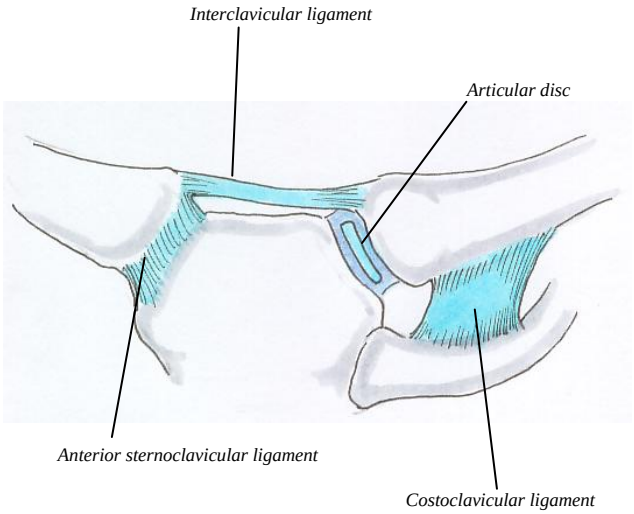
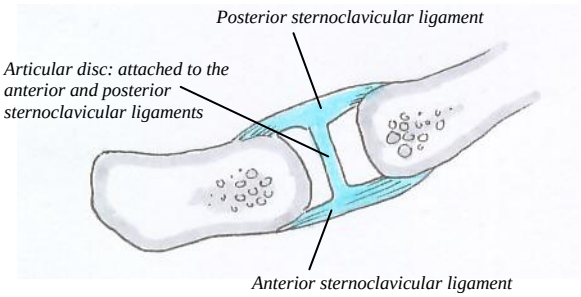
Ligaments and Joints of the Upper Limb

Sternoclavicular joint





Type of joint

Saddle type synovial joint; but it functions like a ball-and-socket joint

ATYPICAL: fibrocartilage cover articular surfaces

Articulating surfaces

Sternal facet of clavicle, clavicular facet of manubrium

There is also an ARTICULAR DISC

Articular capsule

Surrounds the joint, including the clavicular epiphysis

Attached to the articular disc

Lined with synovial membrane, contains synovial fluid

Ligaments

Anterior and posterior sternoclavicular ligaments

Interclavcular ligament

Costoclavicular ligament

Stability factors

Not many muscles around, and the surfaces are incongruous, so the joint relies on the ligaments for stability.

Anterior and posterior sternoclavicular ligaments reinforce it anteriorly and posteriorly

Interclavicular ligament reinforces it superiorly

Costoclavicular ligament reinforces it inferiorly

Articular disc limits medial displacement

Movements

Flexion, extension, rotation, anterior and posterior movement, circumduction

Blood supply

Internal thoracic and subscapular arteries

Nerve supply

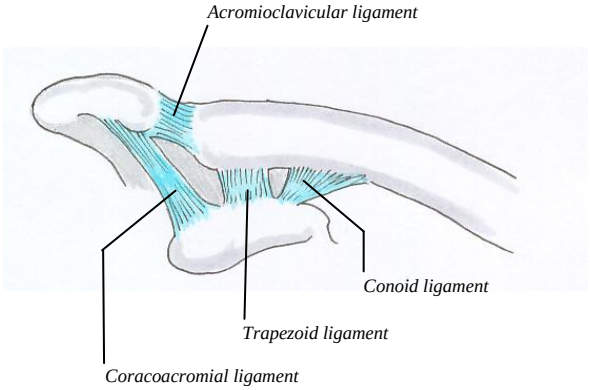
Nerve to subclavius

Medial supraclavicular nerve

All joint stability depends on 3 factors:

1) **shape of articulating surfaces;** i.e. how well the bones fit together
2) **the ligaments**
3) **the tone of the surrounding muscles**

Acromioclavicular joint



Type of joint

Plane type synovial joint

Articulating surfaces

Acromial end of the clavicle, and the acromion process of the scapula

Articular capsule

Attached to the margins of the articular surfaces
Lined with synovial membrane
Contains synovial fluid
Strengthened superiorly by fibers from the trapezius

