The Forearm, Wrist and Hand Assessment

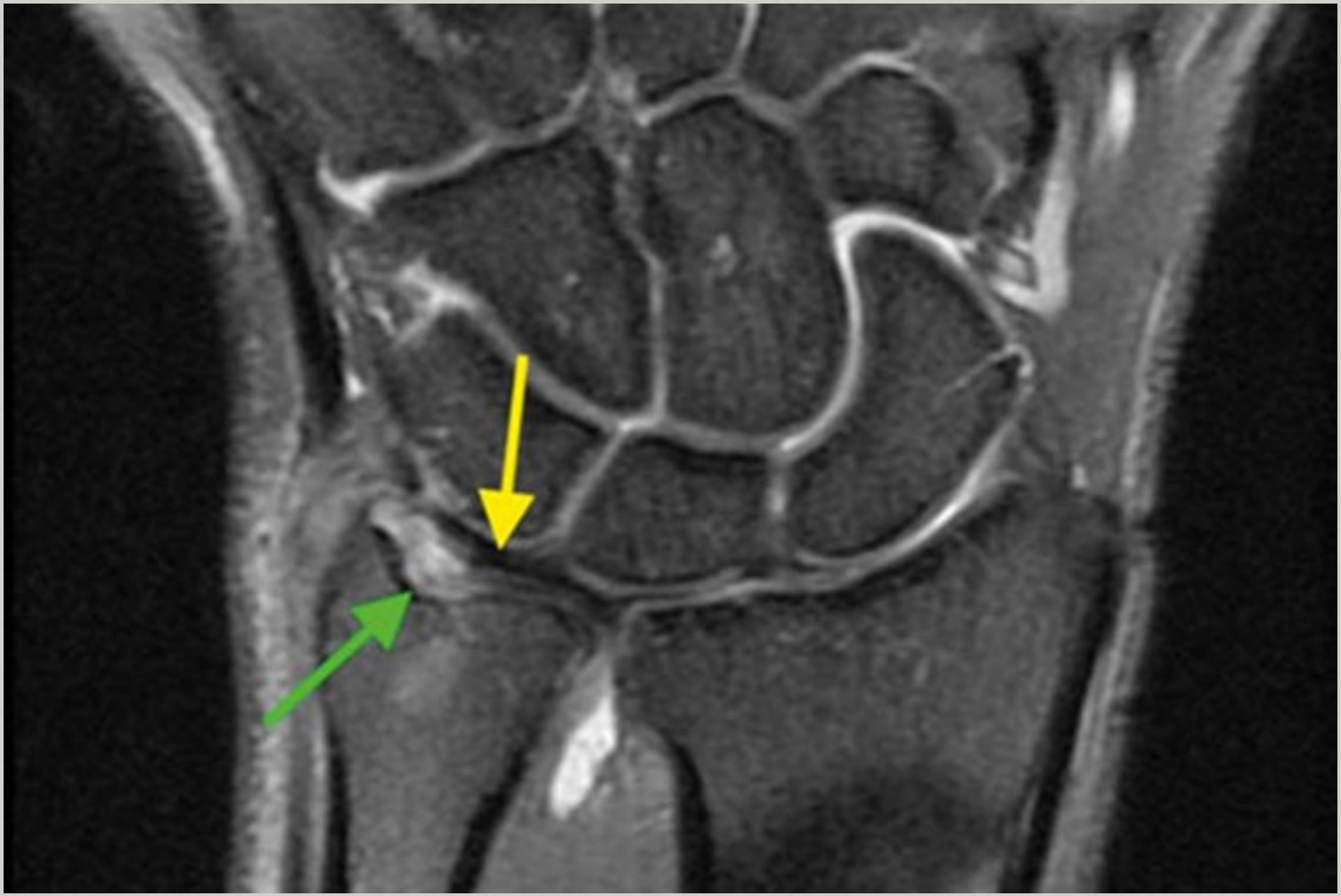
Page 482

Distal Radialulnar Joint

- Uniaxial pivot joint, 1° of freedom (pronation and supination)
- Resting position- 10° supination
- Close packed postion- 5°supination
- Capsular pattern- Full ROM, pain at extremes of rotation
- Articulating surfaces
  - CONVEX distal ulna with CONCAVE radius
  - Triangular Fibrocartilage Complex (TFCC)

Triangular Fibrocartilage Complex

- Binds lower ends of radius
- Apex is on ulna between styloid process and head
- Can be injured by excessive pronation/hyperextension (FOOSH) or repetitive weight bearing



Radiocarpal Joint

- Biaxial ellipsoid joint, 2 degrees of freedom
- Radius articulates with SCAPHOID and LUNATE
- LUNATE and TRIQUETRUM articulate with the TFCC disc (ulnar radius to ulnar styloid process)
- Resting position- neutral with slight ulnar deviation
- Close packed position- extension with radial deviation
- Capsular pattern- flexion, extension equally limitted

