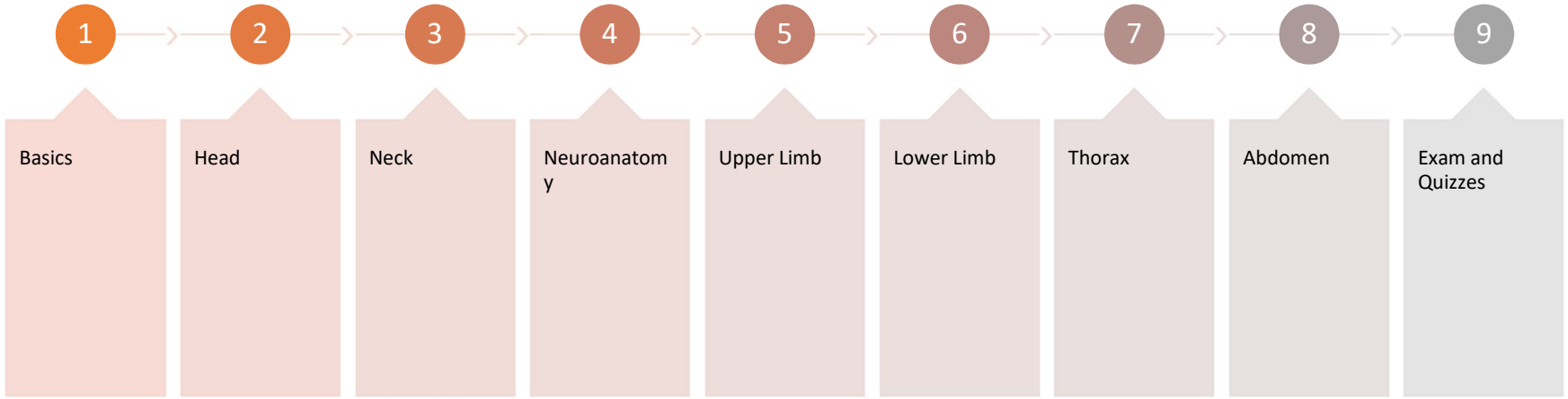
ANATOMY

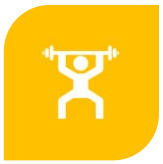
Major Topics



UPPER LIMB

AREAS

BONES



MUSCLES

NERVES

JOINTS

BLOOD VESSELS & LYMPHATICS

Upper limb

1

AREAS
- Axilla
- Cubital Fossa
- Carpal Tunnel
- Anatomical Snuffbox

2

BONES
- Scapula
- Clavicle
- Humerus
- Ulna
- Radius
- The Hand

3

MUSCLES
- Pectoral Region
- Shoulder Region
- Upper Arm
- Anterior Forearm
- Posterior Forearm
- Hand

4

NERVES
- Brachial Plexus
- Axillary Nerve
- Musculocutaneous Nerve
- Median Nerve
- Radial Nerve
- Ulnar Nerve

5

JOINTS
- Acromioclavicular Joint
- Sternoclavicular Joint
- Shoulder Joint
- Elbow Joint
- Radioulnar Joints
- Wrist Joint

6

BLOOD VESSELS & LYMPHATICS
- Arterial Supply
- Venous Drainage
- Lymphatics

TYPES OF JOINTS

1

1 Fibrous Joints

- 1.1 Sutures
- 1.2 Gomphoses
- 1.3 Syndesmoses

2

2 Cartilaginous

- 2.1 Synchondroses
- 2.2 Symphyses

3

3 Synovial

Classification of Joints

Joint classification based on tissues present

- Fibrous – bones connected by fibrous tissue.
- Cartilaginous – bones connected by cartilage.
- Synovial – articulating surfaces enclosed within fluid-filled joint capsule

Joint classification based on mobility

- Synarthrosis – immovable.
- Amphiarthrosis – slightly moveable.
- Diarthrosis – freely moveable.

Classification of Joints

Fibrous

Sutures

- Sutures are **immovable** joints (synarthrosis), and are only found between the flat, plate-like bones of the skull.
- There is limited movement until about **20 years** of age, after which they become fixed and immobile. They are most important in birth, as at that stage the joints are not fused, allowing deformation of the skull as it passes through the birth canal.

Classification of Joints

Fibrous

Gomphoses

- Gomphoses are also **immovable** joints. They are found where the teeth articulate with their sockets in the maxilla (upper teeth) or the mandible (lower teeth).
- The tooth is bound into its socket by the strong **periodontal ligament.**

Classification of Joints

Fibrous

Syndesmoses

- **Syndesmoses** are slightly movable joints (amphiarthroses).
- They are comprised of bones held together by an **interosseous membrane**. The middle radioulnar joint and middle tibiofibular joint are examples of a syndesmosis joint.

Classification of Joints

Cartilaginous

Synchondroses

- In a synchondrosis, the bones are connected by **hyaline cartilage**. These joints are immovable (synarthrosis).
- An example of a synchondrosis is the joint between the **diaphysis and epiphysis** of a growing long bone.

Classification of Joints

Symphyses

- Symphysial joints are where the bones are united by a layer of **fibrocartilage**. They are slightly movable (amphiarthrosis).
- Examples include the **pubic symphysis**, and the joints between **vertebral bodies**

Classification of Joints

Cartilaginous

Symphyses

- Symphysial joints are where the bones are united by a layer of **fibrocartilage**. They are slightly movable (amphiarthrosis).
- Examples include the **pubic symphysis**, and the joints between **vertebral bodies**

Classification of Joints

Synovial

- A **synovial joint** is defined by the presence of a fluid-filled joint cavity contained within a fibrous capsule.
- They are freely movable (diarthrosis) and are the most common type of joint found in the body.
- Synovial joints can be **sub-classified** into several different types, depending on the shape of their articular surfaces and the movements permitted:

Classification of Joints
Synovial Joint

Hinge – permits movement in one plane – usually flexion and extension.

- E.g. elbow joint, ankle joint, knee joint.

Saddle – named due to its resemblance to a saddle on a horse's back. It is characterised by opposing articular surfaces with a reciprocal concave-convex shape.

- E.g. carpometacarpal joints.

Plane – the articular surfaces are relatively flat, allowing the bones to glide over one another.

- E.g. sternoclavicular joint, acromioclavicular joint, subtalar joint.

Pivot – allows for rotation only. It is formed by a central bony pivot, which is surrounded by a bony-ligamentous ring

- E.g. proximal and distal radioulnar joints, atlantoaxial joint.

Condyloid – contains a convex surface which articulates with a concave elliptical cavity. They are also known as ellipsoid joints.

- E.g. wrist joint, metacarpophalangeal joint, metatarsophalangeal joint.

Ball and Socket – where the ball-shaped surface of one rounded bone fits into the cup-like depression of another bone. It permits free movement in numerous axes.

- E.g. hip joint, shoulder joint.

UPPER LIMB

JOINTS OF UPPER LIMB

- **ACROMIOCLAVICULAR JOINT**
- **STERNOCLAVICULAR JOINT**
- **SHOULDER JOINT**
- **ELBOW JOINT**
- **RADIOULNAR JOINTS**
- **WRIST JOINT**

Upper Limb

ACROMIOCLAVICULAR JOINT

1 Structures of the Acromioclavicular Joint

- 1.1 Articulating Surfaces
- 1.2 Joint Capsule
- 1.3 Ligaments

2 Neurovascular Supply

3 Movements

4 Clinical Relevance – Acromioclavicular Dislocation

Joints of Upper Limb

Acromion-Clavicular Joint

Articulating Surfaces

- The acromioclavicular joint consists of an articulation between the **lateral end** of the clavicle and the **acromion** of the scapula. It has two atypical features:
- The articular surfaces of the joint are lined with **fibrocartilage** (as opposed to hyaline cartilage).
- The joint cavity is partially divided by an **articular disc** – a wedge of fibrocartilage suspended from the upper part of the capsule

Joint Capsule

- The joint capsule consists of a loose **fibrous** layer which encloses the two articular surfaces. It also gives rise to the **articular disc**. The posterior aspect of the joint capsule is reinforced by fibres from the trapezius muscle.
- As would be expected of a synovial joint, joint capsule is lined internally by a **synovial membrane**. This secretes synovial fluid into the cavity of the joint.