Ligaments

Acromioclavicular ligament
Conoid ligament
Trapezoid ligament

Stability factors

Stability is maintained by extrinsic ligaments, far from the joint itself
Conoid and trapezoid ligaments anchor the clavicle to the coracoid process, suspending the free limb and scapula from the clavicle

Movements

The acromian rotates on the clavicle

Blood supply

Suprascapular and thoracoaromial arteries

Nerve supply

Lateral pectoral and axillary nerve
Subcutaneous lateral supraclavicular nerve

Coracoclavicular joint

Type of joint

Not really much of a joint, as the two bones don't really articulate. There is a rare anatomical abnormality when they actually come into contact, but normally the coracoid process attaches indirectly to the clavicle by means of the strong coracoclavicular ligaments, the conoid and the trapezoid.

Articulating surfaces

Normally, none.

The superior surface of the coracoid process attaches to the conoid and the trapezoid line of the clavicle by the ligaments abovementioned

Articular capsule

No capsule

Ligaments

Conoid ligament

Trapezoid ligament

Stability factors

Conoid and trapezoid ligaments anchor the clavicle to the coracoid process, suspending the free limb and scapula from the clavicle

Movements

There is limited movement at this joint; the clavicle rotates on the acromion.

Blood supply

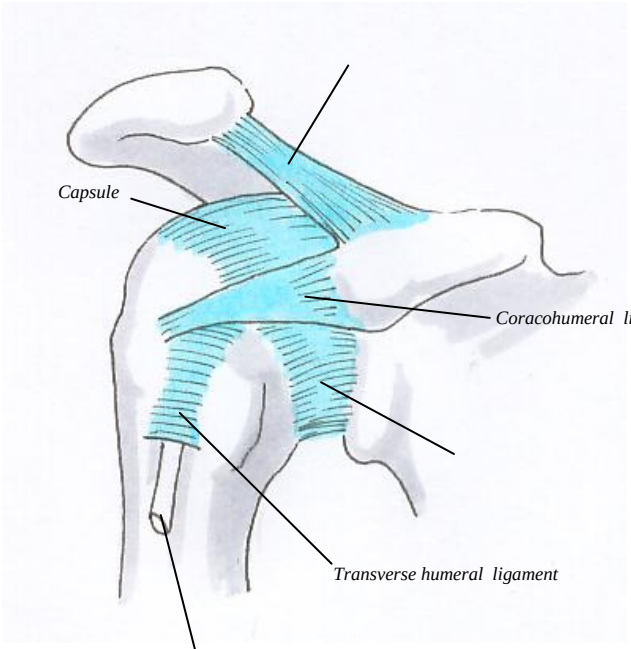
Suprascapular and thoracoaromial arteries

Nerve supply

Lateral pectoral and axillary nerve

Subcutaneous lateral supraclavicular nerve

Glenohumeral joint



Type of joint

Ball and socket synovial joint

Articulating surfaces

Humeral head articulates with the glenoid cavity.
The cavity is deepened by the glenoid labrum.
About 1/3rd of the head actually sits in the cavity.

Articular capsule

Attaches proximally to the margins of the glenoid cavity, and distally to the anatomical neck of the humerus.
IT HAS HOLES IN IT.
One hole admits the tendon of the long head of biceps brachii, and the other communicates with the subscapular bursa.
THE WEAKEST PART is the inferior part which is not reinforced by the rotator cuff muscles

Ligaments

Glenohumeral ligaments: intrinsic ligaments, three fibrous thickenings of the capsule, anteriorly
Coracohumeral ligament – from the base of coracoid to the anterior aspect of the greater tubercle
Transverse humeral ligament- acts as the roof over the bicipital groove
Coracoacromial ligament- forms the roof over the glenohumeral joint

Stability factors

The joint is too shallow to be stable; stability is sacrificed to mobility
The socket is deepened by the glenoid labrum
The joint is stabilized mainly by muscles:

- supraspinatus
- infraspinatus
- teres minor
- subscapularis

they hold the ball in the socket
the coracoacromial arch and supraspinatus tendon limit superior displacement
supraspinatus and teres minor limit posterior displacement
subscapularis limits anterior displacement