Intercarpal Joint

- The joints between the individual bones of the proximal row of carpal bones and the joints between the individual bones of the distal row of carpal bones.
- Proximal row- scaphoid, lunate, triquetrum
- Distal row- trapezium, trapezoid, capitate, hamate
- Pisiform sits on triquetrum (pisotriquetral jt)
- Resting position- neutral or slight flexion
- Close packed postion- extension
- Capsular pattern- none

Midcarpal Joint

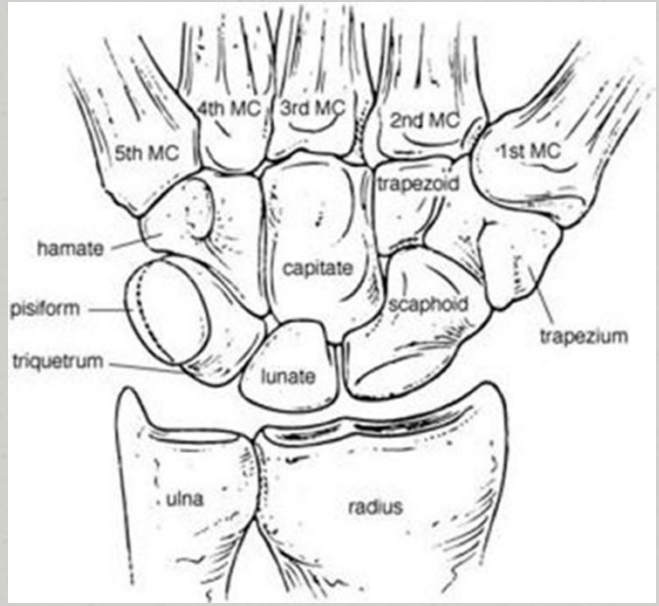
- Medial scaphoid, lunate and triquetrum articular with capitate and hamate forming compound sellar jt (saddle)
- Lateral scaphoid articulates with trapezoid and trapezium forming compound sellar jt
- Resting position- neutral or slight flexion with ulnar deviation
- Close packed position- extension with ulnar deviation
- Capsular pattern- equal limitations of flexion and extension

Carpometacarpal

- Thumb is a saddle jt, 3° of freedom
- 2-5th CMC jts are plane jts
- Resting position- midway btw ABD/ADD and flex/extension (thumb); midway btw flex/extension (fingers)
- Close packed position- full opposition (thumb); full flexion (fingers)
- Capsular pattern- ABD and extension (thumb); all mvts equal limitation (fingers)

Intermetacarpal Joint

- Small amount of gliding movements



Palpation of the carpal bones

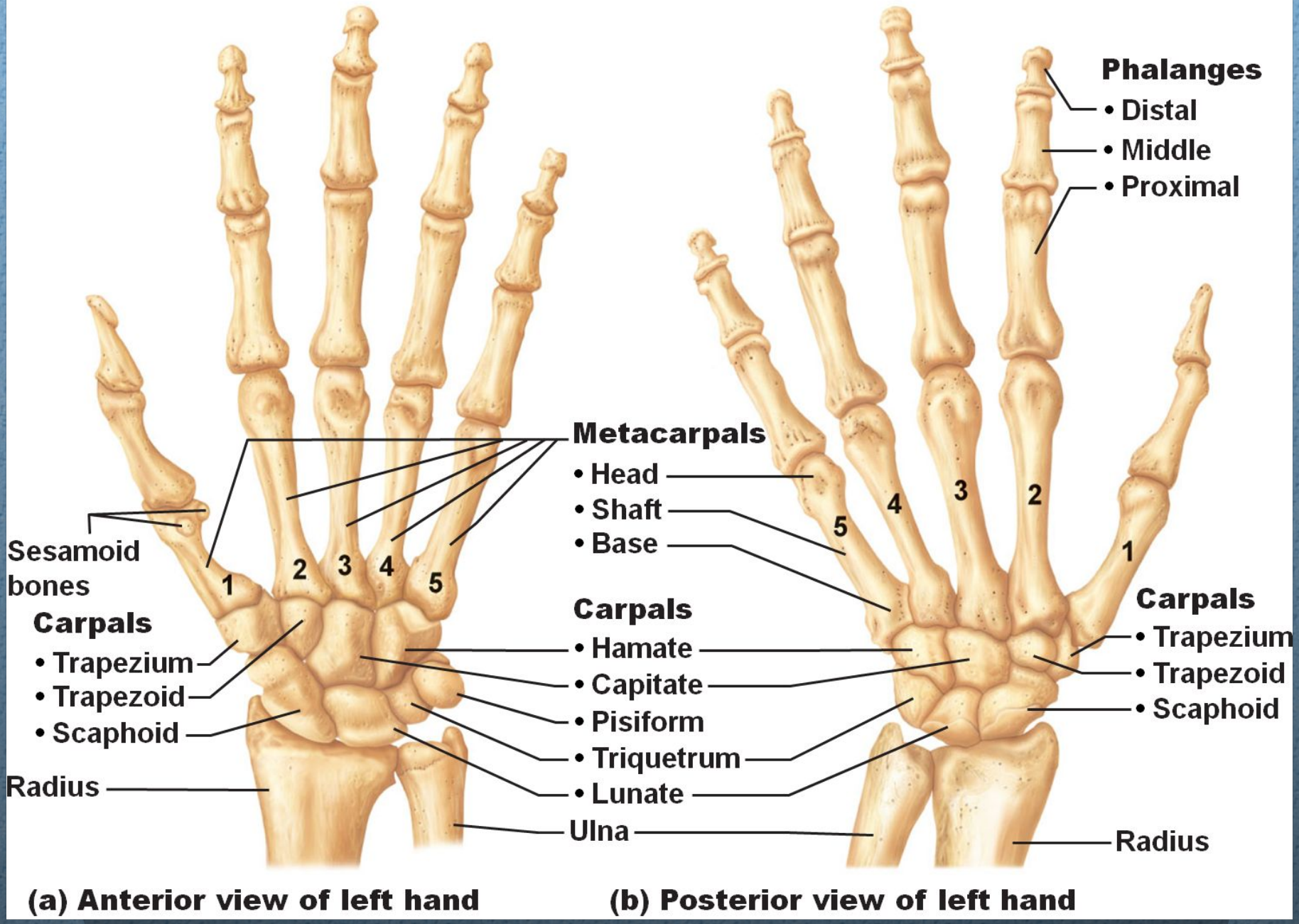
- Scaphoid- floor of anatomical snuff box
- Which tendons border the anatomical snuff box?
- Medial border – tendon extensor pollicis longus
- Lateral border – abductor pollicis longus, extensor pollicis brevis
- Lunate- follow 3rd MC until a depression is found
- Triquetrum- locate ulnar styloid, palpate distally with slight radial deviation for a prominence
- Pisiform- prominence ulnarly
- Hook of Hamate – IP fold of thumb over pisiform, extent thumb towards index finger base

