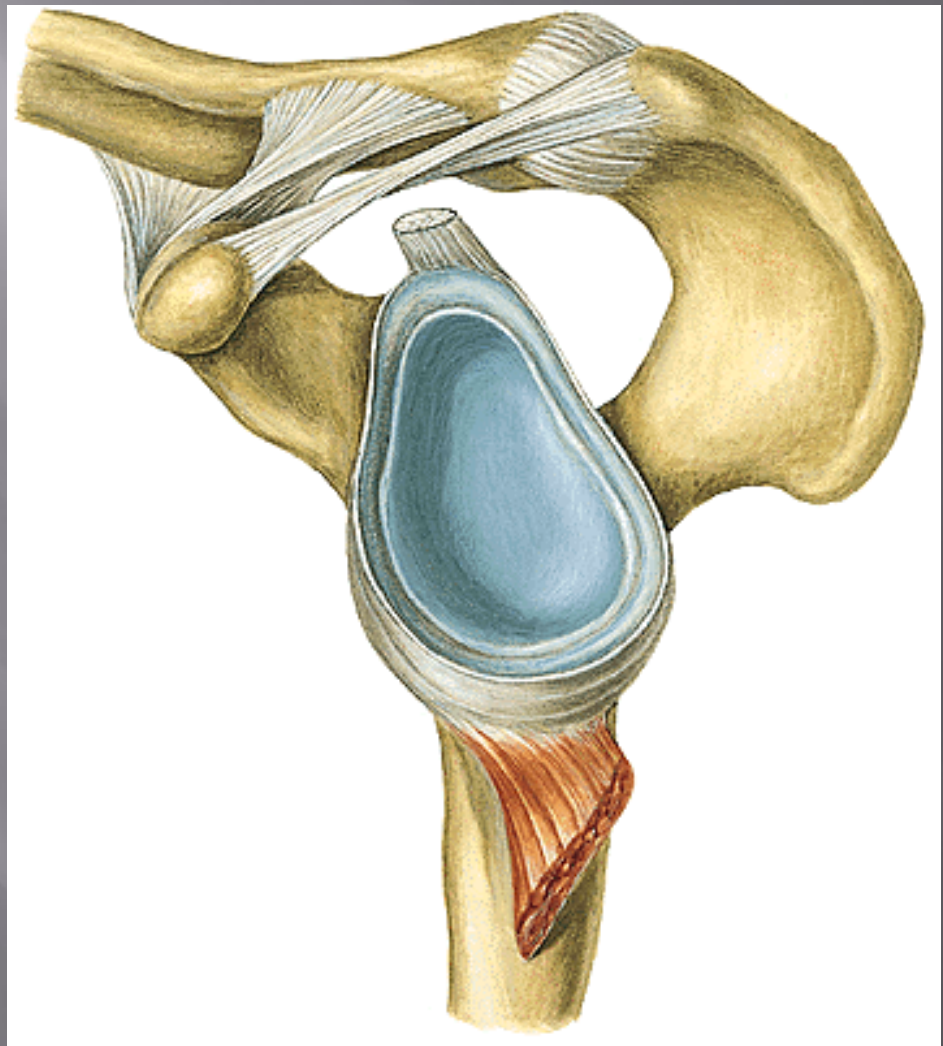




60. SPOJENÍ PLETENCE HORNÍ KONČETINY A KLOUB RAMENNÍ – pravá strana, pohled zředu

- |   |  |
|---|--|
| 1/ frontální řez akromioklavikulárním skloubením (zřetelný discus articularis jako varieta) | 8/ ligamentum coracoacromiale  |
| 2/ ligamentum coracoclaviculare (2/ ligamentum trapezoidum, 3/ ligamentum conoideum)        | 9/ ligamentum coracohumerale   |
| 3/ ligamentum coracoclaviculare (2/ ligamentum trapezoidum, 3/ ligamentum conoideum)        | 10/ pouzdro ramenního kloubu   |
| 4/ ligamentum costoclaviculare  | 11/ ligamentum transversum scapulae (superius)                               |
| 5/ frontální řez sternoklavikulárním skloubením, zřetelný discus articularis                | 12/ výčlipka synoviální membrány podél šlachy dlouhé hlavy m. biceps brachii |
| 6/ ligamentum interclaviculare  | 13/ šlacha dlouhé hlavy m. biceps brachii                                    |
| 7/ ligamentum sternoclaviculare anterius  | 14/ manubrium sterni   |
|   | 15/ první žebro  |

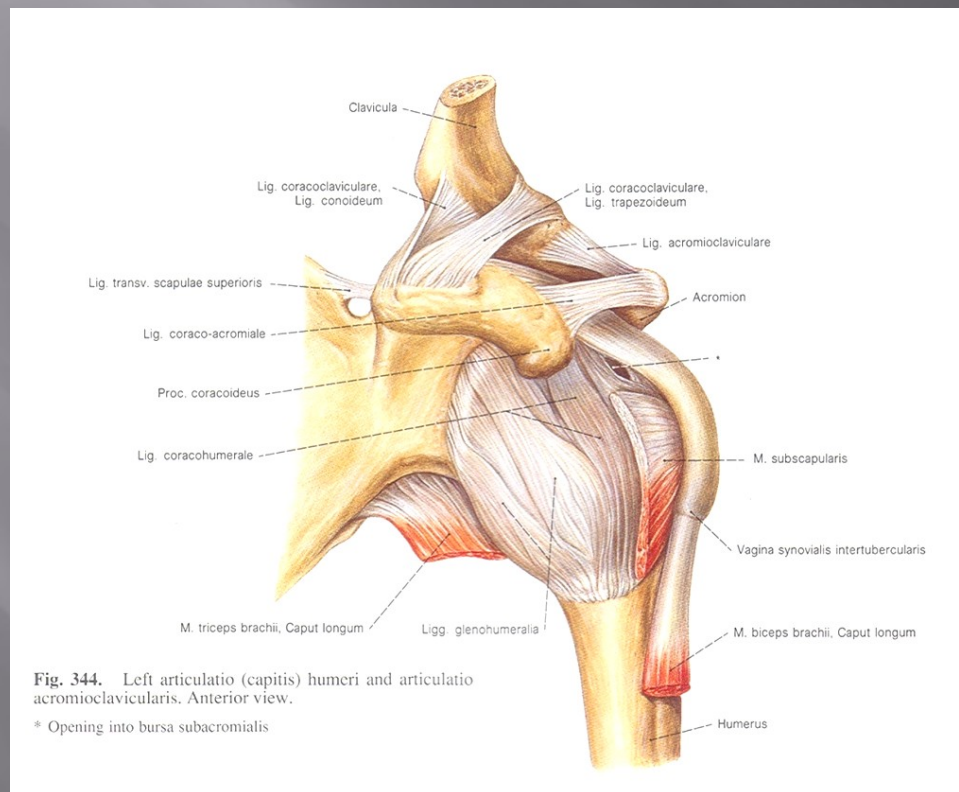




### 3. Ligaments of the scapula

*Lig. transversum scapulae*

*Lig. coracoacromiale* – between *processus coracoideus* and akromion of scapula. Together with both bone processus forms *fornix humeri*. Abduction of shoulder joint is always associated with movements of scapula!





# Connections of the free part of the upper limb

(*juncturae ossium extremitatis superioris*)

## 1. Shoulder joint (*articulatio humeri*)

**Articular surfaces** : *caput humeri* and *cavitas glenoidalis* of scapula

**Articular capsule** : is attached to margins of *cavitas glenoidalis*, reaches *collum anatomicum of humerus*, on the medial side of humerus runs distally (folds of capsule for abduction). Ventrally the synovial layer of articular capsule covers tendon of long head of *m. biceps brachii* and forms – *vagina synovialis intertubercularis*.

**Auxiliary features** : *labrum glenoidale*, *ligg. glenohumeralia*, *lig. coracohumerale*. Articular capsule is reinforced by tendons of muscles (*m. subscapularis*, *m. supraspinatus*, *m. infraspinatus*, *m. teres minor*).

**Type of joint** : ball-and-socket, movements are possible to all directions (three degrees of freedom of movements).

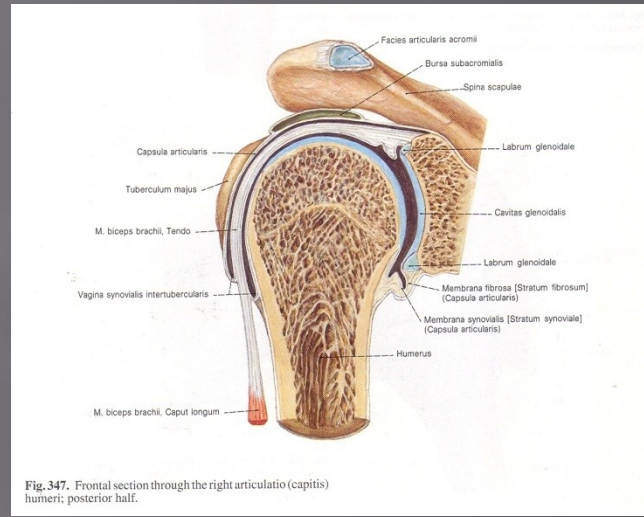
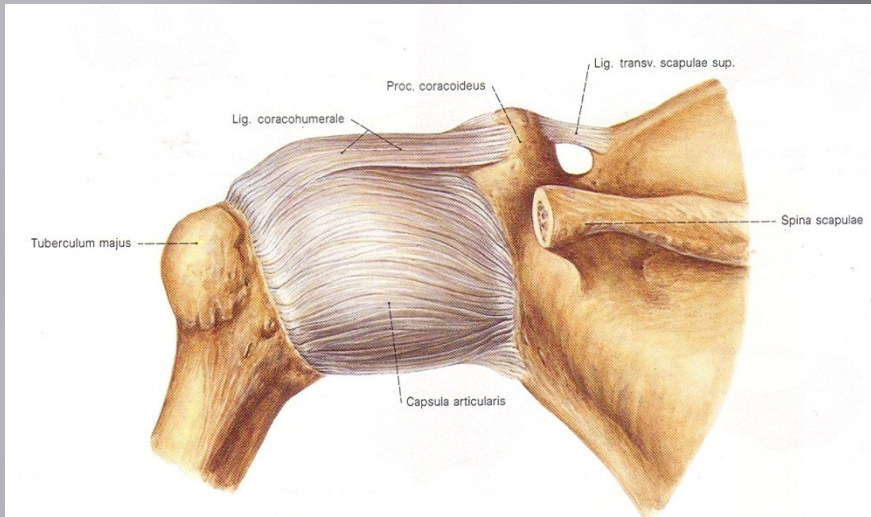


Fig. 347. Frontal section through the right articulatio (capitis) humeri; posterior half.