Movements

Greatest freedom of movement of any joint in the body
Flexion/extension, abduction/adduction, medial and lateral rotation, circumduction
Assisted by the movement of the pectoral girdle (the scapula and the clavicle)

Blood supply

Anterior and posterior circumflex humeral arteries
Branches of the suprascapular artery

Nerve supply

Suprascapular, axillary and lateral pectoral nerves

Factors Influencing the Stability of the Glenohumeral Joint

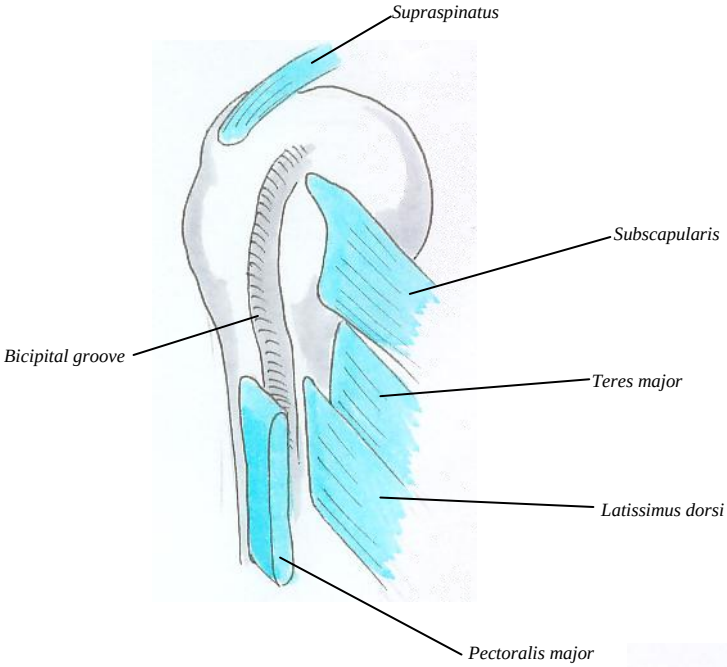
MAINLY, THE ROTATOR CUFF: supraspinatus, infraspinatus, subscapularis and teres minor

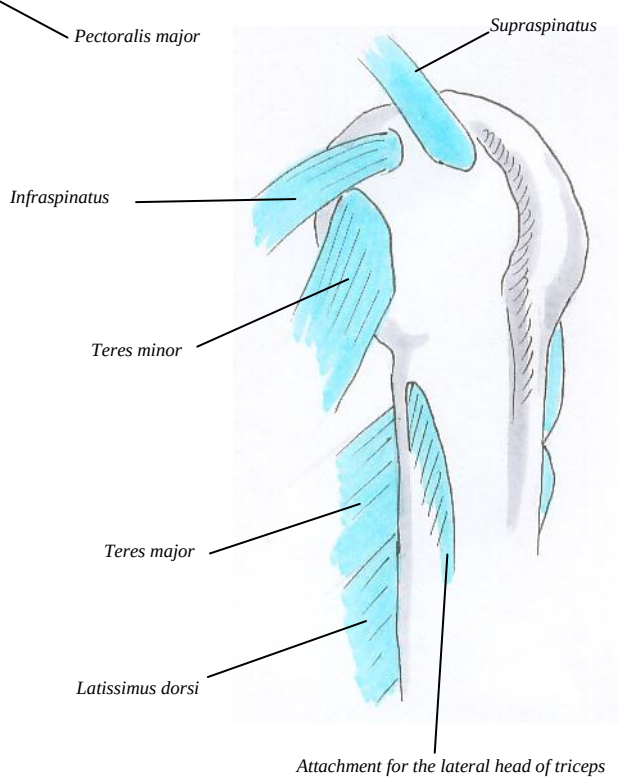
They hold the head of humerus in the glenoid fossa

SOMEWHAT, THE LIGAMENTS:

