



# Joints of upper limb

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### Preamble:

The musculoskeletal system is organized to optimize mobility to varying degrees throughout the animal kingdom. Muscles are attached to bones by their tendons and bones articulate with other bones at their articulating ends by the numerous ligaments. At some points these ligaments span from one area to another while contributing to the formation of joint capsules at the respective junction. The upper limb is the most mobile appendage of the human body. It can achieve a vast range of motions and also facilitates the completion of fine motor tasks.

<b><i>Key facts about the ligaments of the upper limb</i></b>	
<b><i>Pectoral girdle</i></b>	<p>Interclavicular - superior border of medial end of the clavicle -&gt; same area of contralateral clavicle</p> <p>Costoclavicular - anterior surface of medial end of the clavicle -&gt; costal cartilage of the first rib</p> <p>Anterior sternoclavicular - anterosuperior side of medial end of the clavicle -&gt; jugular notch of the manubrium</p> <p>Posterior sternoclavicular - posterosuperior side of the medial end of the clavicle -&gt; jugular notch of the manubrium</p>
<b><i>Glen humeral joint</i></b>	<p>Suprascapular - medial aspect of the scapular notch -&gt; coracoid process of the scapula</p> <p>Spinoglenoid - lateral side of scapular spine -&gt; edge of the glenoid cavity</p> <p>Coracoacromial - acromion of the scapula -&gt; coracoid process of the scapula</p> <p>Coracoclavicular ligaments (<i>trapezoid and conoid</i>) -</p>

	<p>inferior side of the clavicle -&gt; coracoid process of the scapula                  Acromioclavicular - superior side of the lateral end of the clavicle -&gt; superior aspect of the acromion                  Superior glenohumeral - supraglenoid tubercle of the humerus -&gt; superior part of the glenoid rim                  Middle glenohumeral - inferior to the bicipital sulcus of the humerus -&gt; anterior and inferior part of the glenoid rim                  Inferior glenohumeral - surgical neck of the humerus -&gt; glenoid rim                  Coracohumeral - greater and lesser humeral tubercles -&gt; coracoid process of the scapula                  Transverse humeral - encloses the bicipital groove and travels through it</p>
<b><i>Elbow</i></b>	<p><i>Anterior part</i> of the ulnar collateral - superiorly to the anterior surface of medial epicondyle of humerus -&gt; medial coronid margin of the ulna  <i>Posterior part</i> of ulnar collateral - posterior surface of the medial epicondyle of the humerus -&gt; medial part of the ulnar olecranon  <i>Inferior part</i> of the ulnar collateral - coronoid process of the ulna -&gt; olecranon of the ulna                  Radial collateral - lateral epicondyle of the humerus -&gt; annular ligament of the radius, supinator crest</p>
<b><i>Radioulnar joints</i></b>	<p>Annular - head of the radius -&gt; radial notch of the ulna                  Quadrante - radial neck -&gt; ulnar supinator fossa                  Palmar radioulnar - ventral surface of the ulnar notch of the radius -&gt; ventral surface of the head of the ulna                  Dorsal radioulnar - dorsal surface of the ulnar notch of the radius -&gt; ventral surface of the head</p>

	of the ulna Articular disk - styloid process of the ulna -> radius
<b>Wrist</b>	<p>Radioscaphocapitate - styloid process of the radius -&gt; scaphoid and capitate bone</p> <p>Long radiolunate - palmar lip of the radius -&gt; volar horn of the lunate bone</p> <p>Short radiolunate - palmar lip of the lunate fossa of the radius -&gt; palmar horn of the lunate bone</p> <p>Palmar ulnocarpal ligaments (<i>ulnotriquetral, ulnocapitate, ulnolunate</i>) - palmar region of the ulna -&gt; triquetrum, capitate, lunate bones</p> <p>Intrinsic carpal ligaments (<i>proximal, distal, palmar, dorsal</i>) - stabilize carpometacarpal junctions</p> <p>Dorsal ligaments (<i>intercarpal, radiocarpal, radioulnotriquetral</i>) - stabilize same named joints</p>

## Pectoral girdle

### *Interclavicular ligament*

The sternoclavicular junction is the primary point of bony interaction between the upper axial skeleton and the upper limb. As such, the ligaments associated with this articulation will be discussed. The first to be encountered is the interclavicular ligament. It attaches to the roughened upper border of the sternal end of the clavicle, crosses along the sternal notch and inserts on the same area of the contralateral clavicle.



### ***Costoclavicular ligament***

Emerging from a rough area on the ventral surface of the sternal end of the clavicle is the costoclavicular ligament. The inverted cone-shaped band helps to anchor the clavicle to the axial skeleton by inserting on the costal cartilage of the first rib.

### ***Coracoclavicular ligament***

The anterior and posterior sternoclavicular ligaments also contribute to the stability of the sternoclavicular joint. Each one arises from the anterosuperior and posterosuperior (respectively) aspect of the sternal head of the clavicle and insert lateral to the jugular notch. While the posterior sternoclavicular ligament is relatively weaker than its anterior counterpart, both ligaments take an inferomedial course to insert in the manubrium.