Joints of Upper Limb

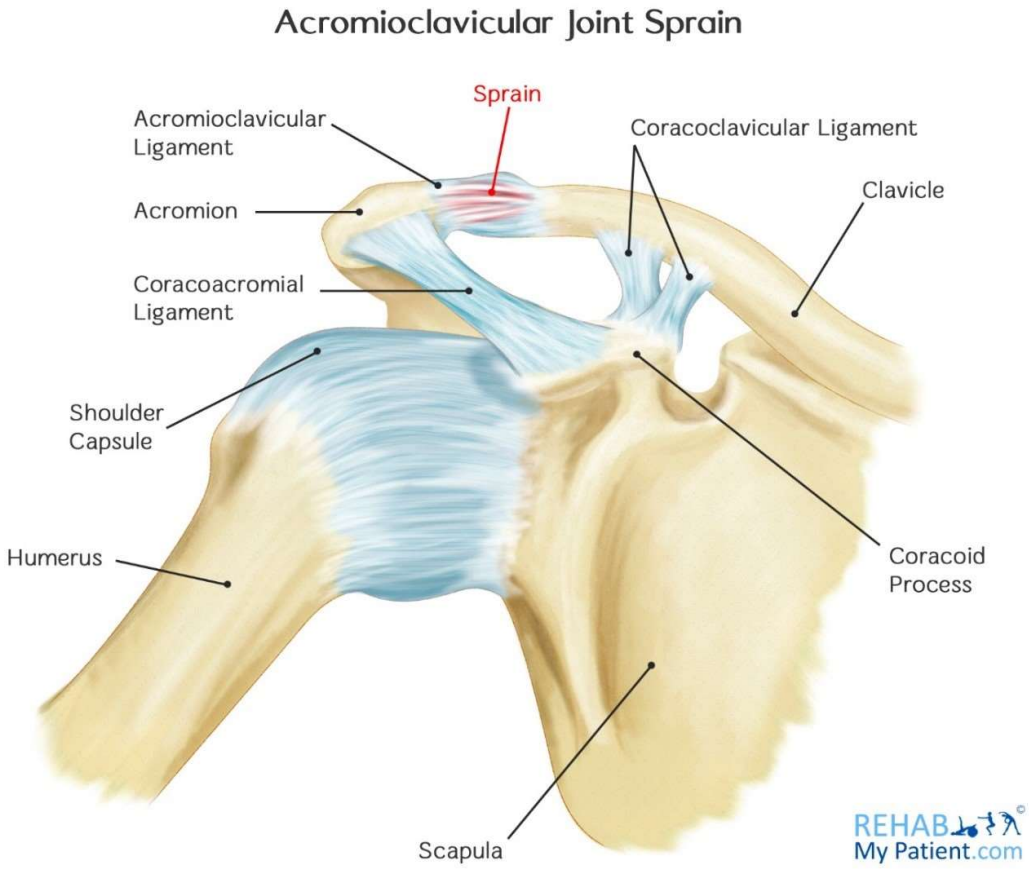
Acromion-Clavicular Joint

Ligaments

- There are three main ligaments that strengthen the acromioclavicular joint. They can be divided into intrinsic and extrinsic ligaments:
- **Intrinsic**:
  - Acromioclavicular ligament – runs horizontally from the acromion to the lateral clavicle. It covers the joint capsule, reinforcing its superior aspect.
- **Extrinsic:**
  - Conoid ligament – runs vertically from the coracoid process of the scapula to the conoid tubercle of the clavicle.
  - Trapezoid ligament – runs from the coracoid process of the scapula to the trapezoid line of the clavicle.
- Collectively, the conoid and trapezoid ligaments are known as the **coracoclavicular ligament**.

Joints of Upper limb

Acromio-Clavicular Ligament



Joints of Upper Limb

Neurovascular Supply

Vessels

- The arterial supply to the joint is via two vessels:
- **Suprascapular artery** – arises from the subclavian artery at the thyrocervical trunk.
- **Thoraco-acromial artery** – arises from the axillary artery.
- The veins of the joint follow the major arteries.

Nerves

- The acromioclavicular joint is innervated by articular branches of the **suprascapular** and **lateral pectoral nerves**. They both arise directly from the brachial plexus.

Joints of Upper Limb

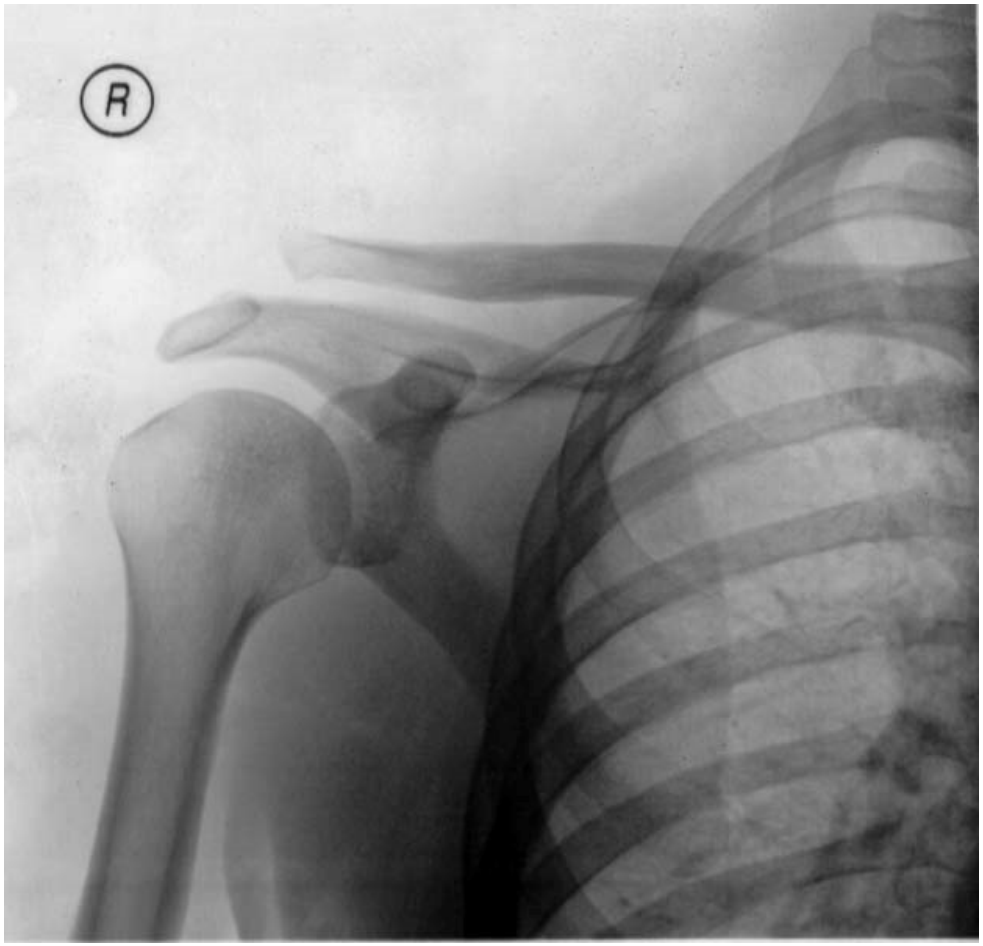
Movement

- The acromioclavicular joint allows a degree of **axial rotation** and **anteroposterior** movement.