Glenohumeral
Coracohumeral
Coracoacromial arch

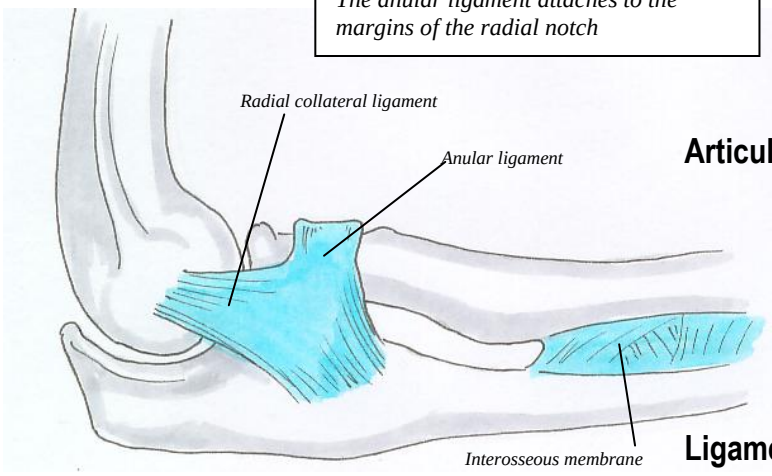
SLIGHTLY, THE GLENOID LABRUM

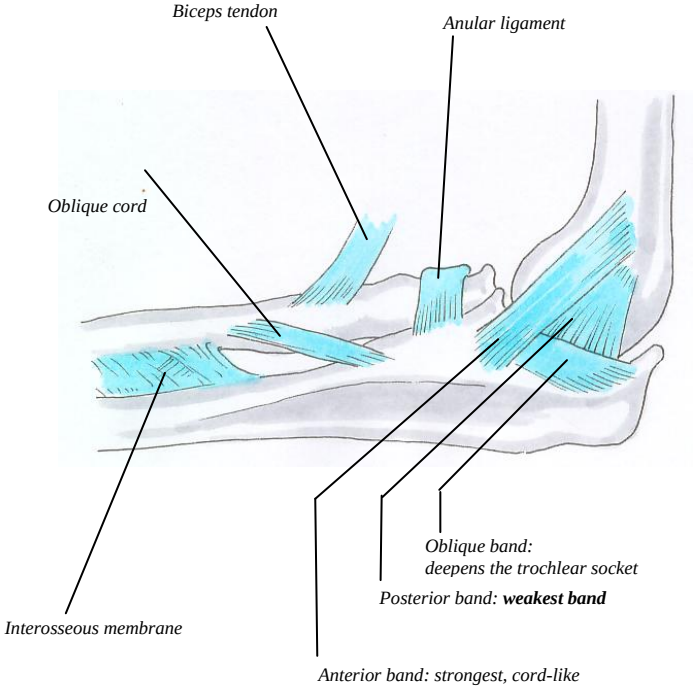




Elbow Joint

The anular ligament attaches to the margins of the radial notch





BURSAE: under every muscle attachment… the most important are:

- **Intratendinous olecranon bursa** sometimes inside the tendon of the triceps
- **Subtendinous olecranon bursa** between the olecranon and the triceps tendon
- **Subcutaneous olecranon bursa** in the subcutaneous tissue over the olecranon

Type of joint

typical synovial hinge joint

Articulating surfaces

Trochlea of humerus articulates with the trochlear notch of the ulna

Capitum of the humerus articulates with the head of radius

the surfaces are most congruent when the arm is halfway pronated, and the elbow is flexed to a right angle

Articular capsule

laterally and medially, just attaches to the margins of the articular surfaces

Anteriorly and posteriorly, the capsule comes up more proximally, to enclose the coronoid fossa and the olecranon fossa

Distally, it blends with the capsule of the proximal radioulnar joint

Ligaments

all are intrinsic- thickened parts of the joint capsule

the lateral one is the Radial Collateral ligament

- blends distally with the annular ligament of the radius; attaches to radial notch margins

the medial one is the Ulnar Collateral ligament

- triangular, fan-like
- the ANTERIOR band is the STRONGEST
- the POSTERIOR band is the weakest
- the slender and feeble OBLIQUE band merely serves to deepens the socket for the trochlea of the humerus