For a quick recap, the ligaments of the pectoral girdle associated with the upper limb are the:

- Interclavicular Ligament
- Anterior Sternoclavicular Ligament
- Posterior Sternoclavicular Ligament
- Costoclavicular Ligament

### **Glenohumeral joint**

#### ***Suprascapular ligament***

The glenohumeral joint is the most mobile polyaxial joint in the body. Its articulating surface involves three bones – the scapula, acromion and humerus. The scapula has ligamentous attachments with the acromion and with other aspects of the scapula. The “intrascapular” attachments include the suprascapular (superior transverse scapular) ligament and the inconstant spinoglenoid (inferior transverse scapular) ligament. The suprascapular ligament extends from the medial aspect of the scapular notch on the superior surface of the scapula to the base of the coracoid process; thus converting it into the scapular foramen. The scapular foramen serves as a conduit for

the suprascapular nerve, while the corresponding vasculature travels superior to the ligament.

Use the following mnemonic to easily remember the neurovasculature arrangement passing through the suprascapular notch.

***Airforce above, Navy below***

- Artery (suprascapular) runs above the ligament
- Nerve (suprascapular) runs below the ligament

***Spinoglenoid ligament***

On the other hand, the spinoglenoid ligament extends from the lateral aspect of the scapular spine to insert in the margin of the glenoid cavity. It also forms a conduit through which the suprascapular neurovasculature enters the infraspinous fossa.

***Coracoacromial ligament***

Arising near the clavicular articulating surface of the acromion is the coracoacromial ligament. It has its insertion along the lateral aspect of the coracoid process. It is a triangular ligament with its apex situated at its origin and the base along its insertion. The ligament subsequently forms the coracoacromial arch, which sits over the head of the humerus.

Coracoclavicular ligaments

***Coracoclavicular ligament***

The clavicle also articulates with the acromion (at its most lateral (acromial) end) and the coracoid process. The pair of ligaments known as the trapezoid (located anterolaterally) and conoid (located posteromedially) ligaments is collectively referred to as the coracoclavicular ligaments.

They attach the clavicle to the coracoid process of the scapula by extending from the medial region of the coracoid process to the lateral aspect of the subclavian groove (on the clavicle).

***Acromioclavicular ligament***

The quadrangular acromioclavicular ligament arises from the superior part of acromial end of the clavicle and attaches to the

superior aspect of the acromion, interlacing with the aponeuroses of deltoid and trapezius along the way.

### **Glenohumeral ligaments**

#### ***Ligamenta glenohumeralia***

Synonyms: Flood's ligament, Glenohumeral bands, show more...

Deep to the glenohumeral joint capsule is a group of three ligaments known as the glenohumeral ligaments. There is a superior, middle and inferior ligament that gives additional anteroinferior support to the joint capsule. Unlike traditional ligaments, the glenohumeral ligaments are not purely tensile. Instead, like reins used in horse racing to steer the horses, the tenacity of the ligaments change when the humerus is rotated or the shoulder is abducted.

The superior glenohumeral ligament has its attachments apically on the supraglenoid tubercle and medially on the lesser tubercle of the intertuberculous groove (bicipital sulcus). The middle glenohumeral ligament has its origin caudal to its previously mentioned counterpart, as well as along the anterior and inferior part of the glenoid rim. It subsequently attaches deep to subscapularis tendon on the lesser tubercle. The largest and longest of the three ligaments is the inferior glenohumeral ligament. It has a relatively wide range of attachment along the glenoid labrum and extends to the inferomedial part of the surgical neck of the humerus.



#### ***Coracohumeral ligament***

The last two ligaments to be discussed are the coracohumeral and transverse humeral ligaments. Both are superficial with respect to the glenohumeral ligaments. The

coracohumeral ligament consists of two bands that bridges the coracoid process (dorsolaterally at its base) to the lesser and greater humeral tubercles. Part of the ligament integrates with the superior glenohumeral ligament inferiorly, while another portion covers the biceps tendon anterior to the joint.

**Transverse humeral ligament**

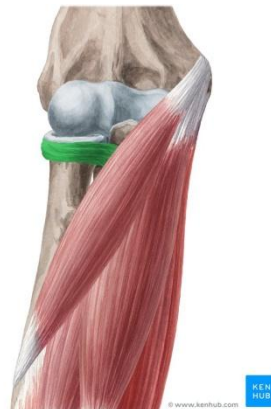
The transverse humeral ligament transforms the bicipital groove into a canal as it travels in the groove, above the long biceps tendon.

**Ulnar collateral ligament**

*Ulnar collateral ligament of elbow joint*

At the humeroulnar joint, the ulnar collateral ligament is a three-part triangular structure whose anterior component is stronger and more taut than the posterior part. The anterior part attaches apically to the anterior surface of the medial epicondyle and basally at the medial coronoid margin.