Joints of Upper Limb

Clinical Relevance

Separated shoulder



Upper Limb

Joints of Upper Limb

Joints of Upper limb

SternoClavicular Joint

1 Joint Structure

- 1.1 Articulating Surfaces
- 1.2 Joint Capsule
- 1.3 Ligaments
- 1.4 Neurovascular Supply

2 Movements

3 Mobility and Stability

4 Clinical Relevance: Dislocation of the Sternoclavicular Joint

Joints of Upper limb

Sterno-Clavicular Joint

- The **sternoclavicular joint** is a synovial joint between the clavicle and the manubrium of the sternum.
- It is the only attachment of the **upper limb** to the axial skeleton. Despite its strength, it is a very mobile joint and can function more like a ball-and-socket type joint

Joints of Upper Limb

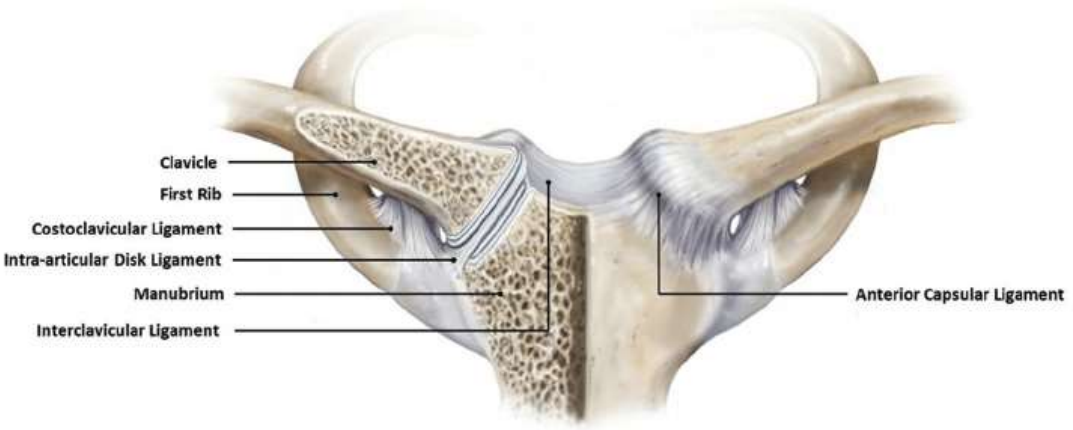
Sterno –Clavicular Joint

Articulating Surfaces

- The sternoclavicular joint consists of the **sternal end** of the clavicle, the manubrium of the sternum, and part of the 1st costal cartilage. The articular surfaces are covered with **fibrocartilage** (as opposed to hyaline cartilage, present in the majority of synovial joints). The joint is separated into two compartments by a fibrocartilaginous **articular disc**

Joints Of Upper Limb

Acromio-Clavicular Joint



Joints of Upper Limb

Ligaments

- **Sternoclavicular ligaments** (anterior and posterior) – these strengthen the joint capsule **anteriorly and posteriorly**.
- **Interclavicular ligament** – this spans the gap between the sternal ends of each clavicle and reinforces the joint capsule **superiorly**.
- **Costoclavicular ligament** – the two parts of this ligament (often separated by a bursa) bind at the **1st rib and cartilage** inferiorly and to the anterior and posterior borders of the **clavicle** superiorly. It is a very strong ligament and is the main stabilising force for the joint, resisting elevation of the pectoral girdle

Joints of Upper llmb

Neurovascular Supply

- Arterial supply to the sternoclavicular joint is from the **internal thoracic artery** and the **suprascapular artery**.
- The joint is supplied by the **medial supraclavicular nerve** (C3 and C4) and the **nerve to subclavius** (C5 and C6)

Joints of Upper limb

- **Elevation** of the shoulders – shrugging the shoulders or abducting the arm over 90º
- **Depression** of the shoulders – drooping shoulders or extending the arm at the shoulder behind the body
- **Protraction** of the shoulders – moving the shoulder girdle anteriorly
- **Retraction** of the shoulders – moving the shoulder girdle posteriorly
- **Rotation** – when the arm is raised over the head by flexion the clavicle rotates passively as the scapula rotates. This is transmitted to the clavicle by the **coracoclavicular ligaments**

Joints of Upper Limb

Mobility

- Type of joint – being a saddle joint it can move in two axes.
- Articular disc – this allows the clavicle and the manubrium to slide over each other more freely, allowing for the rotation and movement in a third axis.

Stability

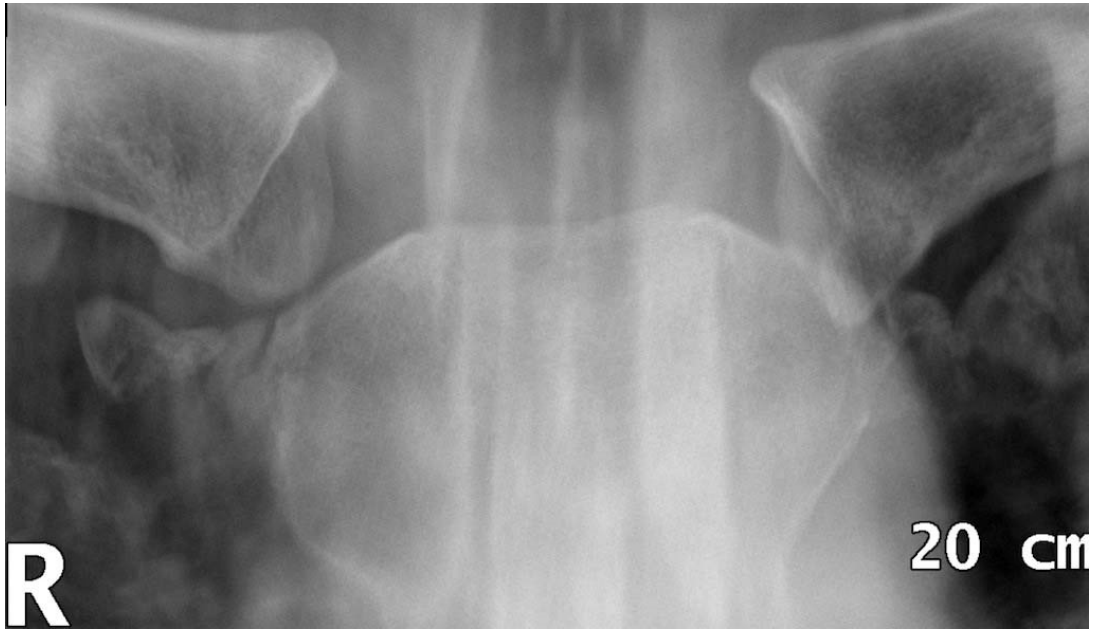
- Strong joint capsule.
- Strong ligaments – particularly the costoclavicular ligament, which transfers stress from the clavicle to the manubrium (via the costal cartilage).

Joints Of upper limb

Sternoclavicular Joint

Clinical Relevance

- **Anterior dislocations** are the most common and can happen following a blow to the anterior shoulder which rotates the shoulder backwards.
- **Posterior dislocations** normally result from a force driving the shoulder forwards or from direct impact to the joint.



Joints of Upper Limb

Shoulder joint

1 Structures of the Shoulder Joint
- 1.1 Articulating Surfaces
- 1.2 Joint Capsule and Bursae
- 1.3 Ligaments

2 Movements

3 Mobility and Stability

4 Neurovascular

5 Clinical Relevance: Common Injuries
- 5.1 Dislocation of the Shoulder Joint
- 5.2 Rotator Cuff Tendonitis

Joints of Upper Limb

The shoulder joint (glenohumeral joint) is a ball and socket joint between the **scapula** and the **humerus**. It is the major joint connecting the upper limb to the trunk.