Stability factors

Major stability factor: bony alignment; The bones articulate well, the olecranon fossa limits hyperextension, and the coronoid fossa limits hyperflexion. The medial and lateral collateral ligaments serve to limit abduction and adduction- a **minorstability factor**

Movements

It is PERMANENTLY ABDUCTED to 17 degrees:

= The "carrying angle"

= this angle is 10 degrees greater in women

= it DISAPPEARS when the arm is PRONATED

..but the elbow only allows flexion and extension

FLEXORS: biceps brachii, brachialis, brachioradialis

EXTENSORS: Triceps Brachii, Anconeus

- **when the forearm is supinated, the biceps brachii helps flex it**
- **when the forearm is pronated, the pronator teres helps flex it.**
- **major flexor is the brachialis; minor flexor is brachioradialis**

Blood supply

Derived from the anastomosis around the elbow joint

Nerve supply

Musculocutaneous, ulnar and median nerve

Proximal Radioulnar Joint

Type of joint

Pivot type synovial joint

Articulating surfaces

The head of radius articulates with the radial notch of the ulna

Articular capsule

The fibrous part blends into the elbow joint

The synovial part is continuous with the elbow joint

There is also a SACCIFORM RECESS of the joint, a distal extension of it down the radius which allows the radius to rotate without tearing the synovium

Ligaments

The ANULAR ligament encircles the head of the radius

Stability factors

The bones articulate well

The ANULAR ligament is the main stability factor, preventing dislocation of the radial head.

The INTEROSSEOUS MEMBRANE also prevents distraction of the radius

The joint is surrounded by muscles eg. brachioradialis and brachialis, which contribute to its stability in a minor way

Movements

Pronation and supination

Supination is the palm turning up, as if to receive alms

The axis of rotation passes through the head of radius and through the site of attachment of of radius and ulna distally

THE RADIUS IS THE ONE THAT ROTATES

the ulna stays stationary

Blood supply

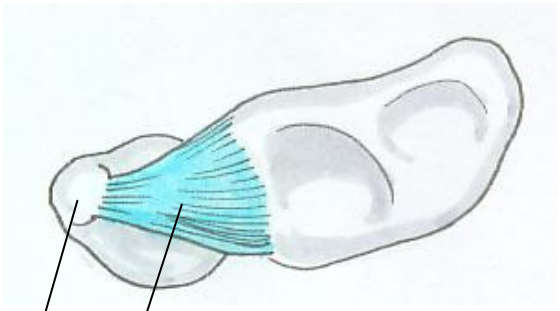
Supplied by the radial portion of the periarticular arterial anastomosis of the elbow, which is the anastomosis of radial and middle collateral arteries with the radial and recurrent inteosseous arteries

Nerve supply

Supplied by the musculocutaneous, median and radial nerves, where

- pronation is work of the median
- supination is the work of the radial and musculocutaneous nerves

Distal Radioulnar Joint



Type of joint

Pivot type of synovial joint

Articulating surfaces

The head of ulna articulates with the ulnar notch of the medial distal radius

which separates the the cavity of the distal radioulnar joint from the cavity of the wrist joint

Articular capsule

The synovial membrane extends supeiorly between the radius and the ulna to form a SACCIFORM RECESS, which accommodates for the twistng of the capsule.

Ligaments

Intrinsic ANTERIOR and POSTERIOR ligaments strengthen the joint capsule

These are weak transverse bands

Stability factors

The ARTICULAR DISC is the main uniting structure of the joint, because it bings the ends of the radius and the ulna together