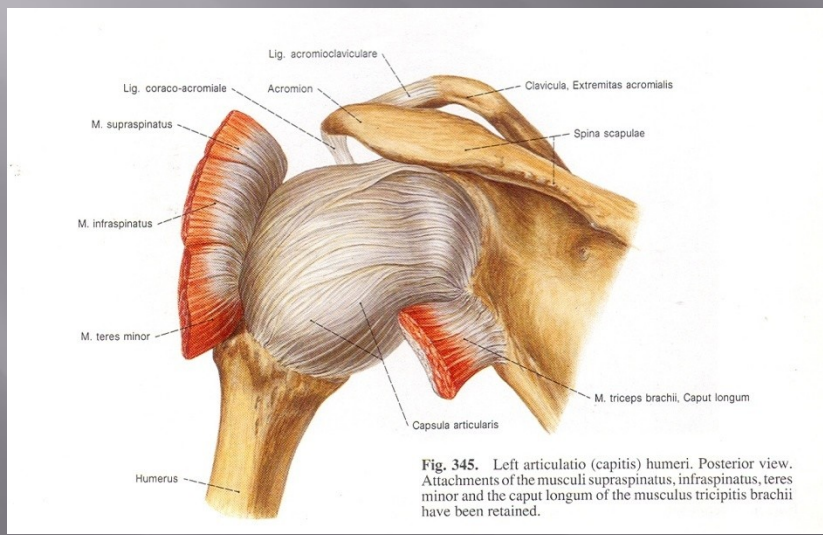


Fig. 345. Left articulatio (capitis) humeri. Posterior view. Attachments of the musculi supraspinatus, infraspinatus, teres minor and the caput longum of the musculus tricipitis brachii have been retained.

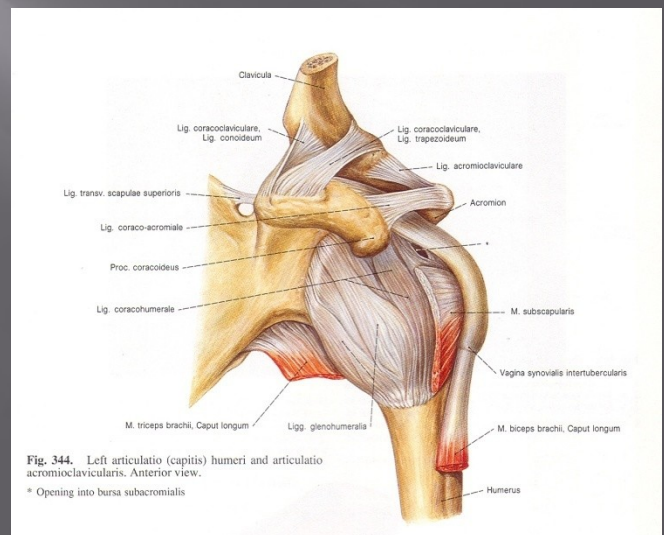


Fig. 344. Left articulatio (capitis) humeri and articulatio acromioclavicularis. Anterior view.  
\* Opening into bursa subacromialis



## 2. Elbow joint (*articulario cubiti*) – compound joint

### *Articulatio humeroradialis*

**Articular surfaces** : *capitulum humeri* and *fovea capitis of radius*

### *Articulatio humeroulnaris*

**Articular surfaces** : *trochlea humeri* and *incisura trochlearis* of ulna

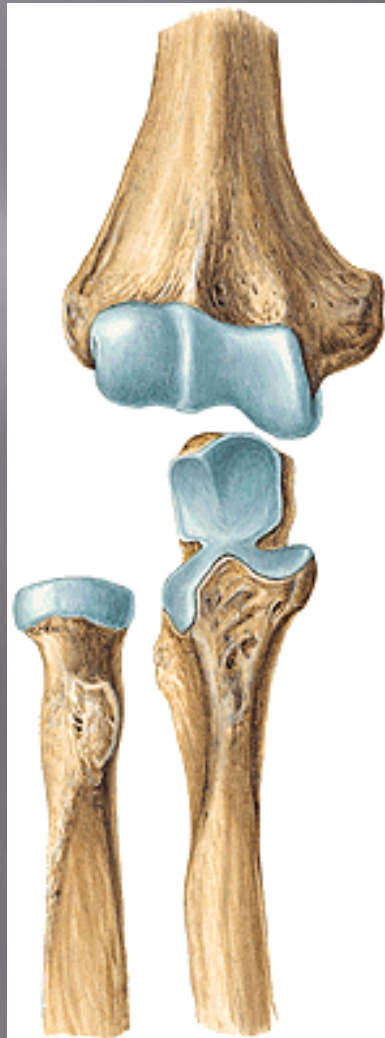
### *Articulatio radioulnaris*

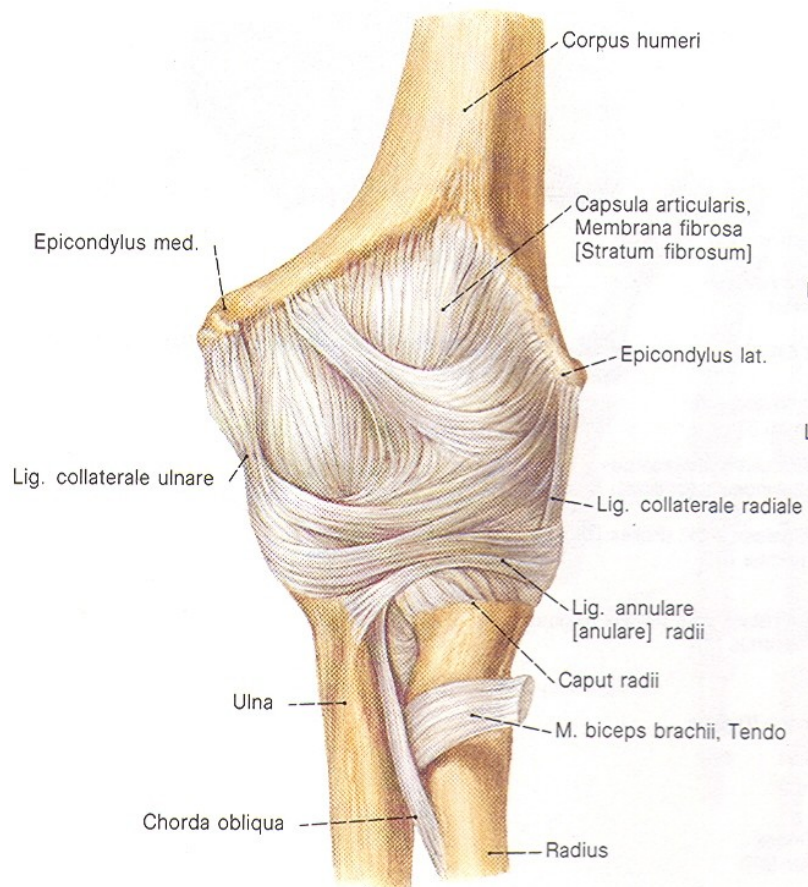
**Articular surfaces** : *circumferentia articularis capitis radii* and *incisura radialis ulnae*

**Articular capsule** : both epicondyli of humerus are free (they serve for attachment of muscles), all fossae of distal end of humerus are located intracapsularly, on the radius runs to the *collum radii – recessus sacciformis*.

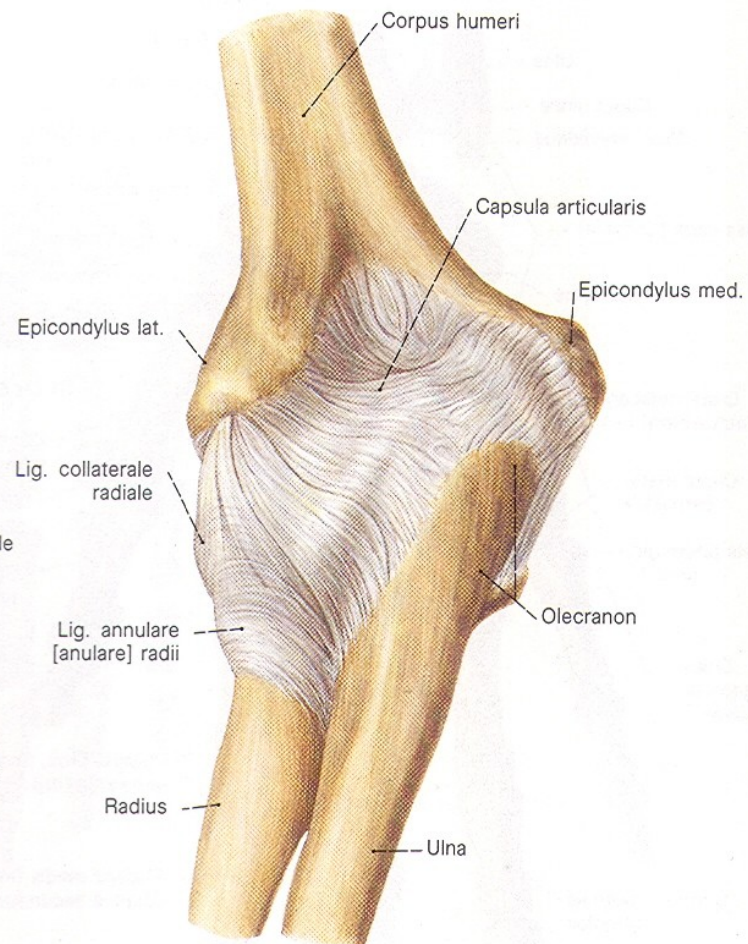
**Auxiliary features** : *lig. anulare radii*, *lig. collaterale radiale* and *lig. collaterale ulnare*.