On the other hand, the posterior part (of a similar shape) connects the back of the medial epicondyle to the medial part of the olecranon. The inferior part travels diagonally between the coronoid process and the olecranon above the trochlear notch (transforming it into the trochlear foramen).



**Radial collateral ligament**

The humeroradial articulation is stabilized by the radial collateral ligament.

It is a ‘Y’ shaped structure that connects to the lateral epicondyle via the long arm of the ‘Y’, and the annular ligament of the radius by the short arms of the ‘Y’. Some fibers extend to the proximal portion of the supinator crest.

**Annular ligament**



Support to the proximal radioulnar joint is provided in part by the annular and quadrate ligaments. The annular ligament of the radius (as the name suggests) partly circumscribes the proximal head of the radius and inserts in the anterior and posterior margins of the radial notch of the ulnar at the points of discontinuity. Proximally, the annular border blends with the joint capsule, while distally it attaches to the neck of the radius.

***Quadrate ligament***

The quadrate ligament is a small structure that runs from the radial neck to the proximal area of the supinator fossa of the ulna. It is always taut when the forearm is supinating or pronating.

***Palmar radioulnar ligament***

At the distal articulation of the joint are three other ligamentous attachments that aids in stabilizing the joint. On the volar surface of the wrist is the palmar radioulnar ligament. It is a narrow fibrous band that courses from the radial ulnar notch to the head of the ulna.

***Dorsal radioulnar ligament***

Dorsally, the dorsal radioulnar ligament also extends from the ulnar notch of the radius to the head of the ulna.

***Wrist joint***

The wrist is a complex transition point from the forearm to the hand. It has many bones articulating with each other to facilitate flexion and extension as well as ulnar and radial deviation. The nomenclature of the ligaments of the hand follows the structures involved from proximal to distal and radial to ulnar. In other words, a ligament involving the trapezoid, trapezium and scaphoid would be named the scaphotrapeziotrapezoid ligament. The ligaments of the wrist can be classified based on their relationship to the joint capsule (intracapsular versus extracapsular), whether they connect structures only within the hand (intrinsic) or extend into the forearm (extrinsic) or whether they are superficial or deep. For

simplicity, the article will focus on the intrinsic and extrinsic classification. Only the major ligaments that contribute significantly to the stability of the joint will be discussed, the others will be mentioned below.

### ***Radioscaphocapitate ligament***

A tripartite ligament arising from the styloid process and palmar lip of the radius is the radioscaphocapitate ligament, which is observed on the palmar surface of the wrist. The first band is relatively short and inserts into the proximal aspect of the scaphoid bone, while the second extends further to attach to the distal pole of the same bone. The third part however, traverses the proximal pole of the scaphoid to insert in the capitate bone, while contributing to the formation of the arcuate ligament of the volar surface of the capitate bone.

### ***Long radiolunate ligament***

Another ligament arises from the palmar lip of the radius next to the radioscaphocapitate ligament, known as the long radiolunate ligament, traverses the scaphoid bone in order to insert in the volar horn of the lunate bone. It is distinctly separated from the radioscaphocapitate ligament and as such, an obvious space called the interligamentous sulcus (which is continuous with the space of Poirier between the inferior border of the radioscaphocapitate ligament and the volar horn of the lunate) can be seen.

### ***Short radiolunate ligament***

The palmar lip of the lunate fossa of the radius serves as a point of origin for the short radiolunate ligament. It subsequently inserts in the palmar horn of the lunate bone.

### ***Palmar ulnocarpal ligaments***

The palmar ulnocarpal group of ligaments include the ulnotriquetral, ulnocapitate and ulnolunate ligaments. As implied by the nomenclature, these ligaments help to stabilize the triquetrum, lunate and capitate bones by anchoring them to the

palmar region of the ulna. The ulnotriquetral ligament inserts on the medial side of the triquetrum, while the ulnolunate ligament attaches to the volar horn of the lunate. The latter also contributes to the formation of the arcuate ligament.

Palmar ulnocarpal ligament (ventral view)

### ***Intrinsic carpal ligaments***

The intrinsic carpal ligaments are further sub classified as proximal and distal interosseous and palmar and dorsal midcarpal ligaments. Not only do they offer stability to the carpal bones, but in some instances they act as partitioning barriers that create the different hand spaces. The proximal row of interosseous ligaments is integral in the hinge mechanism observed with flexion and extension of at the carpometacarpal junctions. The distal row of interosseous ligaments is stronger than those of the proximal row and as such, they are less susceptible to injury than the proximal ligaments.



### ***Dorsal ligaments***

The ligaments of the dorsum of the hand are thinner and more superficial than those on the palmar region. Additionally, the ligaments are arranged in a ‘Z’ pattern, with the dorsal intercarpal ligament superiorly, the dorsal radiocarpal ligament in the middle, and the dorsal radioulnotriquetral ligament inferiorly. So the take home message for the ligaments of the palmar aspect of the wrist is

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