Metacarpalphalangeal

- Condyloid jt, 2° of freedom
- 1st MCP has 3° of freedom
- Resting position- slight flexion
- Close packed position- full opposition (thumb); full flexion (fingers)
- Capsular pattern- flexion and extension

Interphalangeal Joint

- Uniaxial hinge joints, 1° of freedom
- Resting position- slight flexion
- Close packed position- full extension
- Capsular pattern- flexion and extension



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Client History

Client History

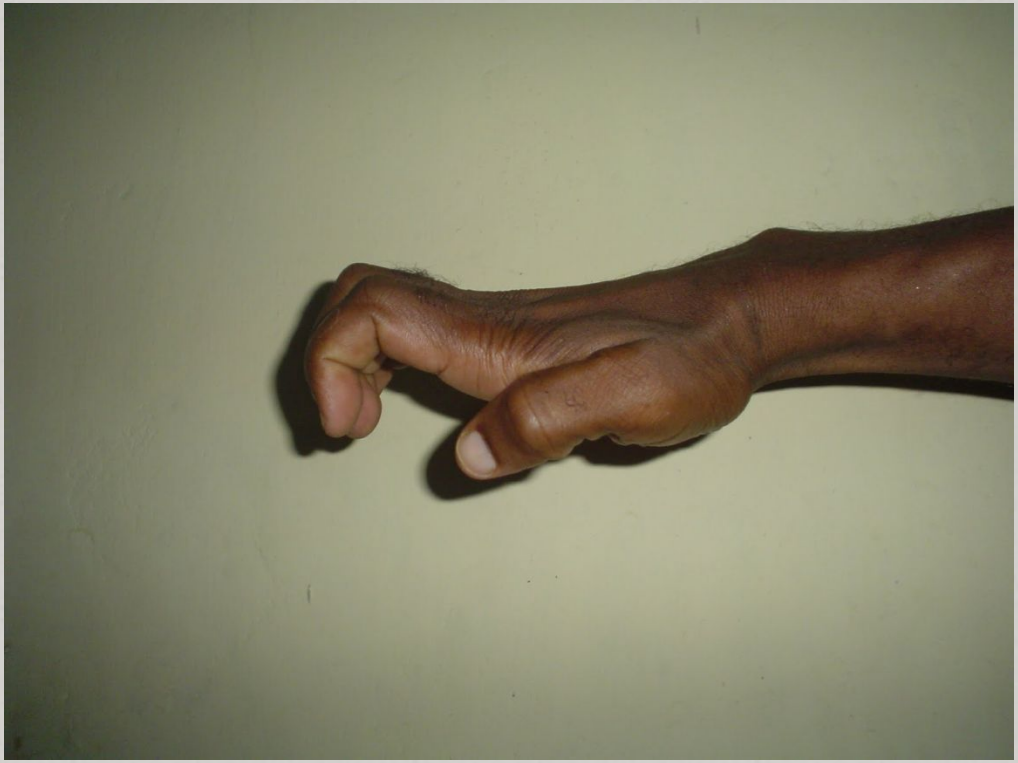
- Read text book section pg 487-490

Observation

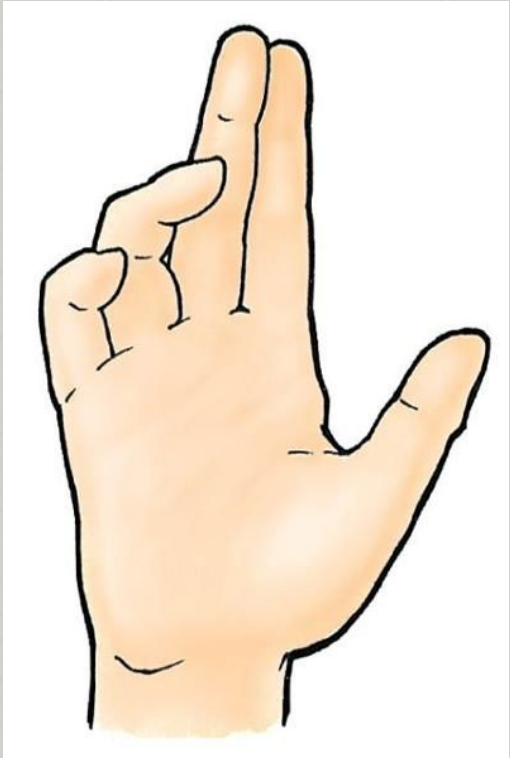
Observation

- Cascade of flexion
  - Increasing flexion of digits from radial to ulnar side
- Resting position
  - Thumb should be in slight opposition
- Deformities
  - Ape Hand
  - Bishop's Hand
  - Boutonniere Deformity
  - Claw Fingers
  - Drop Wrist
  - Dupuytren Contracture
  - Mallet Finger
  - Swan Neck Deformity
  - Trigger Finger
- Arthritic Changes
  - Heberden's Nodes
  - Bouchard's Nodes
  - Ulnar Drift