**Type of joint** : *Articulatio humeroradialis* is ball-and-socket joint, *articulatio humeroulnaris* is a hinge joint and *articulatio radioulnaris proximalis* is a trochoid joint. Movements here are limited by position of olecranon ulnae in *fossa olecrani*. Is possible only flexion and extension, rotation (inner-pronation) and external rotation (supination).

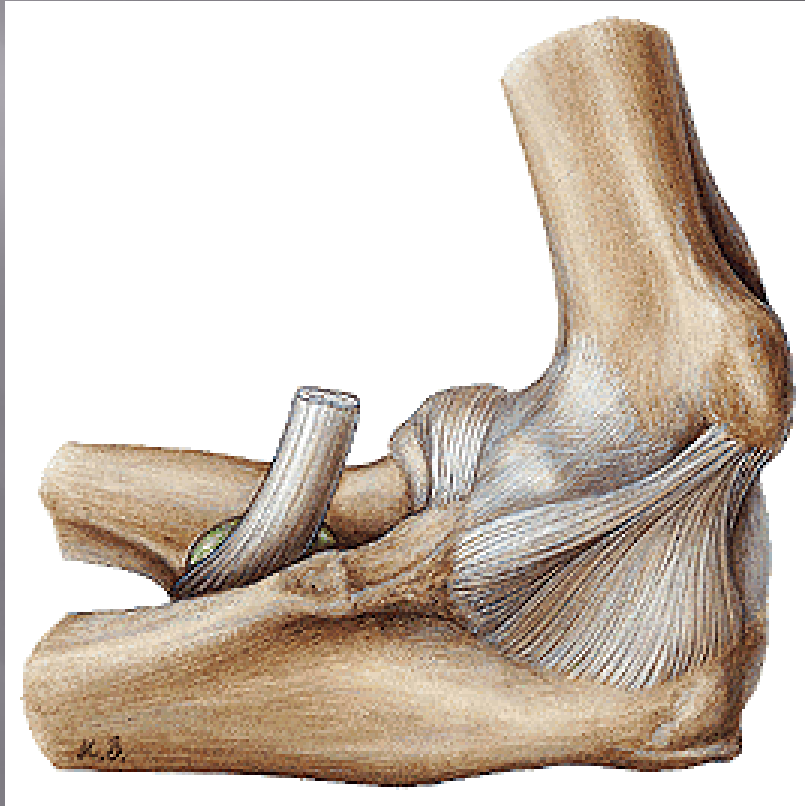




**Fig. 358.** The left articulatio cubiti. Anterior view.

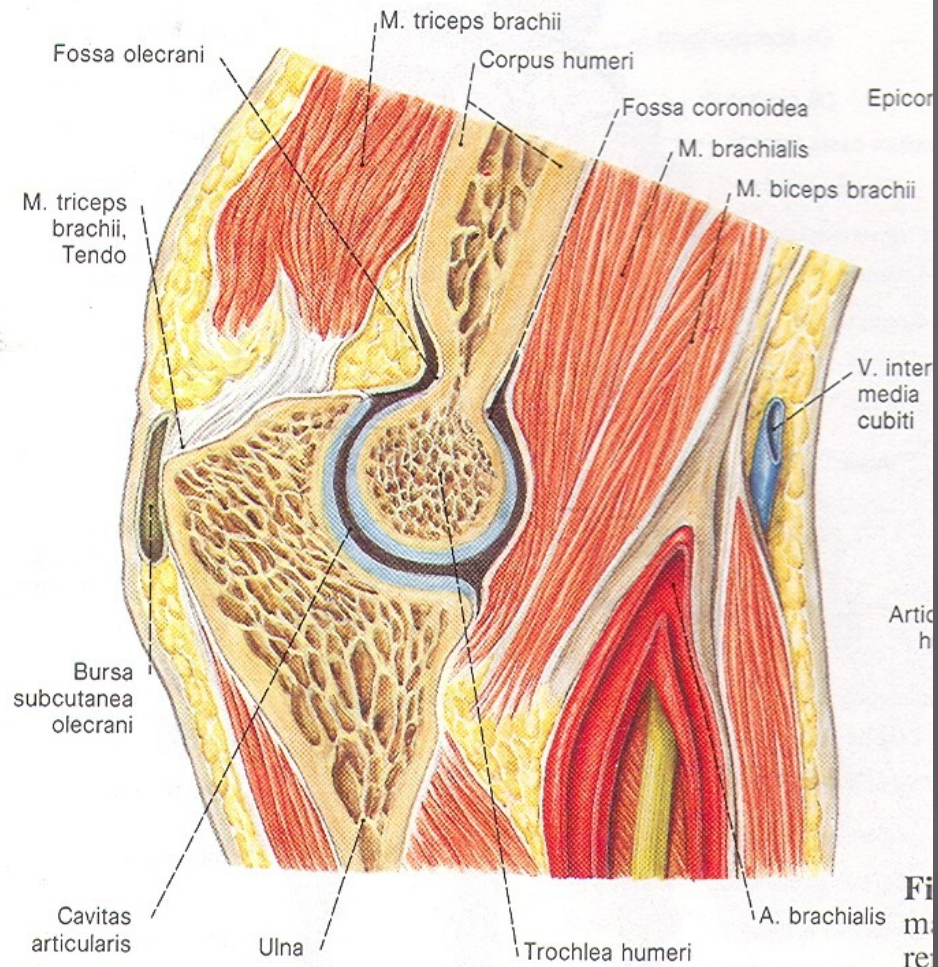


**Fig. 359.** The left articulatio cubiti. Posterolateral view.









**Fig. 360.** Sagittal section through the left articulatio humero-ulnaris.

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## **Connections of antebrachium** (*juncturae radioulnares*)

*Articulatio radioulnaris proximalis, articulatio radioulnaris distalis and membrana interossea antebrachii.*

### **A. Articulatio radioulnaris distalis**

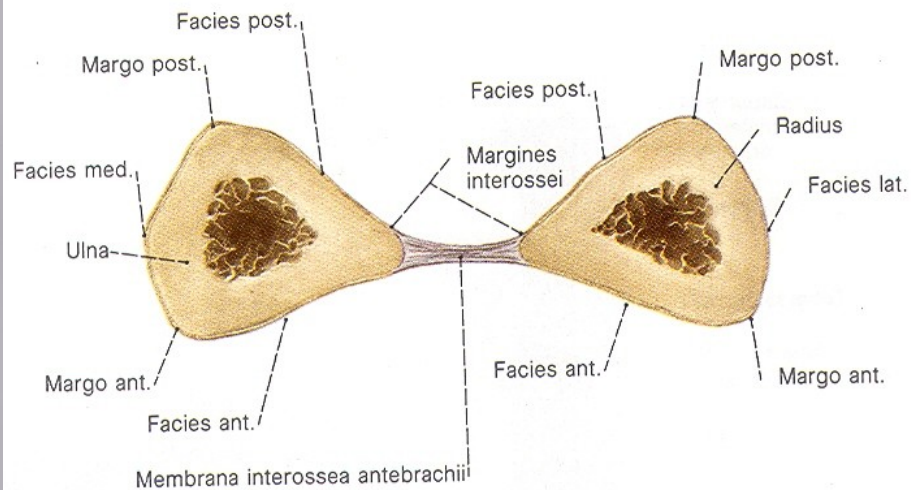
**Articular surfaces** : *caput ulnae* and *incisura ulnaris radii*

**Articular capsule** : is thin and free

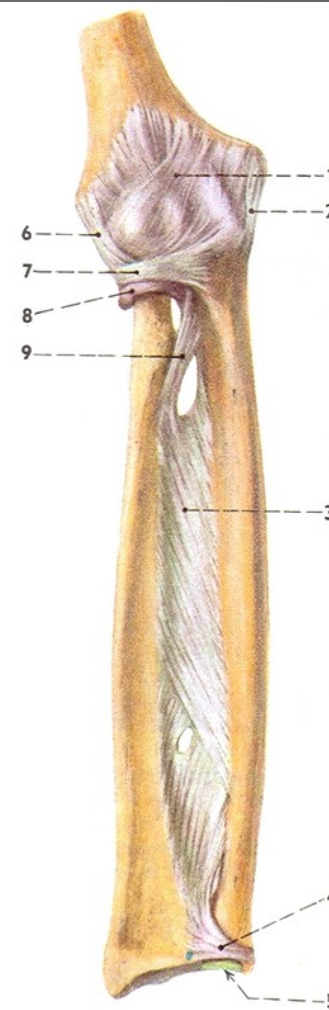
**Auxiliary features** : together with *articulatio radiocarpea*

**Type of joint** : trochoid joint – rotation.

**B. Membrana interossea antebrachii** – stiff membrane attached to margo interosseus of radius and ulna. It serves for attachment of some muscles of forearm, it limits external rotation.