Joints of Upper limb

Articulating Surfaces

- The shoulder joint is formed by the articulation of the **head** of the humerus with the **glenoid cavity** (or fossa) of the scapula. This gives rise to the alternate name for the shoulder joint – the glenohumeral joint.
- Like most synovial joints, the articulating surfaces are covered with **hyaline cartilage.** The head of the humerus is much larger than the glenoid fossa, giving the joint a wide range of movement at the cost of inherent instability. To reduce the disproportion in surfaces, the glenoid fossa is deepened by a fibrocartilage rim, called the **glenoid labrum**.

Joints of Upper limb

Joint capsule and bursa

- It extends from the **anatomical neck** of the humerus to the border or 'rim' of the glenoid fossa. The joint capsule is lax, permitting greater mobility (particularly abduction).
- The **synovial membrane** lines the inner surface of the joint capsule, and produces synovial fluid to reduce friction between the articular surfaces

Joints of Upper limb

To reduce friction in the shoulder joint, several **synovial bursae** are present. A bursa is a synovial fluid filled sac, which acts as a cushion between tendons and other joint structures.

- **Subacromial** – located deep to the deltoid and acromion, and superficial to the supraspinatus tendon and joint capsule. The subacromial bursa reduces friction beneath the deltoid, promoting free motion of the rotator cuff tendons. Subacromial bursitis (i.e. inflammation of the bursa) can be a cause of shoulder pain.
- **Subscapular** – located between the subscapularis tendon and the scapula. It reduces wear and tear on the tendon during movement at the shoulder joint.

Joints of Upper Limb

Shoulder Joint

Ligaments

Glenohumeral ligaments (superior, middle and inferior) – the joint capsule is formed by this group of ligaments connecting the humerus to the glenoid fossa. They are the main source of stability for the shoulder, holding it in place and preventing it from dislocating anteriorly. They act to stabilise the anterior aspect of the joint.

Joints of Upper Limb

Coracohumeral ligament – attaches the base of the coracoid process to the greater tubercle of the humerus. It supports the superior part of the joint capsule.

Transverse humeral ligament – spans the distance between the two tubercles of the humerus. It holds the tendon of the long head of the biceps in the intertubercular groove.]

Coraco–clavicular ligament – composed of the trapezoid and conoid ligaments and runs from the clavicle to the coracoid process of the scapula. They work alongside the acromioclavicular ligament to maintain the alignment of the clavicle in relation to the scapula.

Coraco–clavicular ligament – composed of the trapezoid and conoid ligaments and runs from the clavicle to the coracoid process of the scapula

Joints of Upper Limb

- **Extension** – posterior deltoid, latissimus dorsi and teres major.
- **Flexion** – pectoralis major, anterior deltoid and coracobrachialis. Biceps brachii weakly assists in forward flexion.
- **Abduction :**
  - The first 0-15 degrees of abduction is produced by the supraspinatus.
  - The middle fibres of the deltoid are responsible for the next 15-90 degrees.
  - Past 90 degrees, the scapula needs to be rotated to achieve abduction – that is carried out by the trapezius and serratus anterior.
- **Adduction** – pectoralis major, latissimus dorsi and teres major.
- **Internal rotation** – subscapularis, pectoralis major, latissimus dorsi, teres major and anterior deltoid.
- **External rotation** – infraspinatus and teres minor

Joints of Upper Limb

Shoulder Joint

Mobility and stability

Factors that contribute to mobility:

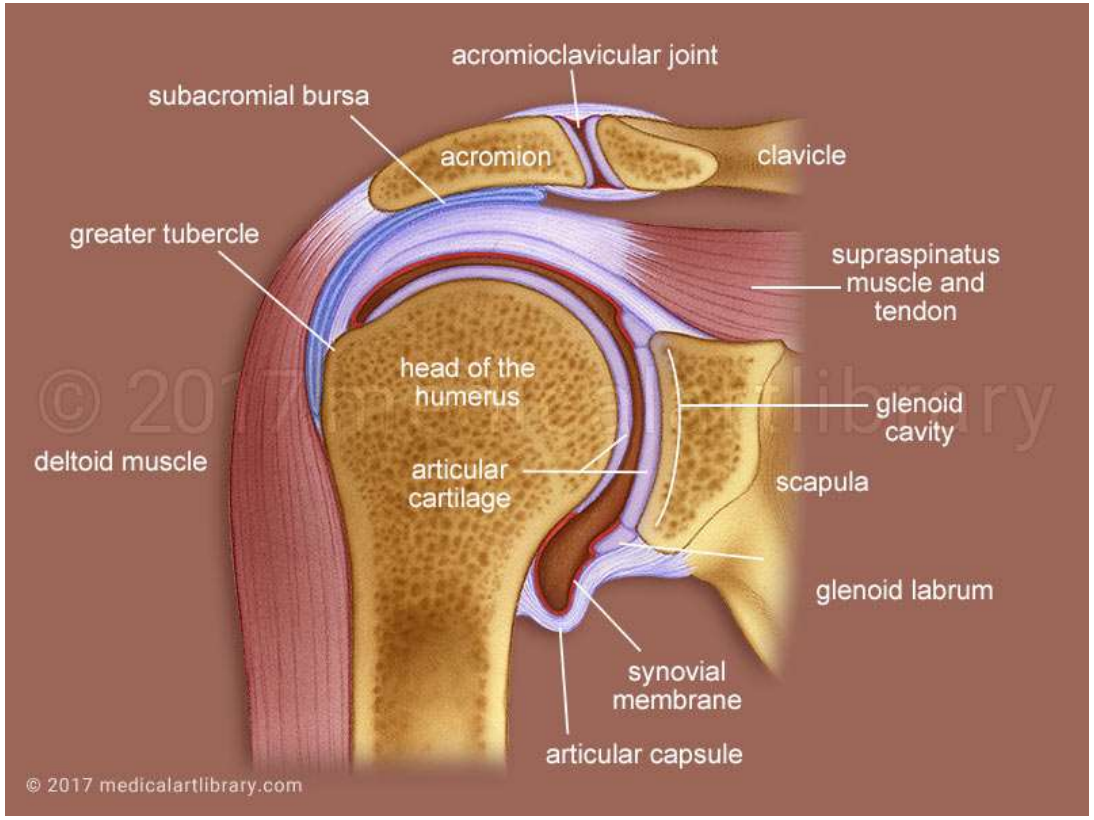
- **Type of joint** – ball and socket joint.
- **Bony surfaces** – shallow glenoid cavity and large humeral head – there is a 1:4 disproportion in surfaces. A commonly used analogy is the golf ball and tee.
- Inherent laxity of the **joint capsule**.

Factors that contribute to stability:

- **Rotator cuff muscles** – surround the shoulder joint, attaching to the tuberosities of the humerus, whilst also fusing with the joint capsule. The resting tone of these muscles act to compress the humeral head into the glenoid cavity.
- **Glenoid labrum** – a fibrocartilaginous ridge surrounding the glenoid cavity. It deepens the cavity and creates a seal with the head of humerus, reducing the risk of dislocation.
- **Ligaments** – act to reinforce the joint capsule, and form the coraco-acromial arch.
- **Biceps tendon** – it acts as a minor humeral head depressor, thereby contributing to stability.