Ape hand



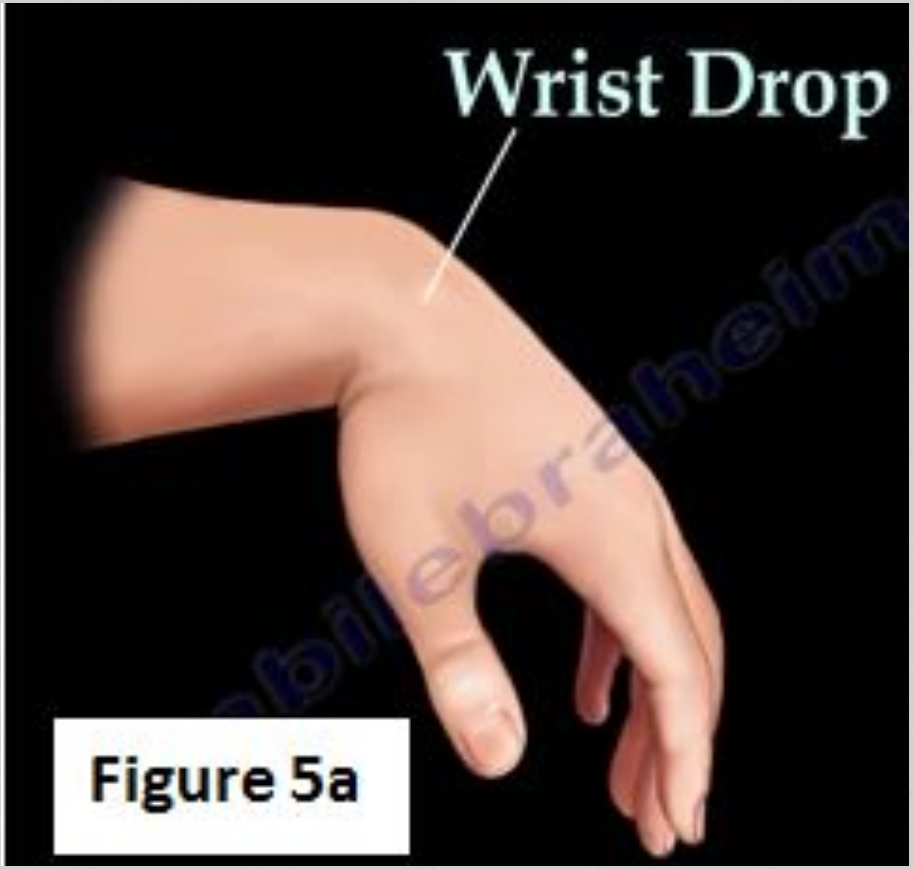
Bishop Hand



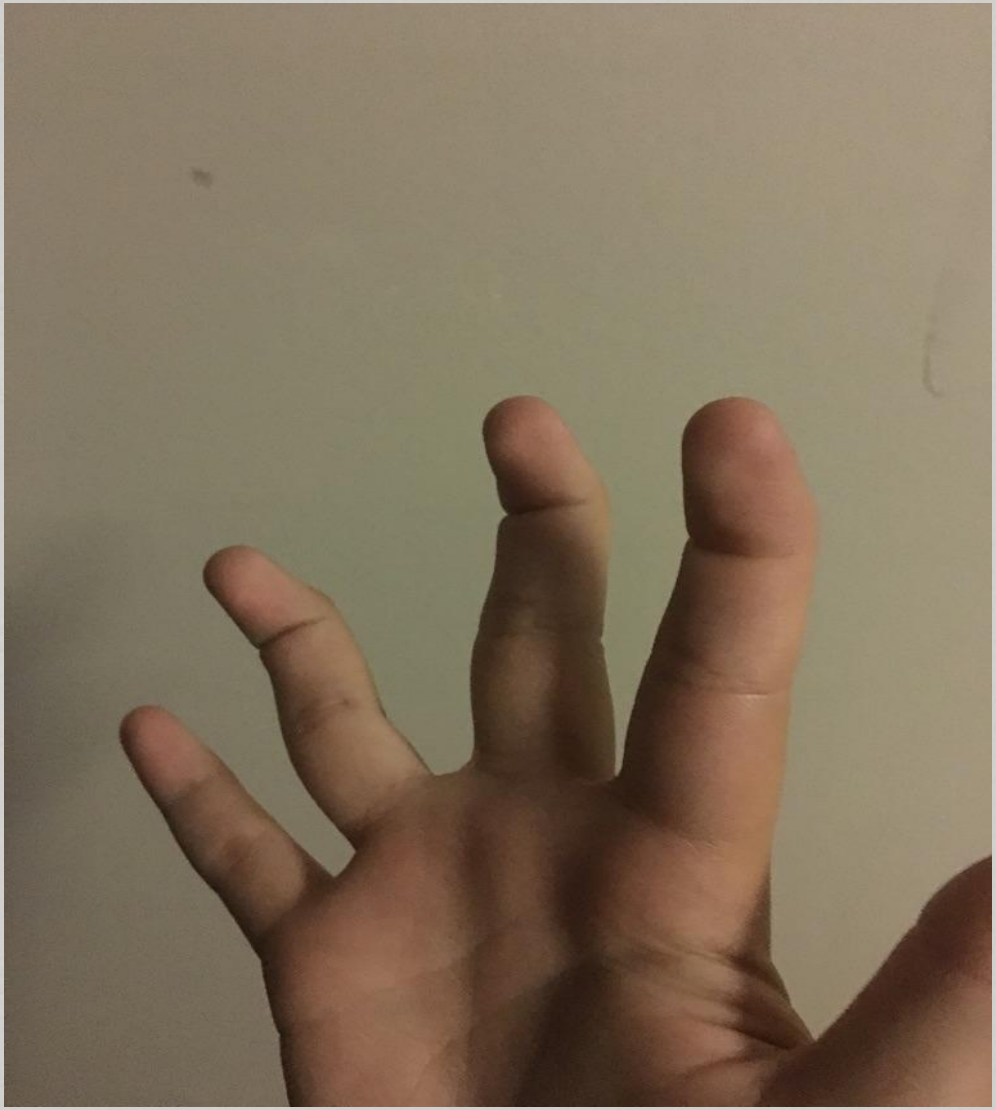
Boutonniere Deformity

Claw Fingers

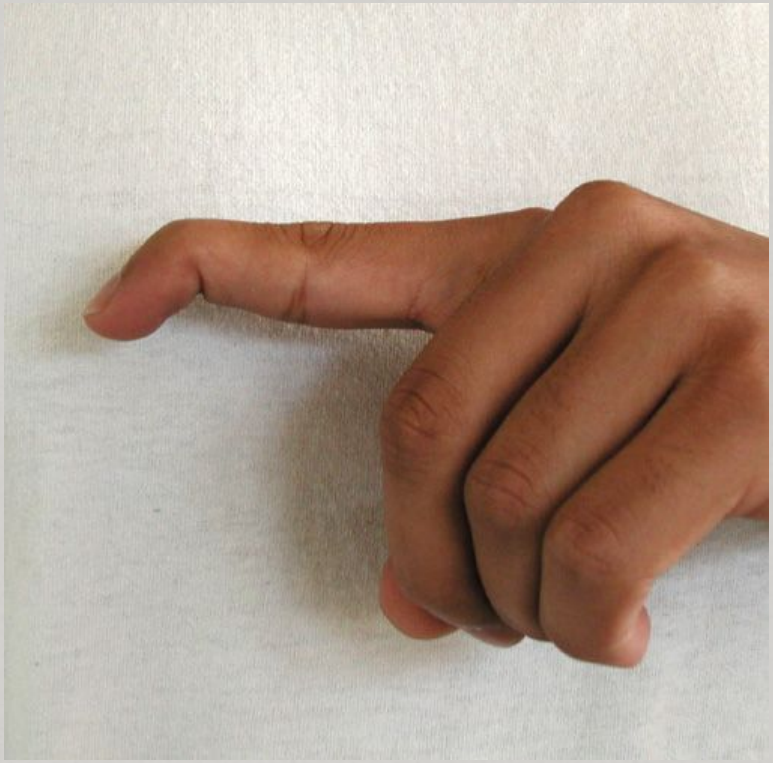
Drop Wrist



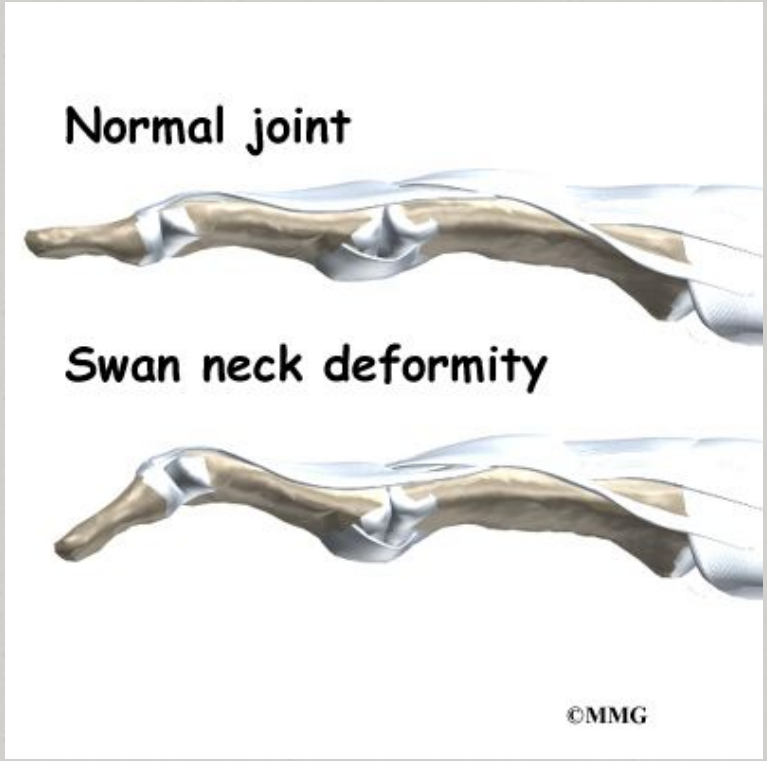
Dupuytren Contracture