**Fig. 356.** Surfaces and borders of the bones of the left forearm, sectioned near the middle of its long axis.



264. KLOUB LOKETNÍ, MEMBRANA INTEROSSEA ANTEBRACHII, ARTICULATIO RADIOULNARIS DISTALIS – pravá strana, pohled zředu  
 1/ pouzdro loketního kloubu  
 2/ ligamentum collaterale ulnare  
 3/ membrana interossea antebrachii  
 4/ pouzdro distálního radioulnárního skloubení (odlišeno barevně)  
 5/ discus articularis mezi hlavici ulny a proximální řadou karpálních kostí  
 6/ ligamentum collaterale radiale (loketního kloubu)  
 7/ ligamentum anulare radii  
 8/ recessus sacciformis (pouzdra loketního kloubu)  
 9/ chorda obliqua (membranae interosseeae)

## 4. Joints of the hand (*articulationes manus*)

### A. *Articulatio radiocarpea*

**Articular surfaces** : *facies articularis carpea radii* and *os scaphoideum*, *os lunatum* and *os triquetrum*.

**Articular capsule** : together with *articulatio mediocarpea*

**Auxiliary features** : *discus articularis*, ulna is separated from carpal bones by this discus.

Ligaments shares with *articulatio mediocarpea*.

**Type of joint** : ellipsoidal, movements together with *articulatio mediocarpea*.

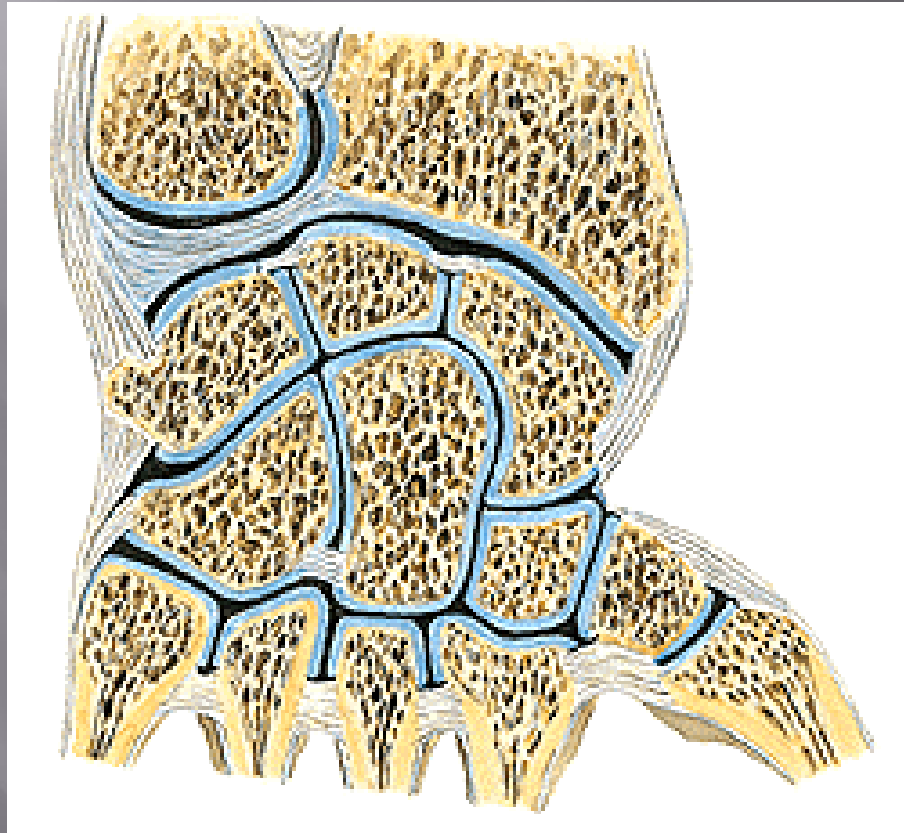
B. Midcarpal joint (*articulatio mediocarpea*) – connection between proximal and distal row of carpal bones

**Articular surfaces** : laterally – trapezium (*os trapezium*) and trapezoideum (*os trapezoideum*) form the articular fossa and scaphoideum (*os scaphoideum*) forms an articular head, medially – scaphoid (*os scaphoideum*), lunate and triquetrum (*os lunatum* and *os triquetrum*) form an articular fossa and articular head is formed by capitate and hamate (*os capitatum* and *os hamatum*). Joint has an S-shaped joint space.

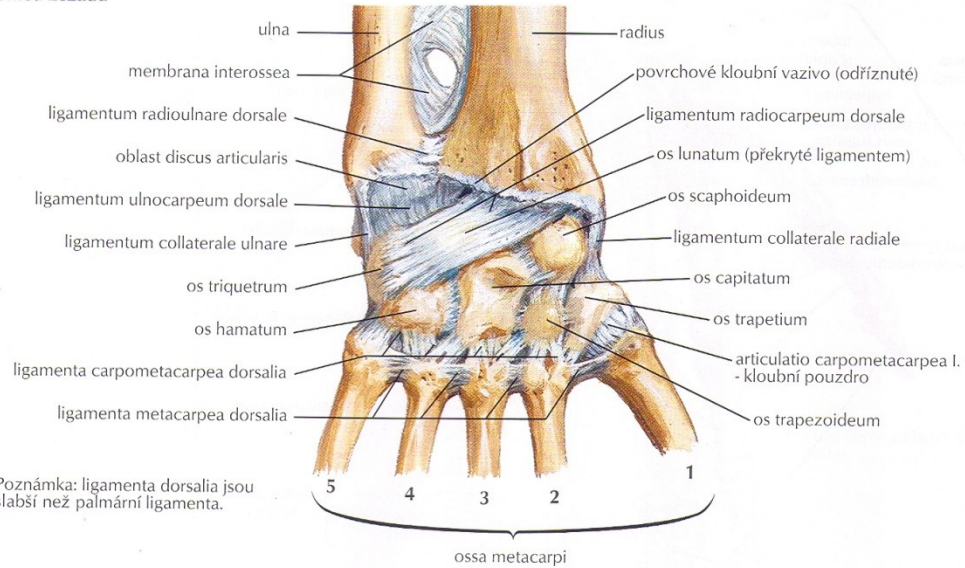
**Articular capsule** : shares with radiocarpal joint ( *articulatio radiocarpea*)

**Additional features**: dorsal and palmar radiocarpal ligaments (*lig. radiocarpeum dorsale* and *palmare*), palmar ulnocarpal ligament (*lig. ulnocarpeum palmare*), radiate carpal ligament (*lig. carpi radiatum*) runs from palmar surface of capitate (*os capitatum*) to the neighbour carpal bones. Dorsal, palmar and interosseous intercarpal ligaments (*ligg. intercarpea dorsalia*, *palmaria* and *interossea*) join together carpal bones.

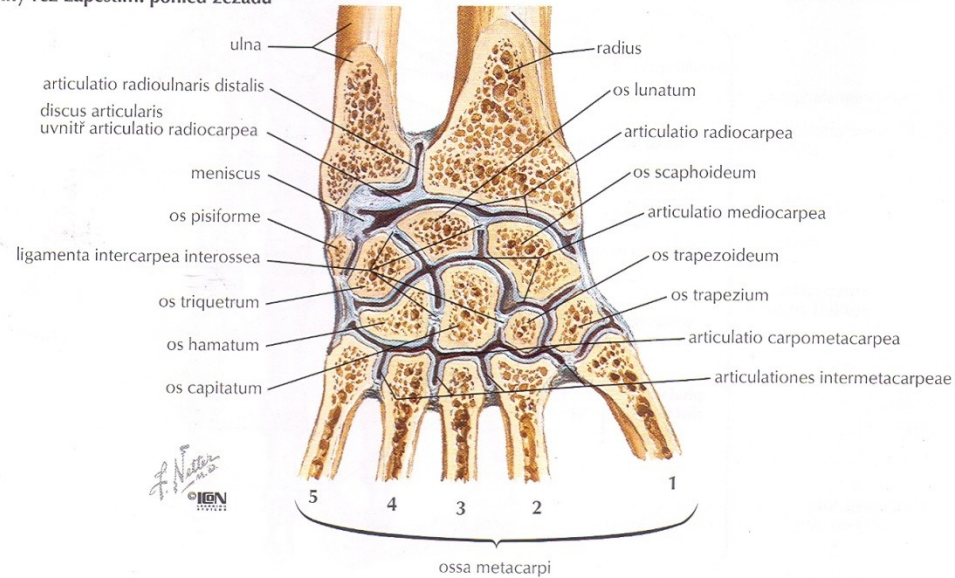
**Type of joint** : ellipsoid joint, movements shares together with midcarpal joint (*articulatio mediocarpea*) – palmar and dorsal flexion, radial and ulnar deviation and rotary movement .