Joints of Upper limb

Shoulder Joint



Joints of Upper Limb

Shoulder joint

Clinical Relevance

- Clinically, dislocations at the shoulder are described by where the humeral head lies in relation to the **glenoid fossa**. Anterior dislocations are the most prevalent (95%), although posterior (4%) and inferior (1%) dislocations can sometimes occur. Superior displacement of the humeral head is prevented by the **Coraco-acromial arch**.
- The **axillary nerve** runs in close proximity to the shoulder joint and around the surgical neck of the humerus, and so it can be damaged in the dislocation or with attempted reduction. Injury to the axillary nerve causes paralysis of the deltoid, and loss of sensation over regimental badge area.

Joints of Upper limb

Shoulder Joint

Dislocation of Shoulder Joint

Joints of Upper limb

Shoulder Joint

- The rotator cuff muscles have a very important role in **stabilising** the glenohumeral joint. They are often under heavy strain, and therefore injuries of these muscles are relatively common.
- The spectrum of rotator cuff pathology comprises tendinitis, shoulder impingement and sub-acromial bursitis. Tendinitis refers to **inflammation** of the muscle tendons – usually due to overuse. Over time, this causes **degenerative changes** in the subacromial bursa and the supraspinatus tendon, potentially causing bursitis and impingement.
- The characteristic sign of supraspinatus tendinitis is the '**painful arc**' – pain in the middle of abduction between 60-120 degrees, where the affected area comes into contact with the acromion. This sign may also suggest a partial tear of supraspinatus.

Joints of Upper Limb

Elbow Joints

Structures of the Elbow Joint

- 1.1 Articulating Surfaces
- 1.2 Joint Capsule and Bursae
- 1.3 Ligaments

2 Neurovasculature

3 Movements of the Joint

4 Clinical Relevance: Injuries to the Elbow Joint

- 4.1 Bursitis
- 4.2 Dislocation
- 4.3 Epicondylitis (Tennis elbow or Golfer's elbow)
- 4.4 Supracondylar Fracture

Joints of Upper Limb

Elbow Joint

Structure of Elbow Joint

Articulating Surfaces

- It consists of two separate articulations:
- Trochlear notch of the ulna and the trochlea of the humerus
- Head of the radius and the capitulum of the humerus
- *Note: The proximal radioulnar joint is found within same joint capsule of the elbow, but most resources consider it as a separate articulation.*

Joints of upper limb

Elbow Joint

Structure of the elbow Joint

Joint Capsule and Bursae

- **Intratendinous** – located within the tendon of the triceps brachii.
- **Subtendinous** – between the olecranon and the tendon of the triceps brachii, reducing friction between the two structures during extension and flexion of the arm.
- **Subcutaneous (olecranon) bursa** – between the olecranon and the overlying connective tissue (implicated in olecranon bursitis).

Joints of Upper Limb

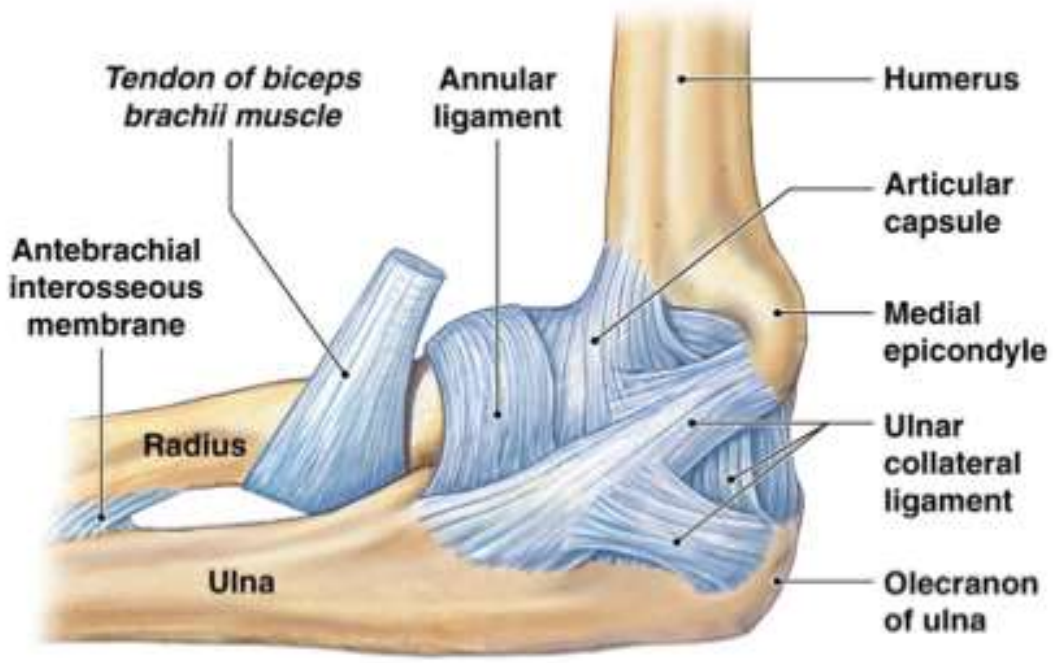
Elbow joint

Structure of Elbow Joint

- **Ligaments**
- The joint capsule of the elbow is strengthened by ligaments medially and laterally.
- The **radial collateral** ligament is found on the lateral side of the joint, extending from the **lateral epicondyle**, and blending with the annular ligament of the radius (a ligament from the proximal radioulnar joint).
- The **ulnar collateral** ligament originates from the **medial epicondyle**, and attaches to the coronoid process and olecranon of the ulna.

Joints of Upper limb

Elbow Joint



Joints of Upper Limb

Elbow Joint

Neurovasculature

- The arterial supply to the elbow joint is from the **cubital anastomosis,** which includes recurrent and collateral branches from the **brachial** and **deep brachial** arteries.
- Its nerve supply is provided by the **median**, **musculocutaneous** and **radial** nerves anteriorly, and the **ulnar** nerve posteriorly.

Joint of Upper Limb

Elbow Joint

Movements of Elbow Joint

- **Extension** – Triceps brachii and Anconeus
- **Flexion** – brachialis, biceps brachii, brachioradialis
- *Note – pronation and supination do not occur at the elbow – they are produced at the nearby radioulnar joints*

Joints of Upper Limb

Elbow joint

Bursitis

- **Subcutaneous bursitis:** Repeated friction and pressure on the bursa can cause it to become inflamed. Because this bursa lies relatively superficially, it can also become infected (e.g cut from a fall on the elbow)
- **Sub tendinous bursitis:** This is caused by repeated flexion and extension of the forearm, commonly seen in assembly line workers. Usually flexion is more painful as more pressure is put on the bursa.

Joints of Upper Limb

Elbow Joint

Dislocation

Dislocation

- An elbow dislocation usually occurs when a young child falls on a hand with the elbow flexed. The distal end of the humerus is driven through the weakest part of the joint capsule, which is the anterior side. The ulnar collateral ligament is usually torn and there can also be ulnar nerve involvement
- Most elbow dislocations are posterior, and it is important to note that elbow dislocations are named by the position of the ulna and radius, not the humerus.

Joints of Upper Limb

Elbow Dislocation

Joints of Upper Limb

Elbow Joint

Clinical Relevance

Epicondylitis (Tennis elbow or Golfer's elbow)

- Most of the flexor and extensor muscles in the forearm have a **common tendinous origin.** The flexor muscles originate from the medial epicondyle, and the extensor muscles from the lateral. Sportspersons can develop an **overuse strain** of the common tendon – which results in pain and inflammation around the area of the affected epicondyle.
- Typically, tennis players experience pain in the lateral epicondyle from the common extensor origin. Golfers experience pain in the medial epicondyle from the common flexor origin. This is easily remembered as golfers aim for the 'middle' of the fairway, while tennis players aim for the 'lateral' line of the court!