Movements

During pronation, the radius crosses the ulna

During supination, the radius is parallel with the ulna

Supination is produced by Supinator

Pronation is produced by the Pronator Quadratus

…as well as Pronator Teres

FCR, PL and brachioradialis also help when the forearm is mid-pronated

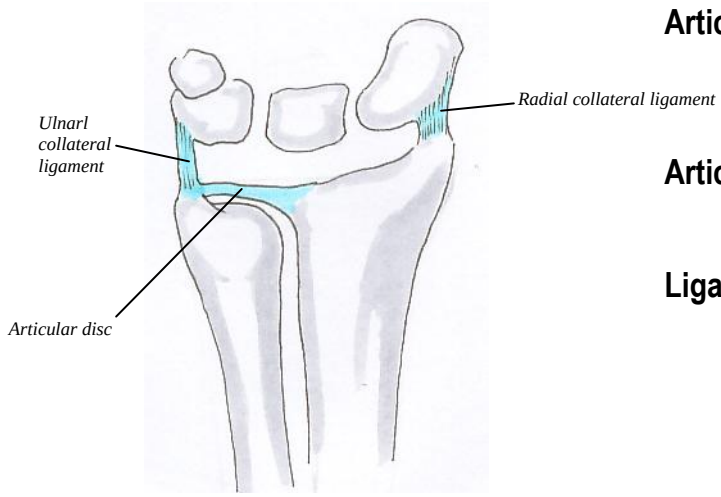
Blood supply

Anterior and posterior interosseous arteries

Nerve supply

Anterior and posterior interosseous nerves

Radiocarpal joint



Type of joint

Condyloid (ellipsoid) type of synovial joint

Articulating surfaces

Three of the carpal bones (scaphoid, triquetrum and lunate) articulate with the radius

The pisiform and the ulna don't participate

Articular capsule

Stretches from the distal ends of the radius and ulna, to the proximal row of carpal bones (but not the pisiform)

Ligaments

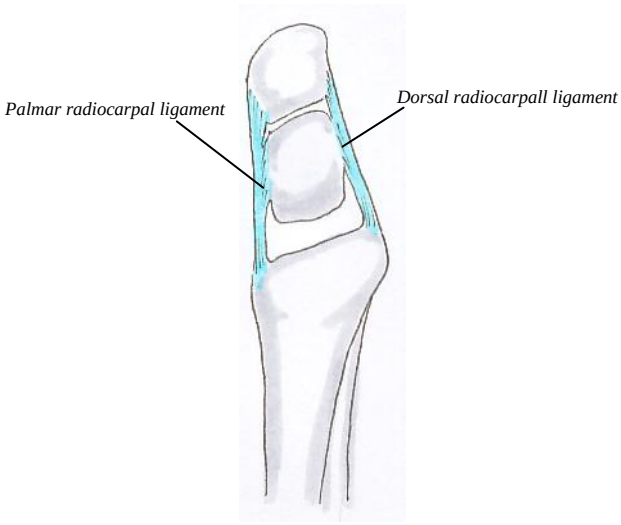
The PALMAR radiocarpal ligaments stretch from the radius to both of the two rows of carpal bones;

The DORSAL radiocarpal ligament does the same

these ligaments make sure the hand follows the radius in its rotation

the ULNAR COLLATERAL LIGAMENT passes from the ulnar styloid to the triquetrum

the RADIAL COLLATERAL LIGAMENT passes from the radial styloid to the triquetrum



Stability factors

The radius articulates tightly with the carpus; the styloid processes of the radius and ulna limit abduction and adduction

The ligaments and tendons supply most of the stability

Movements

The movements of this joint are augmented by the slight movements permitted by the intercarpal and midcarpal joints. These are

- flexion + extension (greater range of flexion than extension)
- flexion is produced by
  FCR and FCU, Palmaris longus
  APL, Flexors of the fingers and thumb
- extension is produced by
  ECRL, ECRB, and ECU
  Extensors of fingers and thumb
- adduction + abduction (ulnar and radial deviation) – greater range of adduction(ulnar) than of abduction, because of the larger radial styloid. Most abduction occurs at the midcarpal joint.
- Adduction is produced by
  Simultaneous ECU and FCU action
- Abduction is produced by
  APL, FCR, ECRL and ECRB together
- Circumduction – consists of successive flexion, adduction, extension and abduction

Blood supply: Branches of the dorsal and palmar carpal arch

Nerve supply: Anterior interosseous branch of the median nerve, posterior interossous branch of the radial nerve, and dorsal and deep branches of the ulnar nerve

Intercarpal joints

Type of joint

Plane synocial joints

Articulating surfaces

Joints between carpal bones of the middle row
Joints between carpal bones of the distal row
MIDCARPAL JOINT: between the proximal and distal rows of the joints
PISOTRIQUETRAL JOINT: articulation between the pisiform and the palmar surface of the triquetrum

Articular capsule

The articular cavity is common to all intercarpal and carpometacarpal joints – EXCEPT the thumb, which has its own carpometacarpal capsule.