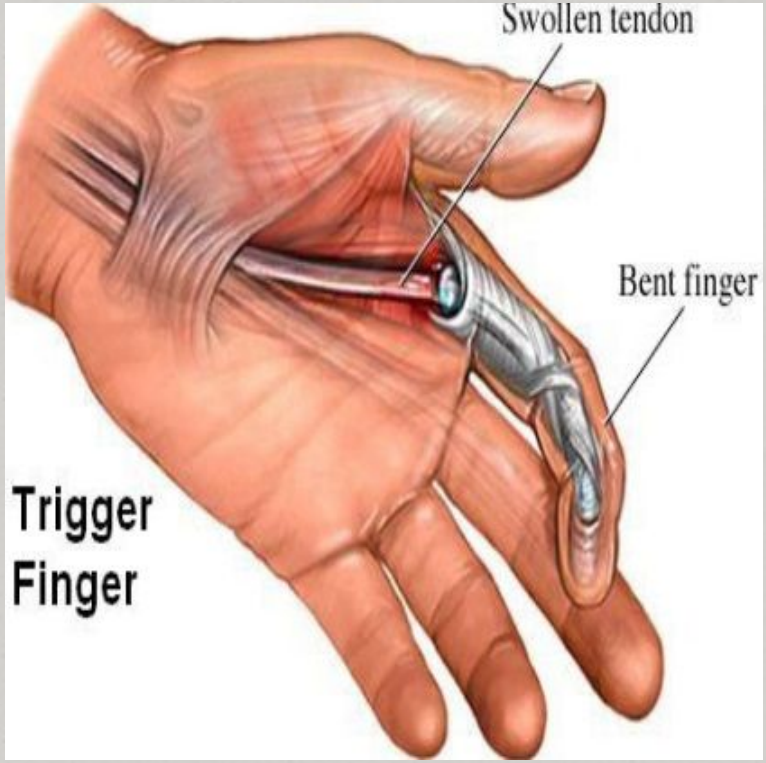
Mallet Finger



Swan Neck Deformity



Trigger Finger



Heberden's nodes

Bouchard's Nodes

Ulnar Drift

Range of Motion

Range of Motion Degrees

- Radial Deviation 15°
- Ulnar Deviation 30° – 45°
- Wrist Flexion 80° – 90°
- Wrist Extension 70° – 90°
- Finger Flexion
  - MCP 85° - 90°
  - PIP 100° - 115°
  - DIP 80° - 90°

Continued

- Finger Extension
  - MCP 30°– 45°
  - PIP 0°
  - DIP 20°
- Finger Abduction 20° – 30°
- Finger Adduction 0°
- Thumb flexion
  - CMC 45°– 50°
  - MCP 50°– 55°
  - IP 85° -90°