Joints of Upper Limb

Elbow Joint

Supracondylar Fracture

- A supracondylar fracture usually occurs due to a fall onto on outstretched, extended hand in a child (95%) but more rarely can occur by a direct impact onto a flexed elbow. It is typically a **transverse** fracture, spanning between the two epicondyles in the relatively weak epicondylar region formed by the olecranon fossa and coronoid fossa which lie opposite each other in the distal humerus.

Joints of Upper Limb

Radio Ulnar Joint

- 1 Proximal Radioulnar Joint
- 2 Distal Radioulnar Joint
- 3 Interosseous Membrane
- 4 Clinical Relevance: Fractures to the Radius and Ulna

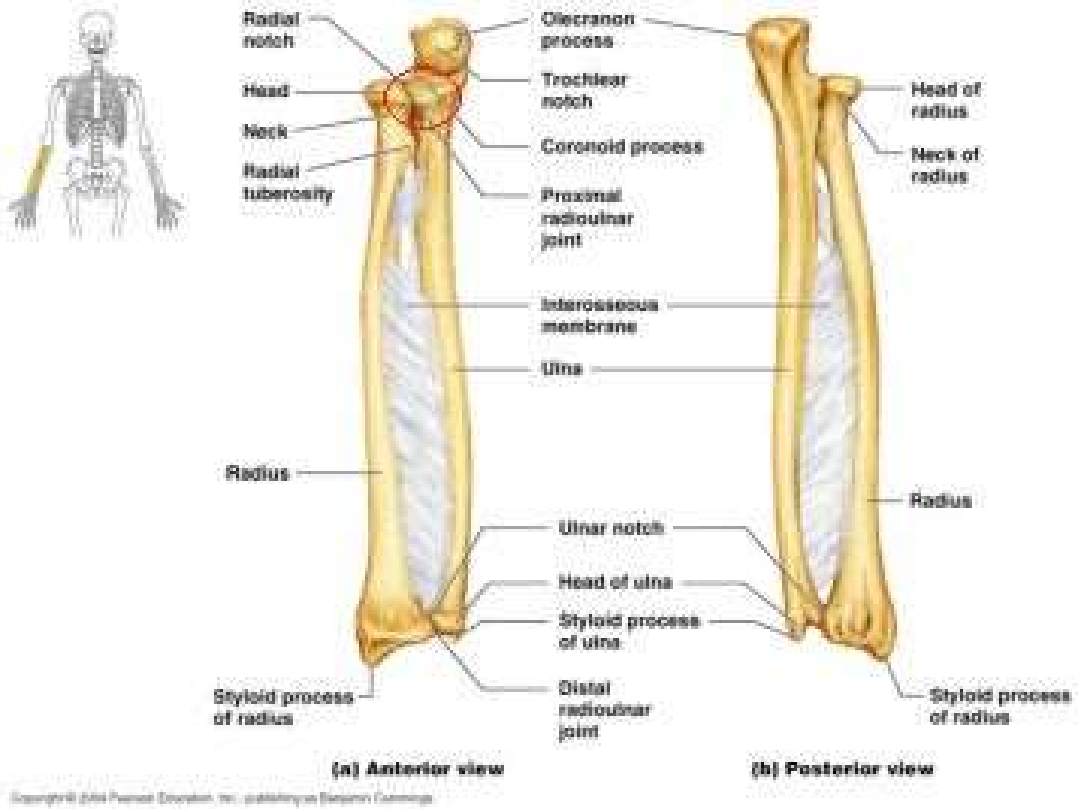
Joints of Upper limb

Radio Ulnar Joint

- **Proximal radioulnar joint**: This is located near the elbow, and is an articulation between the head of the radius, and the radial notch of the ulna.
- **Distal radioulnar joint**: This is located near the wrist, and is an articulation between the ulnar notch of the radius, and the ulnar head.
- Both of these joints are classified as pivot joints, responsible for **pronation** and **supination** of the forearm

Joints of Upper limb

Radio Ulnar Joint



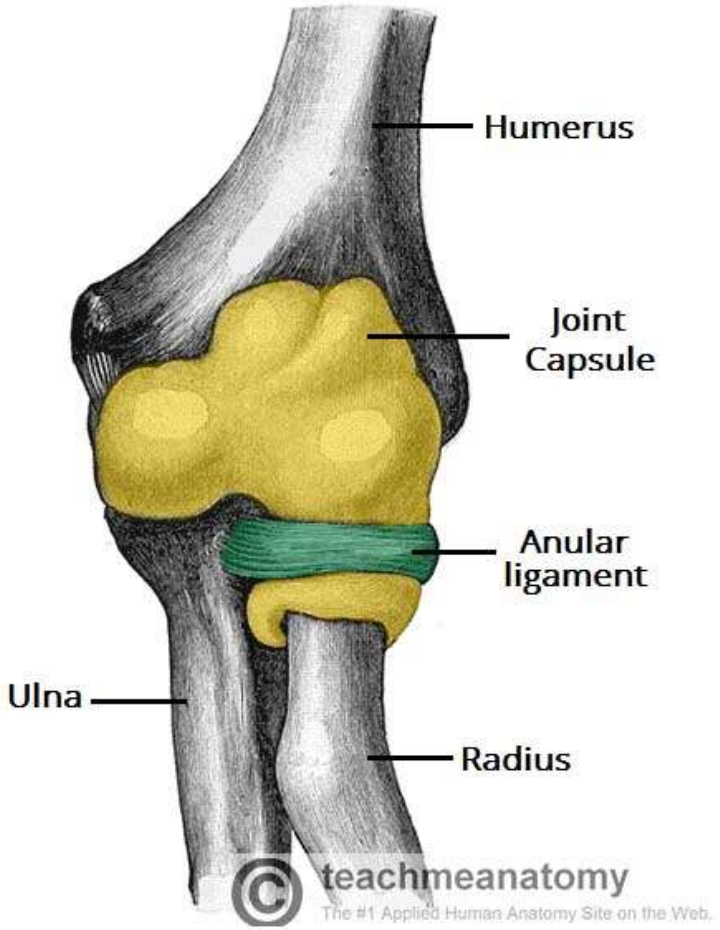
Joints of Upper limb

Proximal Radioulnar Joint

- The proximal radioulnar joint is located immediately distal to the **elbow joint**, and is enclosed with in the same **articular capsule**. It is formed by an articulation between the head of the radius and the radial notch of the ulna.
- The radial head is held in place by the **annular radial ligament**, which forms a 'collar' around the joint. The annular radial ligament is lined with a synovial membrane, reducing friction during movement.
- Movement is produced by the head of the radius rotating within the annular ligament. There are two movements possible at this joint; pronation and supination.
- **Pronation**: Produced by the pronator quadratus and pronator teres.
- **Supination*:*** Produced by the supinator and biceps brachii.