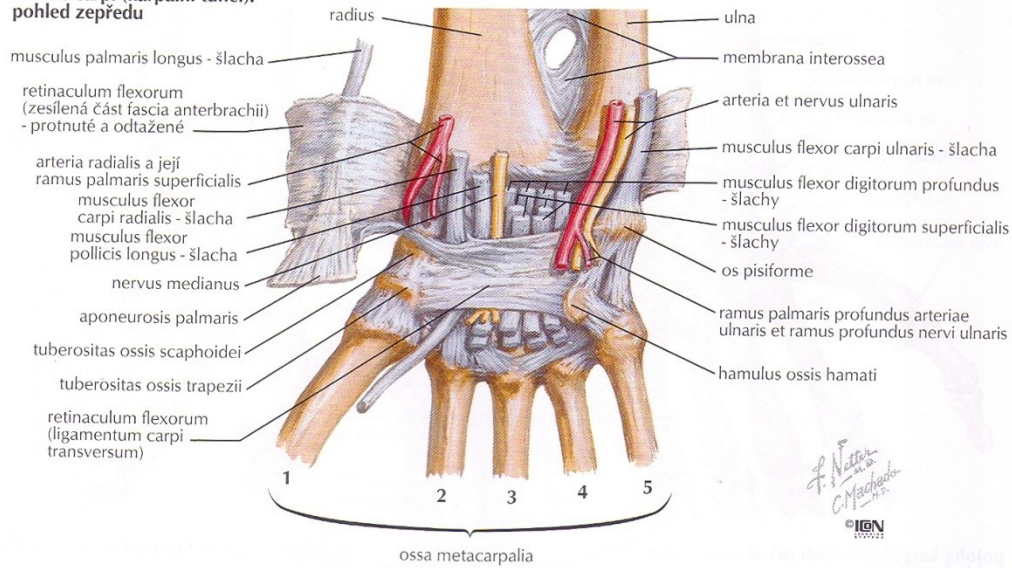
### pohled zezadu



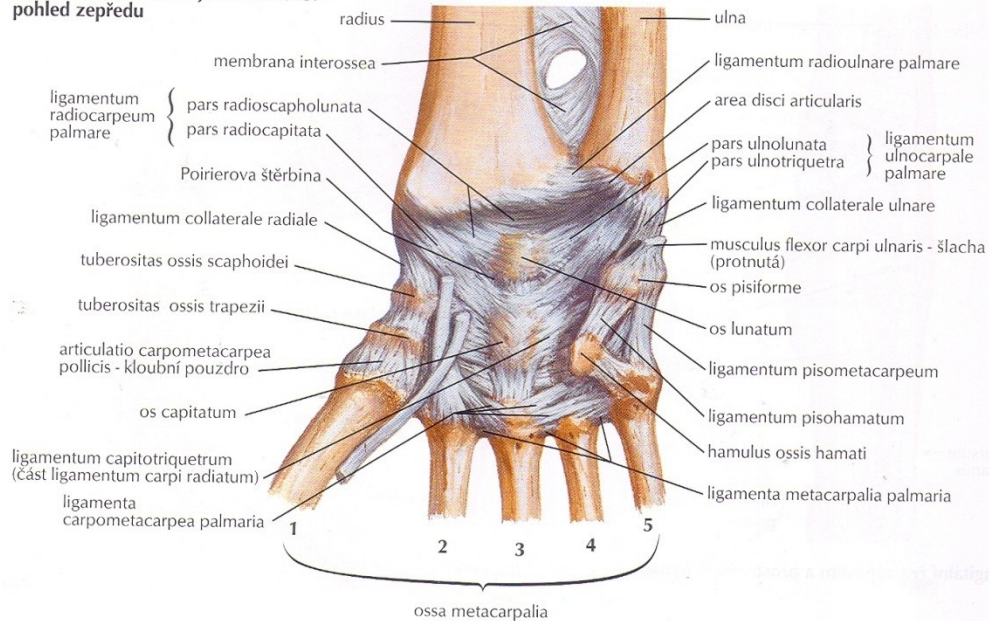
### podélný řez zápěstím: pohled zezadu



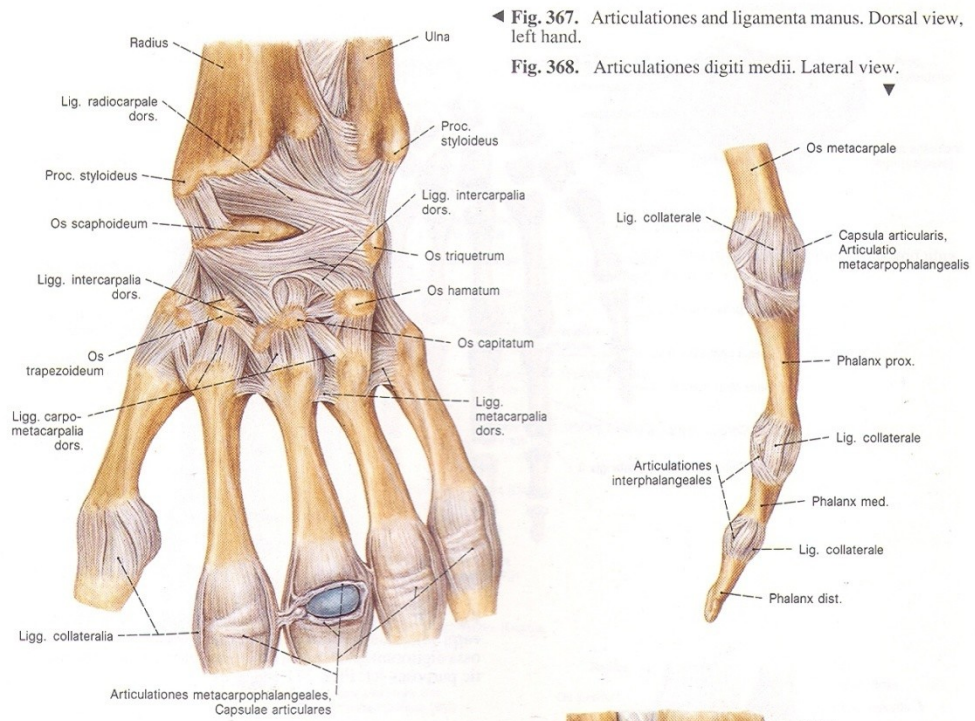
**canalis carpi (karpální tunel):  
pohled zepředu**



**retinaculum flexorum je odstraněno:  
pohled zepředu**







◀ Fig. 367. Articulationes et ligamenta manus. Dorsal view, left hand.

Fig. 368. Articulationes digiti medii. Lateral view.

Fig. 369. Articulationes et ligamenta manus. Palmar view, left hand. The retinaculum flexorum has been removed. The os sesamoideum radiale of the pollex [digitus primus (I)] and ossa sesamoidea of the index [digitus secundus (II)] and digitus minimus [quintus (V)] have been exposed.

### **C. *Articulatio ossis pisiformis***

**Articular surfaces:** connection between *os pisiforme* and *os triquetrum*.

**Articular capsule:** is attached to margins of the articular surfaces.

**Auxiliary features:** articular capsule is reinforced by *lig. pisohamatum* and *lig. pisometacarpeum*.

### **D. *Articulatio carpometacarpea pollicis***

**Articular surfaces:** connection between *os trapezium* and basis of the I. metacarpal bone.

**Articular capsule:** is relatively free and it is attached to margins of the articular surfaces.

**Type of the joint:** saddle; movements – abduction and adduction of the thumb, opposition and reposition. Thumb is the most movable finger.

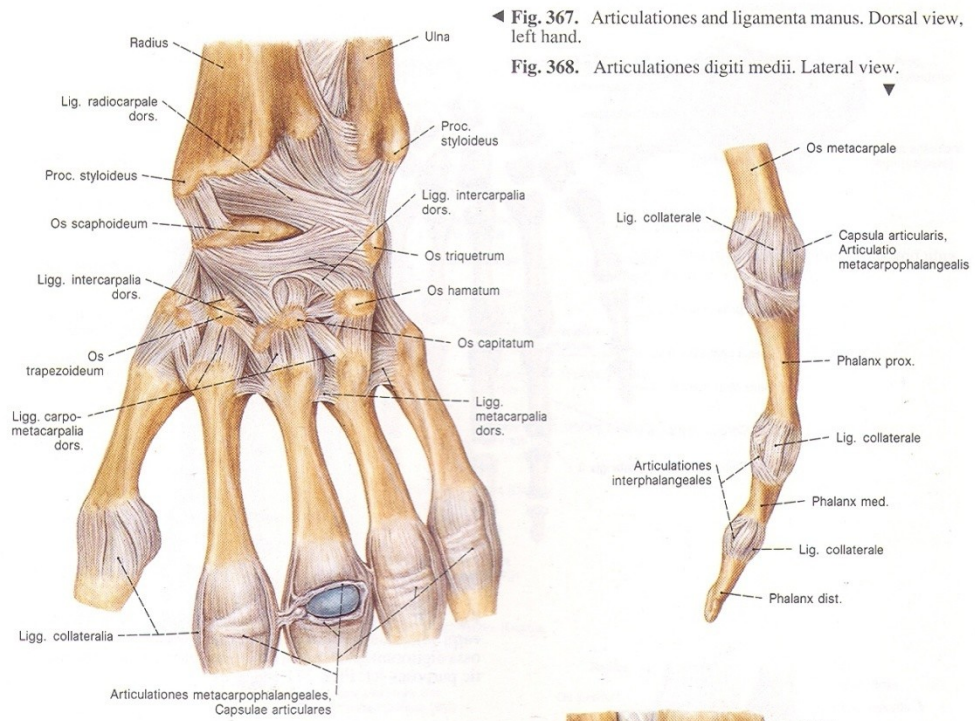
### **E. *Articulationes carpometacarpeae II. – V.***

**Articular surfaces:** distal row of carpal bones joins to bases of the II. – V. metacarpal bones. Connection between sides of bases of metacarpal bones.

**Articular capsule:** is attached to margins of the articular surfaces.

**Auxiliary features:** *Ligg. metacarpea palmaria, dorsalia* and *interossea* and between bases of metacarpal bones *ligg. metacarpea palmaria, dorsalia* and *interossea*.

**Type of the joint:** amphiartrrosis (almost immobile joint).



◀ Fig. 367. Articulationes et ligamenta manus. Dorsal view, left hand.

Fig. 368. Articulationes digiti medii. Lateral view.

Fig. 369. Articulationes et ligamenta manus. Palmar view, left hand. The retinaculum flexorum has been removed. The os sesamoideum radiale of the pollex [digitus primus (I)] and ossa sesamoidea of the index [digitus secundus (II)] and digitus minimus [quintus (V)] have been exposed.

## **F. *Articulationes metacarpophalangeae***

**Articular surfaces:** caput of metacarpals and bases of proximal phalanges

**Articular capsule:** is attached to margins of the articular surfaces.

**Auxiliary features:** connective plates increase articular pits – *laminae fibrocartilagineae palmares* and *ligg. collateralia*.