Continued

- Thumb Extension
  - MCP – 0°
  - IP – 0°– 5°
- Thumb Abduction 60°– 70°
- Thumb Adduction 30°
- Opposition of little finger to thumb – tip to tip
- Action of pronation and supination should be checked as well based on the action and the wrist joint

https://youtu.be/kFnDRhcsFdM

Passive Movements

- Pronation - tissue stretch
- Supination - tissue stretch
- Radial deviation - bone to bone
- Ulnar deviation - bone to bone
- Wrist flexion - tissue stretch
- Wrist extension - tissue stretch
- Finger flexion - tissue stretch

https://youtu.be/1MhBpNR83xs

- Finger extension - tissue stretch
- Finger abduction - tissue stretch
- Thumb flexion - tissue stretch
- Thumb extension - tissue stretch
- Thumb abduction - tissue stretch
- Thumb adduction - tissue approximation
- Opposition - tissue stretch

RIM

- Forearm supination
- Forearm pronation
- Wrist extension
- Wrist flexion
- Ulnar deviation
- Radial deviation
- Finger extension
- Finger flexion
- Finger ABD
- Finger ADD
- Thumb extension
- Thumb flexion
- Thumb ABD
- Thumb ADD
- Opposition

Resisted Isometric Movements

- Done with the client is a seated position
- Isometric movements must be applied when the wrist is neutral

https://youtu.be/DKE4QDMIFAs

Functional assessment

- Wrist flexion and extension
- Wrist ulnar and radial deviation
- Making a standard fist
- Making a hook grasp
- Making a straight fist
- Pulp to pulp thumb to all fingers pinch
- Tip to tip thumb to all fingers pinch

Action	Muscles Acting
Supination of forearm	Supinator, biceps brachii
Pronation of forearm	Pronator quadratus, pronator teres, FCR
Extension of wrist	ECRL, ECRB, ECU
Flexion of wrist	FCR, FCU
Ulnar deviation of wrist	FCU, ECU
Radial deviation of the wrist	FCR, ECRL, abductor pollicis longus, extensor pollicis brevis
Extension of fingers	Extensor digitorum, extensor indicis, extensor digiti minimi
Flexion of fingers	FDP, FDS, lumbricals, interossei, flexor digiti minimi
Abduction of fingers	Dorsal interossei, abductor digiti minimi
Adduction of fingers	Palmar interossei
Extension of thumb	EPL, EPB, abductor pollicis longus
Flexion of thumb	FPB, FPL, opponens pollicis
Abduction of thumb	Abductor pollicis longus, abductor pollicis brevis
Adduction of thumb	Adductor pollicis
Opposition of thumb and little finger	Opponens pollicis, FPB, abductor pollcis brevis, opponens digiti minimi

Muscle Length Test – Extensors*

- Extensors of the wrist
  - Client is supine with elbow extended
    - Therapist passively flexes the fingers and then the wrist
    - If muscles are tight flexion will be restricted
- ECRL Bias- same as above but add flexion to 2nd metacarpal/digit
- ECRB Bias- same as above but add flexion to 3rd metacarpal/digit

Muscle Length Test – Flexors*

- Client is supine with elbow extended
- Therapist passively extends the clients fingers and then wrist
- If the muscles are tight extension will be restricted

Special Tests

Ligament Stability Test*

- Ulnar Collateral Ligament Stability Test of Wrist
  - Method: grasp client's wrist above and below the attachments of the UCL, radially deviate the wrist assessing the client's tolerance and endfeel
  - Positive: pain at UCL, excess laxity

- Radial Collateral Ligament Stability Test
  - Method: grasp client's wrist above and below the attachments of the RCL, ulnarly deviate the wrist assessing the client's tolerance and endfeel
  - Positive: pain at RCL, excess laxity

MCP, DIP, IP, PIP collateral Ligament test

- UCL apply a varus stress
- RCL apply a valgus stress

TFCC Injury

- Injuries in the Triangular Fibrocartilage Complex (TFCC Injuries) occur on the side of the wrist, below the pinky finger. TFCC Injuries are usually caused by a fall onto an outstretched hand or from bending the wrist too far backwards. However, they can also be caused by degeneration over time. The most common symptom of a TFCC injury is severe pain, making it difficult to bend or straighten the wrist. Since the TFCC is used to move the wrist in several different directions, it's extremely vulnerable to re-injury

TFCC Ligament Test

- TFCC Grind Test (Sharpey's Test)- TFCC pathology
  - Method: axially load client's wrist, ulnarly deviate wrist then flex and extend wrist (rotate)
  - Positive: pain, clicking, crepitus in TFCC area

- Ulnomeniscaltriquetral Dorsal Glide Test- TFCC pathology (see figure 7-62 p. 471)
  - Method: client is seated with forearm pronated, T. stabilizes ulna with thumb and applies a posterior force at the pisotriquetral complex with the index finger stressing the TFCC
  - Positive: excessive pain and/or laxity

Carpal Tunnel Syndrome

- What is it?
  - Compressive neuropathy of median nerve as it passes through the carpal tunnel. This is the most common peripheral compressive neuropathy
- How its happens?
  - Increased pressure in the carpal tunnel which will cause compression on the medial nerve which creates the symptoms of pain, tingling and weakness. The increase in pressure will result in decreased venous outflow, edema and ischemia in the median nerve. Generally the sensory fibers are affected first, then motor fibers