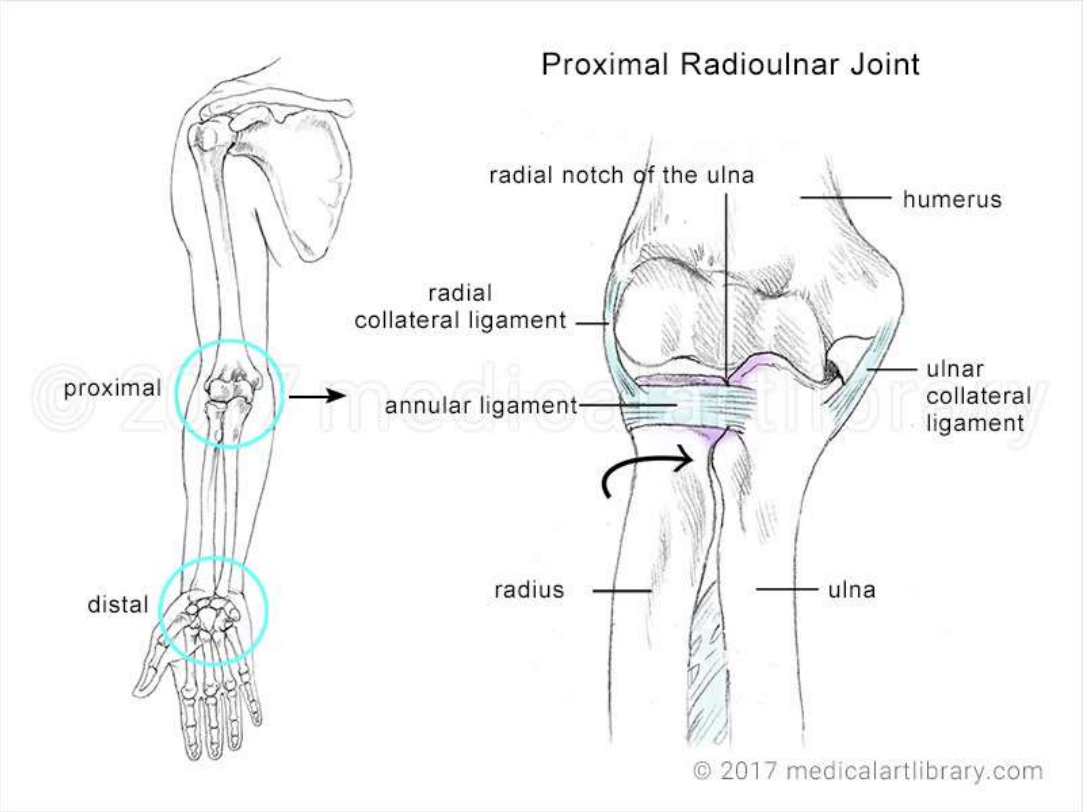
Joints of Upper Limb

Proximal Radio Ulnar joint



Joints of Upper limb

Proximal Radio ulnar Joint



Joints of Upper limb

Digital Radio Ulnar Joint

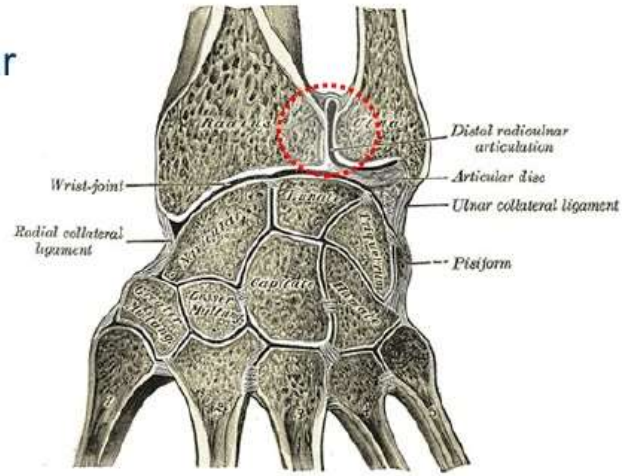
- This distal radioulnar joint is located just proximally to the **wrist joint**. It is an articulation between the ulnar notch of the radius, and the ulnar head.
- In addition to anterior and posterior ligaments strengthening the joint, there is also a fibrocartilaginous ligament present, called the **articular disk**. It serves two functions:
- Binds the radius and ulna together, and holds them together during movement at the joint.
- Separates the distal radioulnar joint from the wrist joint.
- Like the proximal radioulnar joint, this is a **pivot** joint, allowing for pronation and supination. The ulnar notch of the radius slides anteriorly over the head of the ulnar during such movements.
- **Pronation**: Produced by the pronator quadratus and pronator teres
- **Supination***:* Produced by the supinator and biceps brachii

Joint of the Upper Limb

Digital Radioulnar Joint

Distal Radio-Ulnar Joint

- Head of ulna articulate with ulnar notch of radius.



Joints of the Upper Limb

Clinical Relevance:

Fractures to the Radius and Ulna

- Although the radius and ulnar are two distinct and separate bones, when dealing with injuries to the forearm, they can be thought of as a **ring**.
- A ring, when broken, usually breaks in two places. The best way of illustrating with is with a polo mint – it is very difficult to break one side without breaking the other.
- This means that a fracture to the radius or the ulna usually causes a fracture or dislocation of the other bone. There are two classical fractures:
- **Monteggia's Fracture** – Usually caused by a force from behind the ulna. The proximal shaft of Ulna is fractured, and the head of the radius dislocates anteriorly at the elbow.
- **Galeazzi's Fracture** – A fracture to the distal radius, with the ulna head dislocating at the distal radio-ulnar joint.

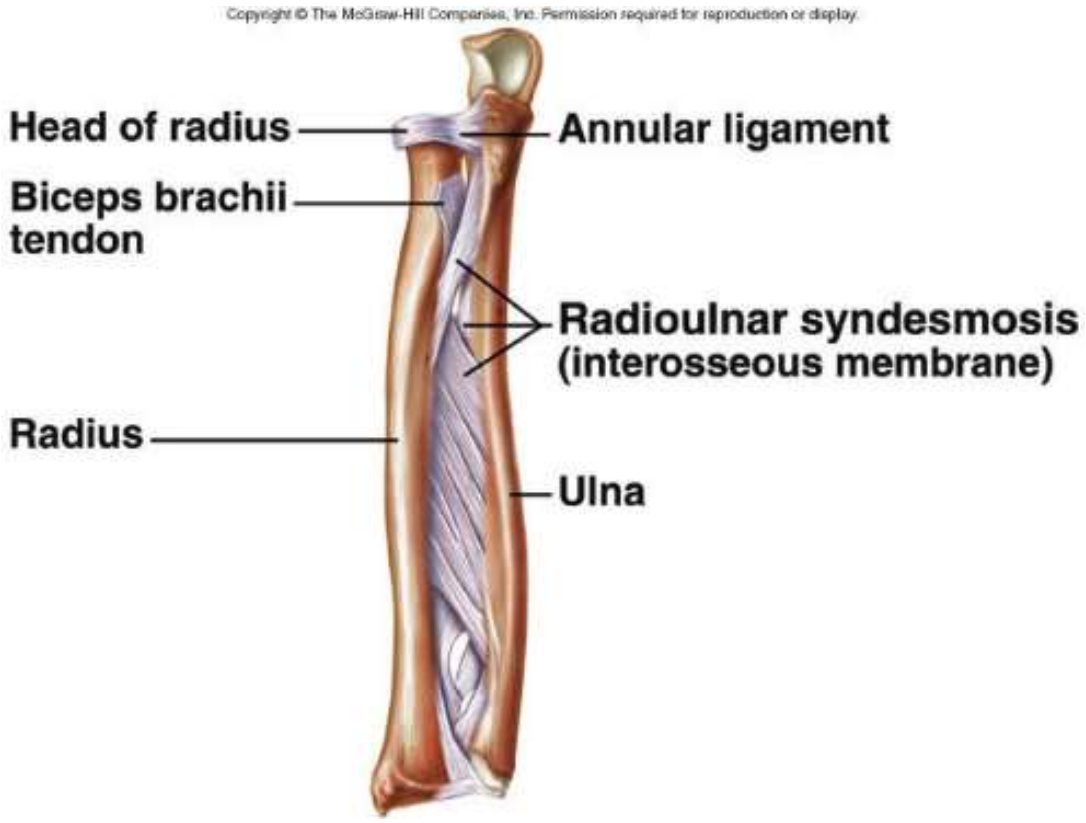
Joints of Upper Limb

Radio Ulnar Joint

- The interosseous membrane is a sheet of **connective tissue** that joins the radius and ulna together between the radioulnar joints.
- It spans the distance between the medial radial border, and the lateral ulnar border. There are small holes in the sheet, as a conduit for the forearm vasculature.
- This connective tissue sheet has three major functions:
- **Holds the radius and ulna together** during pronation and supination of the forearm, providing addition stability.
- **Acts as a site of attachment** for muscles in the anterior and posterior compartments of the forearm.
- **Transfers forces** from the radius to the ulna

Joints of Upper limb

Radio Ulnar Joint



Joints of Upper Limb

Elbow Joint

1 Structures of the Wrist Joint

- 1.1 Articulating Surfaces
- 1.2 Joint Capsule
- 1.3 Ligaments
- 1.4 Neurovascular Supply

2 Movements of the Wrist Joint

3 Clinical Relevance: Injuries to the Wrist Joint

- 3.1 Fracture of the Scaphoid
- 3.2 Anterior Dislocation of the Lunate
- 3.3 Colles' Fracture

Joints of Upper Limb

Wrist Joint

The wrist joint (also known as the radiocarpal joint) is a synovial joint in the upper limb, marking the area of transition between the forearm and the hand.