Metacarpophalangeal joint has in *lamina fibrocartilaginea* two small sesamoid bones. Palmar side of caput the II. – V. metacarpal bones are joined by *lig. metacarpeum transversum profundum*.

**Type of the joint:** ellipsoidal, with possibility of flexion, extension, abduction and adduction.

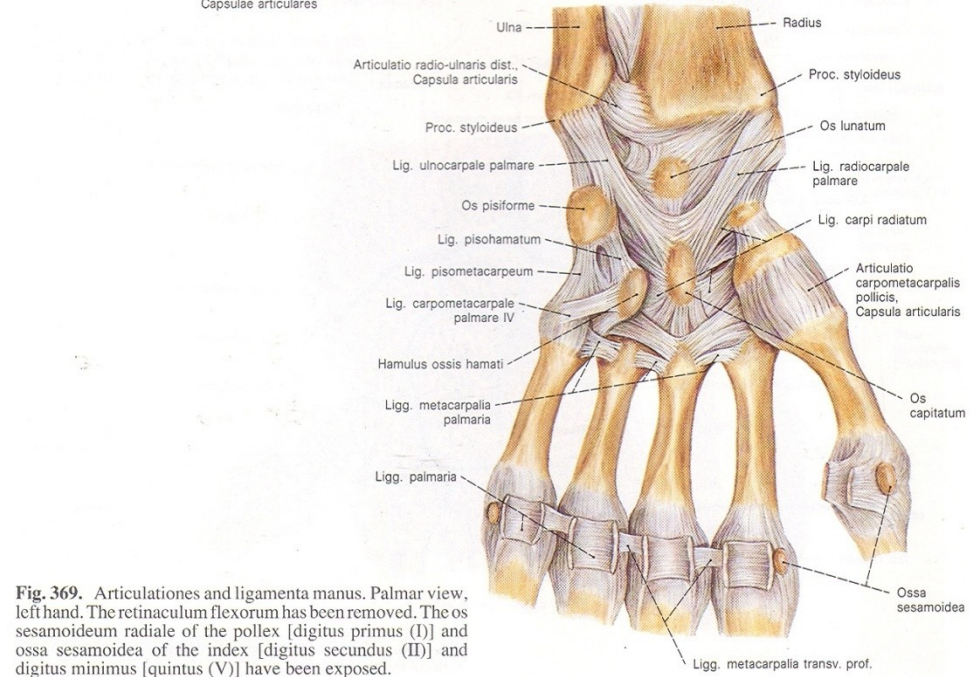
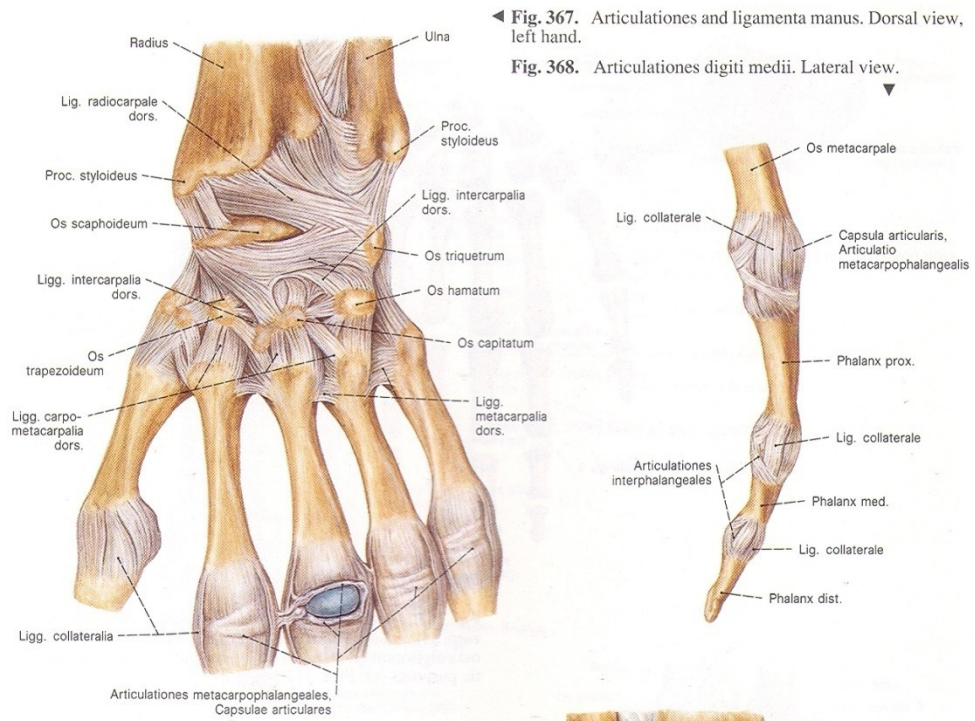
## **G. *Articulationes interphalangeae manus***

**Articular surfaces :** *trochlea phalangis* of the proximal phalanx, basis of distal phalanx.

**Articular capsule :** is attached to margins of the articular surfaces.

**Auxiliary features :** connective plate increases articular pit – *lamina fibrocartilaginea palmaris*. Articular capsule is reinforced by *ligg. collateralia*.

**Auxiliary features :** hinge joint, movements – flexion and extension, distal phalanx with possibility of hyperextension.





# Connection of the lower limb

*(juncturae ossium extremitatis inferioris)*

includes connection of pelvic girdle and free part of lower limb.

**Connection of pelvic girdle** (*juncturae ossium cinguli extremitatis inferioris*) they have relation to pelvis, which arises by joining of two pelvic bones and dorsally with sacral bone.

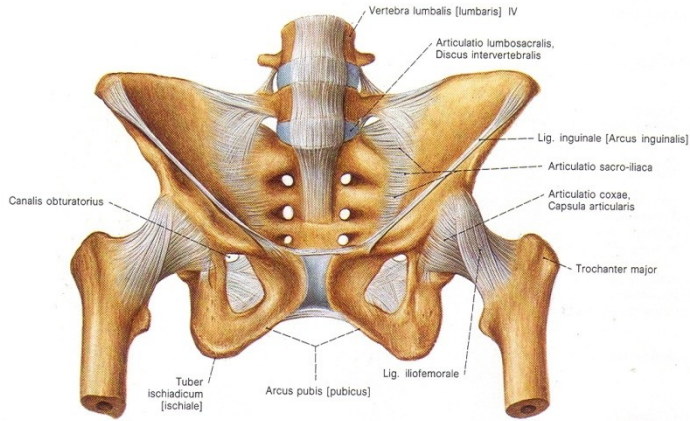
## 1. *Articulatio sacroiliaca (sacroiliac joint)*

**Articular surfaces:** *facies auricularis* of sacral and hip bones.

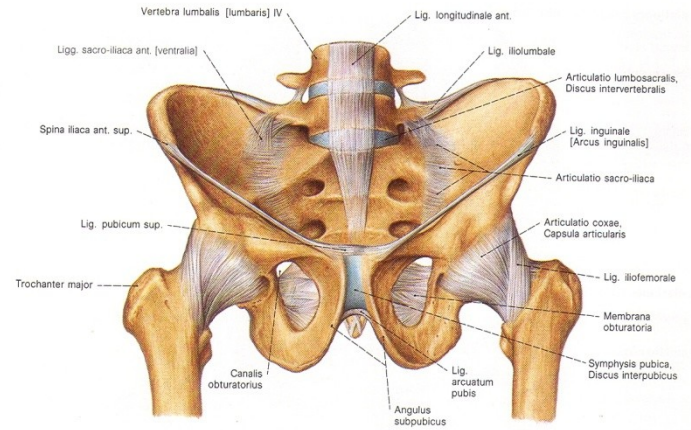
**Articular capsule:** is taut and is attached to the articular surfaces.

**Auxiliary features:** capsule is strengthened by *ligg. sacroiliaca ventralia* and *dorsalia*, *ligg. sacroiliaca interossea* are located between *tuberositas sacralis* and *tuberositas iliaca*.

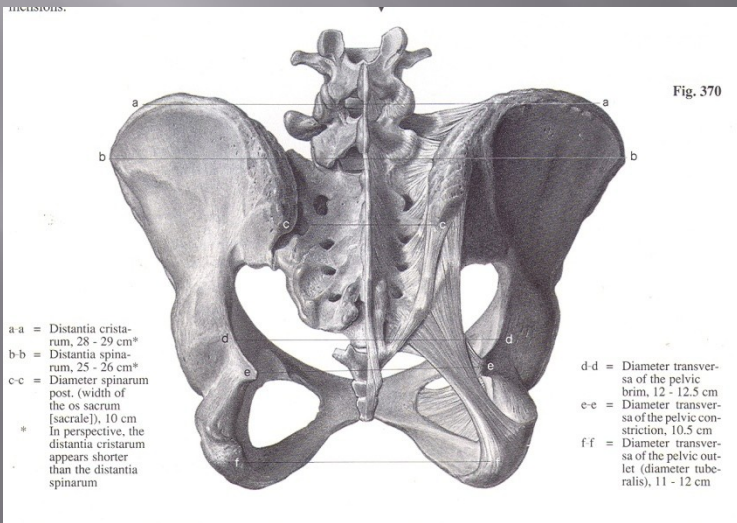
**Auxiliary features:** amphiartrrosis (with minimal movements).