Ligaments

All the carpals are united with anterior, posterior and interosseous ligaments

Stability factors

The ligaments above contribute most;
The fibrous articular capsule wraps the carpal bones up, and keeps them together

Movements

Slight movemens which extent the range of motion available at the radiocarpal joint

Blood supply

Dorsal and palmar carpal arches

Nerve supply

Anterior interosseous branch of the median nerve
Dorsal and deep branches of the ulnar nerve

Carpometacarpal and Intermetacarpal joints

Type of joint

Plane type synovial joints- EXCEPT the carpometacarpal joint of the thumb, which is a saddle type joint

Articulating surfaces

Distal surfaces of the carpal bones articulate with the bases of the metacarpals

The important thumb joint is the articulation between the trapezium and the bease of the first metacarpal

The INTERMETACARPAL joints ar adjacent metacarpals articulating with each other's bases

Articular capsule

The medial four carpometacarpal joints, and the three intermetacarpal joints, are all enclosed by the same articular capsule.

The thumb CMC joint has its own capsule

Ligaments

All thse bones are united by the palmar and dorsal carpometacarpal ligaments, and by the intermetacarpal ligaments.

The DEEP TRANSVERSE METACARPAL LIGAMENT and the SUPERFICIAL TRANSVERSE METACARPAL LIGAMENT (which is part of the palmar aponeurosis) both work to prevent separation of the metacarpal bases

Stability factors

The above ligaments are he major stability factors

Movements

Almost no movement at the CMCs of the 2nd and 3rd fingers,
Slight movement at the 4th CMC
Moderate movement of the 5th CMC (flexion, extension and rotation)

Blood supply

Periarticular arterial anasomoses of the wrist and hand (basically, the arterial arches)

Nerve supply

Anterior interosseous branch of the median nerve, posterior interossous branch of the radial nerve, and dorsal and deep branches of the ulnar nerve

The carpometacarpal joint of the thumb is independent – it has its own synovial capsule

Joint at the base of the thumb: First carpometacarpal joint

Type of joint

Saddle-type synovial joint

Articulating surfaces

Trapezium and the base of the 1st metacarpal

Articular capsule

Coveres the articulating surfaces

Ligaments

anterior oblique (volar) ligament (AOL)
dorsoradial ligament,
posterior oblique ligament
intermetacarpal ligament.

Stability factors

Ligaments, mainly

Movements

Angular movements in any plane:
Flexion- extension
Adduction-abduction
(thus, circumduction)
opposition

Blood supply

Periarticular arterial anasomoses of the wrist and hand (basically, the arterial arches)

Nerve supply

Anterior interosseous branch of the median nerve, posterior interossous branch of the radial nerve, and dorsal and deep branches of the ulnar nerve

Metacarpophalangeal and interphalangeal joints

Type of joint

Metacarpophalangeal joints are condyloid synovial joints

Interphalangeal joints are hinge joints

Articulating surfaces

Bases and heads

Articular capsule

Joint capsules surround each joint, attaching to the margins

Ligaments

Each MCP ad ICP joint is reinforced by a medial and lateral collateral ligaments

Each of these ligaments has two parts:

The dense cord-like part passes from one head to the next base; the thin fan-like part passes anteriorly to fuse with the anterior (palmar) part of the joint capsule

The cord-like parts are slack dring extension and taught during flexion- this means you usually cannot spread (abduct) the fingers when the fingers are fully flexed

The fan-like parts move like a visor over the underlying heads

The palmar ligament (thick part of the capsule) blend with the digital sheaths and provide grooves for the flexor tendons to glide in.

At the MCPs, THE PALMAR LIGAMENTS ARE UNITED by the deep transverse metacarpal ligament

Stability factors

ligaments

Movements

MCPS: flexion, extension, adduction, abduction

Blood supply

Digital arteries

Nerve supply

Digital nerves from the median and ulnar nerves

References: Moore's Clinically Oriented Anatomy 5th edition