Joints of Upper limb

Wrist joint

Structures of the Wrist Joint

Articulating Surface

The wrist joint is formed by:

- **Distally** – The proximal row of the carpal bones (except the pisiform).
- **Proximally –** The distal end of the radius, and the articular disk (see below).
- **The ulna is <u>not</u> part of the wrist joint** – it articulates with the radius, just proximal to the wrist joint, at the distal radioulnar joint. It is prevented from articulating with the carpal bones by a fibrocartilaginous ligament, called the articular disk, which lies over the superior surface of the ulna.
- Together, the carpal bones form a **convex** surface, which articulates with the **concave** surface of the radius and articular disk.

Joints of Upper Limb

Wrist joint

Structures of Wrist joint

Joint Capsule

- Like any synovial joint, the capsule is dual layered. The fibrous outer layer attaches to the radius, ulna and the proximal row of the carpal bones. The internal layer is comprised of a synovial membrane, secreting synovial fluid which lubricates the joint

Joints of the Upper limb

Wrist Joint

Structures of wrist Joint

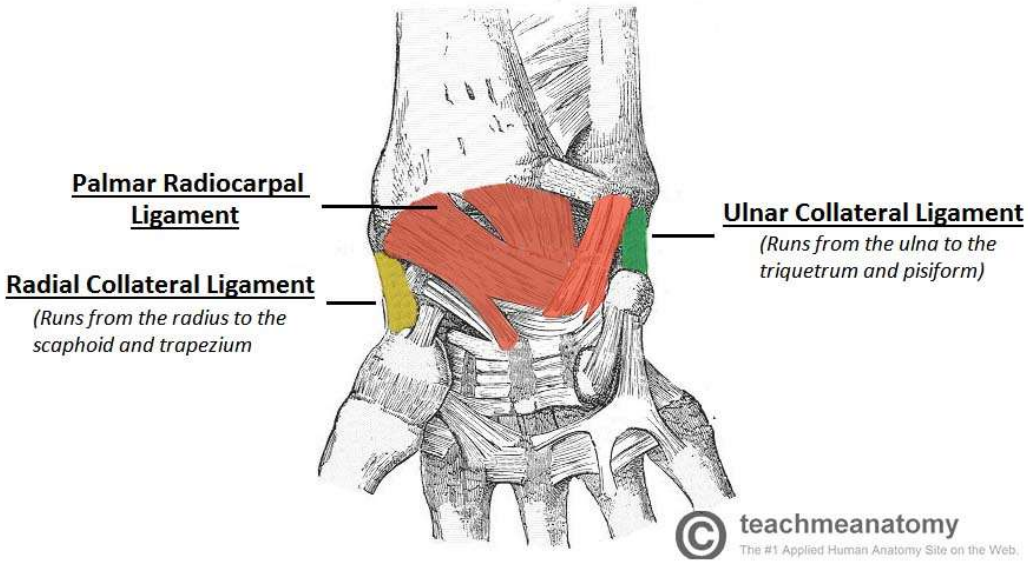
Ligaments

- There are four ligaments of note in the wrist joint, one for each side of the joint
- **Palmar radiocarpal** – It is found on the palmar (anterior) side of the hand. It passes from the radius to both rows of carpal bones. Its function, apart from increasing stability, is to ensure that the hand follows the forearm during supination.
- **Dorsal radiocarpal** – It is found on the dorsum (posterior) side of the hand. It passes from the radius to both rows of carpal bones. It contributes to the stability of the wrist, but also ensures that the hand follows the forearm during pronation.
- **Ulnar collateral** – Runs from the ulnar styloid process to the triquetrum and pisiform. Works in union with the other collateral ligament to prevent excessive lateral joint displacement.
- **Radial collateral** – Runs from the radial styloid process to the scaphoid and trapezium. Works in union with the other collateral ligament to prevent excessive lateral joint displacement.

Joints of Upper LImb

Wrist Joint

Ligament of wrist



Joints of Upper limb

Wrist Joint

Neurovascular Supply

- The wrist joint receives blood from branches of the dorsal and palmar carpal arches, which are derived from the **ulnar** and **radial** arteries (for more information, see Blood Supply to the Upper Limb)
- Innervation to the wrist is delivered by branches of three nerves:
- **Median nerve** – Anterior interosseous branch.
- **Radial nerve** – Posterior interosseous branch.
- **Ulnar nerve** – deep and dorsal branches.

Joints Of Upper limb

Wrist Joint

Movements of the Wrist Joint

- The wrist is an **ellipsoidal** (condyloid) type synovial joint, allowing for movement along two axes. This means that flexion, extension, adduction and abduction can all occur at the wrist joint.
- All the movements of the wrist are performed by the muscles of the forearm.
- **Flexion** – Produced mainly by the flexor carpi ulnaris, flexor carpi radialis, with assistance from the flexor digitorum superficialis.
- **Extension** – Produced mainly by the extensor carpi radialis longus and brevis, and extensor carpi ulnaris, with assistance from the extensor digitorum.
- **Adduction** – Produced by the extensor carpi ulnaris and flexor carpi ulnaris
- **Abduction** – Produced by the abductor pollicis longus, flexor carpi radialis, extensor carpi radialis longus and brevis.

Joints of upper Limb

Wrist Joint

Clinical Relevance

Fracture of the Scaphoid

- In the event of a blow to the wrist (e.g falling on an outstretched hand), the scaphoid takes most of the force. A fractured scaphoid is more common in the younger population.
- The scaphoid has a unique blood supply, which runs distal to proximal. A fracture of the scaphoid can disrupt the blood supply to the proximal portion. Failure to revascularise the scaphoid can lead to **avascular necrosis**, and future arthritis for the patient.
- The main clinical sign of a scaphoid fracture is tenderness in the anatomical snuffbox.

Joints of upper limb

Wrist Joint

Anterior Dislocation of the Lunate

- This can occur by falling on a **dorsiflexed** wrist. The lunate is forced anteriorly, and compresses the carpal tunnel, causing the symptoms of carpal tunnel syndrome.
- This manifests clinically as paraesthesia in the sensory distribution of the median nerve and weakness of thenar muscles. The lunate can also undergo avascular necrosis, so immediate clinical attention to the fracture is needed.

Joints of upper Limb

Wrist Joint

Clinical Relevance

Colles' Fracture

- The Colles' fracture is the **most common** fracture involving the wrist, caused by falling onto an outstretched hand.
- The radius fractures, with the distal fragment being displaced **posteriorly**. The ulnar styloid process can also be damaged, and is avulsed in the majority of cases.
- This clinical condition produces what is known as the 'dinner fork deformity'.

Joints of Upper limb

Wrist joint

Clinical relevance