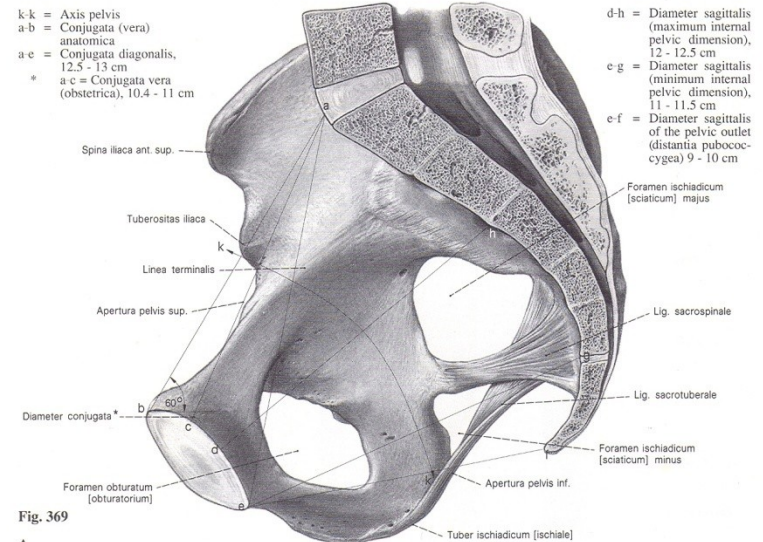
**Fig. 372.** The female pelvis. Articulationes cinguli membri inferioris et articulationes coxae and associated ligamenta, in a ventral and caudal view.



**Fig. 371.** The male pelvis. Articulationes cinguli membri inferioris et articulationes coxae and associated ligamenta, in a ventral and caudal view.



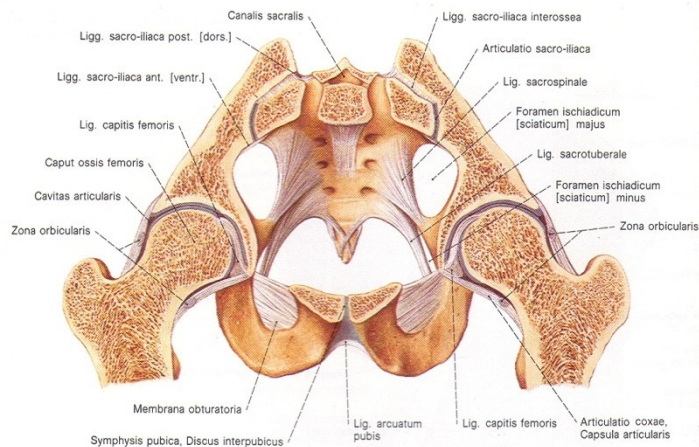
**Fig. 370**



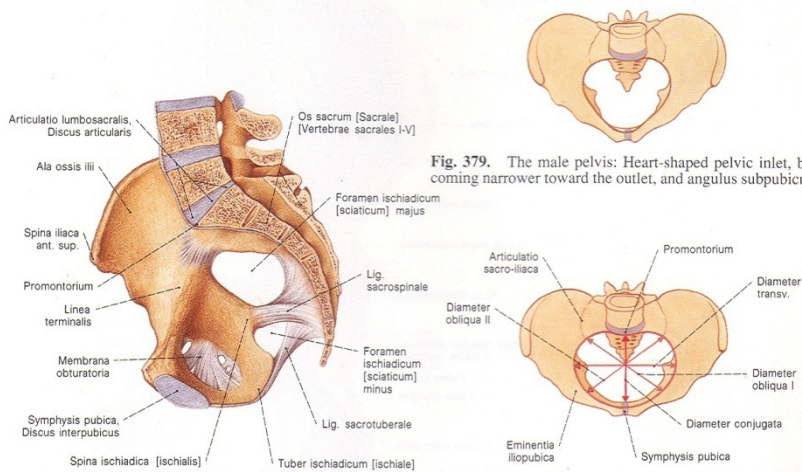
**Fig. 369**

**Fig. 370.** Dorsal view of the female pelvis with clinical dimensions. The ligamenta are retained on the right.



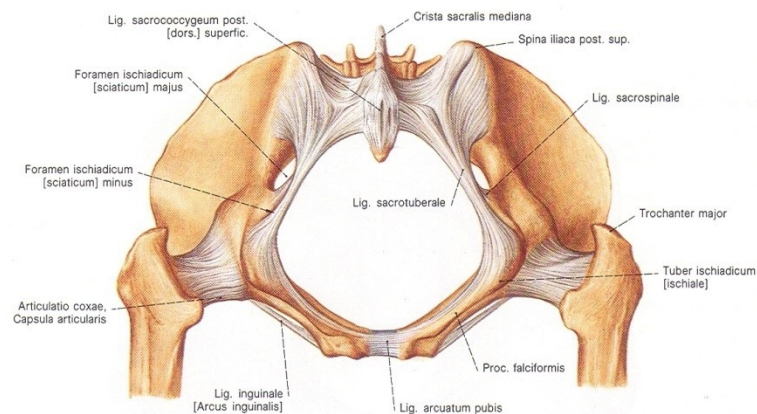


**Fig. 377.** Frontal section of the pelvis at the level of both articulationes coxae, somewhat perpendicular to the axis pelvis. The specimen also shows the symphysis pubica with its discus interpubicus, and the bilateral articulationes sacro-iliacae and their associated ligamenta. Cranial view.

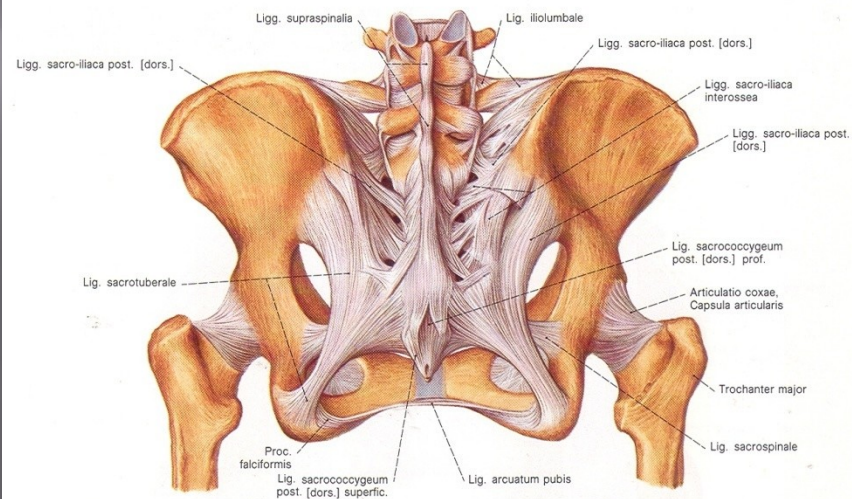


**Fig. 378.** Articulationes and ligamenta of the hemisected pelvis, medial view.

**Fig. 380.** The female pelvis: Horizontal oval pelvic inlet, cylindrical lesser pelvis which does not narrow toward the outlet, and a rounded arcus pubis [pubicus].



**Fig. 375.** The female pelvis. Articulationes cinguli membri inferioris and articulationes coxae and associated ligamenta, viewed from below.



**Fig. 376.** The female pelvis. Articulationes of the vertebrae lumbales [lumbares], os sacrum [sacrale], and the articulation sacro-iliaca and associated ligamenta, in a posterior view. On

the right a portion of the superficial layer of the ligamenta sacro-iliaca posteriora [dorsalia] has been removed.

Note the sex differences, especially in shape, size and diameter of the pelvic inlet, also in relation to the os sacrum [sacrale] and position of the ala ossis ili. The red arrows in Fig. 380 indicate: the left diameter obliqua of the pelvis (I), from the left eminentia iliopubica to the right articulation

sacro-iliaca (12.5 cm); the right diameter obliqua of the pelvis (II), from the eminentia iliopubica to the left articulation sacro-iliaca (12.5 cm); diameter **conjugata** from the promontorium to the most prominent part of the posterior symphyseal border (= **11 cm**).

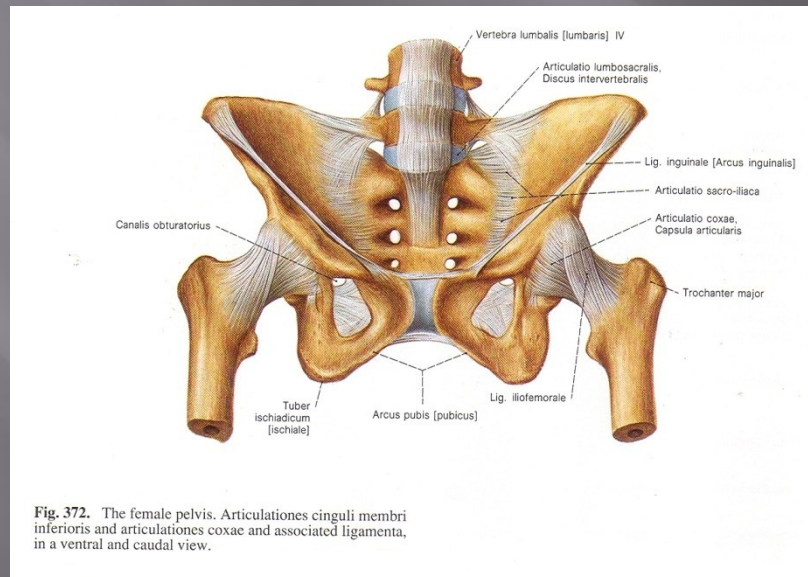
## 2. *Symphysis pubica*

Is formed by cartilagenous *discus interpubicus* which connects both pubic bones. Symphysis pubica is 4,5 – 5 cm in height.

There is on the upper margin of symphysis *lig. pubicum superius*, under it very strong *lig. arcuatum pubis*.

## 3. *Membrana obturatoria*

Is a stiff membrane which closes *foramen obturatum*; it serves as attachment for *mm. obturatorii*.



**Fig. 372.** The female pelvis. Articulationes cinguli membri inferioris and articulationes coxae and associated ligamenta, in a ventral and caudal view.

#### 4. Ligaments in the pelvic region

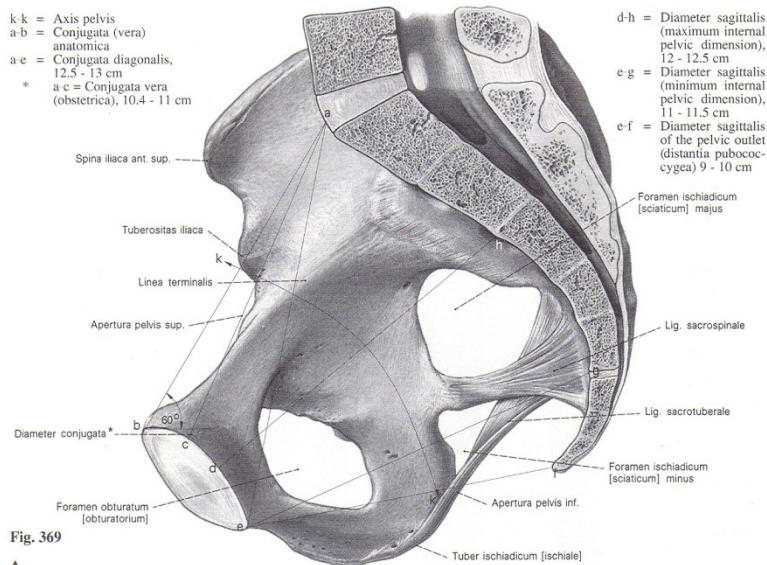
*Lig. sacrospinale* (fan out to the lateral margin of the sacral bone from the *spina ischiadica*).

*Lig. sacrotuberale* (fan out to the lateral margin of the sacral bone from the *tuber ischiadicum*).

*Incisura ischiadica major* is converted by course of *lig. sacrospinale* into *foramen ischiadicum majus* (*greater sciatic foramen*). This foramen is divided by *m. piriformis* into *foramen suprapiriforme* and *foramen infrapiriforme* (content – nerves and vessels to gluteal muscles). *Foramen ischiadicum minus* (*lesser sciatic foramen*) is limited by *ligamentum sacrotuberale* and *sacrospinale* and *incisura ischiadica minor*. Through this opening run *m. obturatorius internus* and nerves and vessels to external genital organs).

*Lig. iliolumbale* passes from *processus costarius* of 4. and 5. lumbar vertebrae to *crista iliaca* (*iliac crest*).

- k-k = Axis pelvis
- a-b = Conjugata (vera) anatomica
- a-e = Conjugata diagonalis, 12.5 - 13 cm
- \* a-c = Conjugata vera (obstetrica), 10.4 - 11 cm



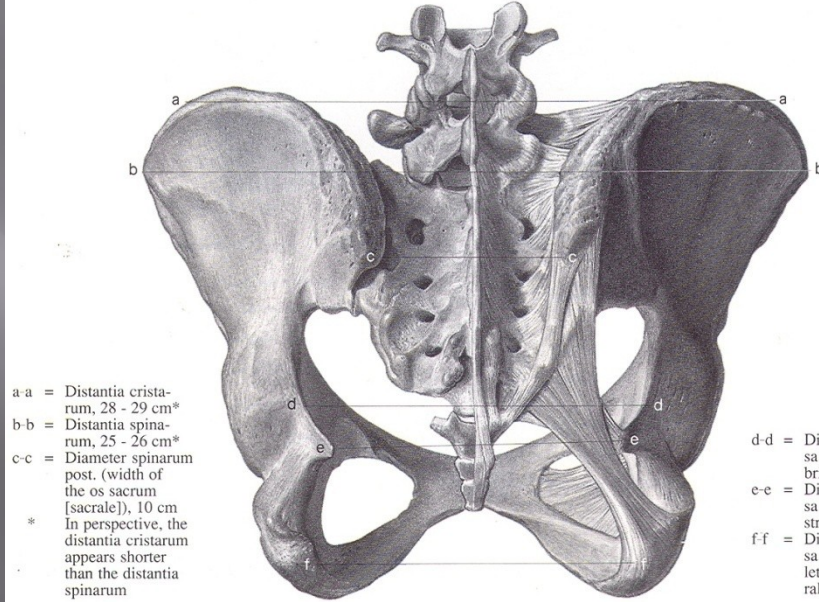
**Fig. 369**

▲ **Fig. 369.** Median sagittal section of the pelvis of an adult female indicating the pelvis axis and various clinical pelvic dimensions.

- d-h = Diameter sagittalis (maximum internal pelvic dimension), 12 - 12.5 cm
- e-g = Diameter sagittalis (minimum internal pelvic dimension), 11 - 11.5 cm
- e-f = Diameter sagittalis of the pelvic outlet (distantia pubococcygea) 9 - 10 cm

▼ **Fig. 370.** Dorsal view of the female pelvis with clinical pelvic dimensions. The ligamenta are retained on the right.

MEASUREMENTS.



- a-a = Distantia cristarum, 28 - 29 cm\*
- b-b = Distantia spinarum, 25 - 26 cm\*
- c-c = Diameter spinarum post. (width of the os sacrum [sacrale]), 10 cm
- \* In perspective, the distantia cristarum appears shorter than the distantia spinarum

- d-d = Diameter transversa of the pelvic brim, 12 - 12.5 cm
- e-e = Diameter transversa of the pelvic constriction, 10.5 cm
- f-f = Diameter transversa of the pelvic outlet (diameter tuberalis), 11 - 12 cm

**Fig. 370**

## 5. Pelvis

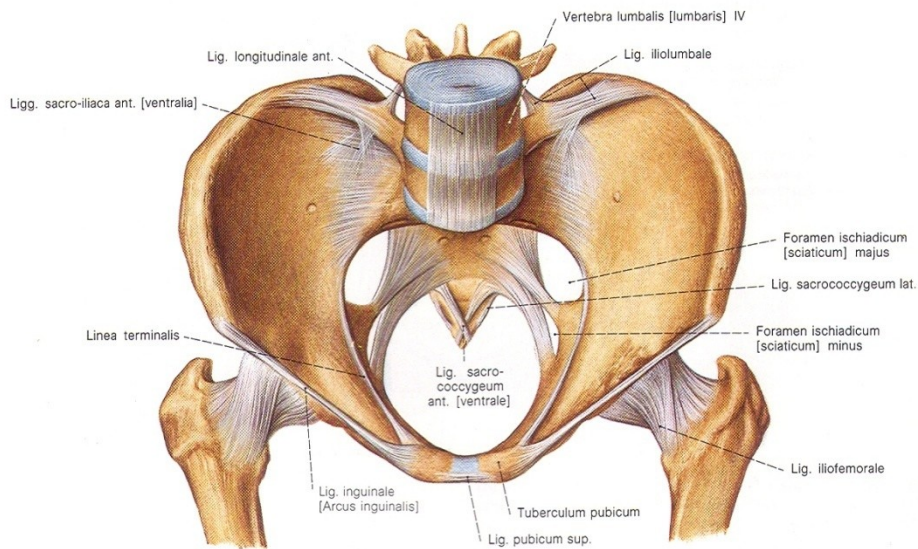
The bony pelvis consists of two hip bones, ventrally are joined by cartilaginous *symphysis pubis* and dorsally by *os sacrum* and *os coccygis*. *Aditus pelvis* (the pelvic inlet) is bordered by *linea terminalis* which separates *pelvis major*, located above this line (a part of the abdominal cavity) and *pelvis minor* (its content – a part of genital and urinary systems). *Exitus pelvis* (the pelvic outlet) is the region between the subpubic angle, *tubera ischiadica* and *os coccygis*.

Pelvis minor is an important childbirth way in female and it has an great intersexual differences.

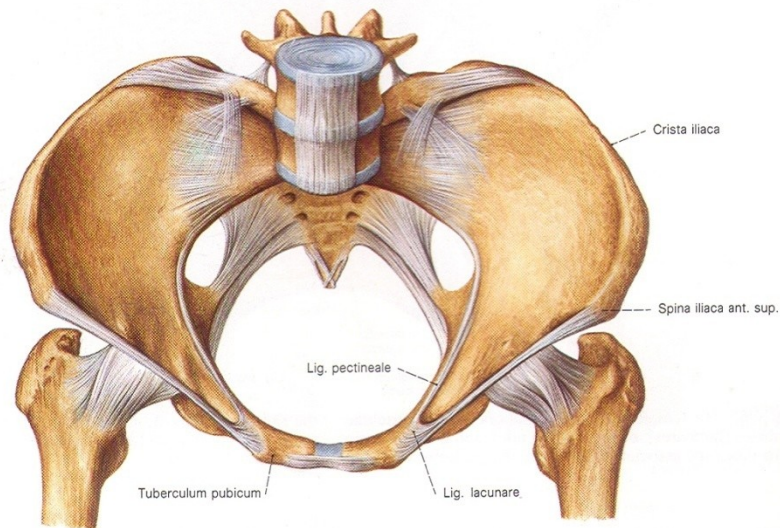
Male pelvis is higher and narrower, *incisura ischiadica major* has shape like letter J, longitudinally oriented *foramen obturatum* and *angulus subpubicus*.

Female pelvis is lower and wider than in the male. *Foramen obturatum* is transversely directed and female pelvis has *arcus pubicus*, *incisura ischiadica major* has shape like broad V letter.

The absolute diameters are longer in pelvis of males.



**Fig. 373.** The male pelvis. Articulationes cinguli membri inferioris and articulationes coxae and associated ligamenta, viewed from above. The inclinatio pelvis corresponds to the human upright position.



**Fig. 374.** The female pelvis. Articulationes cinguli membri inferioris and articulationes coxae and associated ligamenta, viewed from above. The inclinatio pelvis corresponds with the human upright position. Note the characteristic sex differences between the male and female pelvis.