Risk Factors

- Repetitive use (Sport of Occupational)
  - Typing, chiropractors, Massage therapist, Construction worker
- A decrease in tunnel space possible caused by
  - Subluxation of carpals
  - Thickened flexor Retinaculum
  - Anatomical Variation
- Obesity
- Diabetes

Risk Factors

- Pregnancy
- Excessive Caffeine
- Excessive Nicotine
- Hypothyroidism
- Rheumatoid arthritis
- Renal Dialysis
- Trauma (Fracture, dislocation)
- Controversial – B6 or B12 deficiency

Health History

- Usually begins as momentary numbness and tingling over thumb, index and ring finger
- Usually not over the palmer surface of the hand as the palmer branch of the medial nerve does not generally travel through the carpal tunnel
- Hand falls asleep
- Clumsiness, drops things and weakness

Continued

- Symptoms occur during activity
- Awakens patient at night
- Symptoms may be relieved by shaking wrist or hand
- Pain can radiate distal into the hand or upward into forearm
- May coexist with medial epicondylitis
- Some experience temperature differences hot or cold or have sensitivity to cold

Observation and palpation

- Observation
  - Possible swelling when compared to the opposite side
  - Advanced case may present with atrophy of thenar muscles
- Palpation
  - Local pain over anterior wrist
  - Possibly myospasm of forearm muscles

Special Test - Phalen's Test

- How its done?
  - Patient Seated with wrists maximally flexed,
    - Patient may place their hands back to back in front of their body, fingers pointed down and maintains the positions for 1 minute
- Result – Positive Sign – Numbness or tingling over the distribution of the median nerve, increased wrist pain of subsequent weakness of thumb opposition **Indicates -** Carpal Tunnel Syndrome
- Best test for CTS

Tinels Sign at the Wrist

- How its done?
  - Patient seated
  - Examiner gently taps over the carpal tunnel
- Results – Positive Sign – Paresthesia on median nerve distribution **indicates –** Median neuropathy

Reverse Phalen's Test

- How its done?
  - Same as Phalen's only this time the patient is performing maximal extension (prayer position)
- Results – Positive sign – Numbness or tingling over the distribution of the median nerve increased anterior neck pain **Indicates –** Carpal Tunnel Syndrome, MFTP referral from forearm flexors

Carpal Instability

- What is it?
  - Disruption of the ligament support between individual carpal bones and/or between the radius and the carpal bones. It results in a loss of structural integrity and effects normal wrist function. Carpal instability can cause carpal Tunnel Syndrome, Triangular fibrocartilage tear, Tendinopathy or Osteoarthritis

Four main types

- Dynamic instability –normal alignment at rest but not under load
- Static instability - bones assume abnormal alignment
- Dorsal intercalated Segmental instability – most common is the Scapholunate dissociation
- Ventral intercalated segmental instability – Lunotriquetral dissociation

Health History

- Prior micro trauma
- Single traumatic event – FOOSH particularly if hand is extended and ulnar deviated
- The most common complaint is wrist pain
- Symptoms of median nerve compression is common with anterior dislocations
- Snap or pop at time of injury

Observation and Palpation

- Observation
  - Local swelling or bruising
  - Possible visible protrusion
- Palpation
  - Most of diagnoses' of carpal instability is through palpation
  - Tenderness and bony mass if dislocation (usually the back of the hand)
  - Anatomical Snuff box tenderness – most commonly seen in cases of scaphoid fractures
  - MFTP and myospams may be seen in hand and forearm

Movement

- Possible pain with Wrist Extension
- Crepitus or clicking with movement
- Apprehension with radial and ulnar deviation

Special Tests – Ballottement Test

- How its done?
  - Patient seated
  - Examiner grasps Triquetrum with one hand and lunate with the other
  - Then move the lunate anterior and posterior
- Results - Pain laxity or crepitus **Indicates –** Carpal instability
- Note – This test may be used to test other carpal bones as well

Murphy's Sign – lunate dislocation

- Client is asked to make a fist
- Positive Sign –
  - If the head of the third metacarpal is level with the second and fourth metacarpals, it is a positive sign for a lunate dislocation
  - Normally the lunate would project beyond the 2nd and 4th metacarpals

De Quervain’s Tenosynovitis

- is a painful condition affecting the tendons on the thumb side of your wrist. If you have de Quervain's tenosynovitis, it will probably hurt when you turn your wrist, grasp anything or make a fist.
- Although the exact cause of de Quervain's tenosynovitis isn't known, any activity that relies on repetitive hand or wrist movement — such as working in the garden, playing golf or racket sports, or lifting your baby — can make it worse.

Symptoms

- Symptoms of de Quervain's tenosynovitis include:
  - Pain near the base of your thumb
  - Swelling near the base of your thumb
  - Difficulty moving your thumb and wrist when you're doing something that involves grasping or pinching
  - A "sticking" or "stop-and-go" sensation in your thumb when moving it
- If the condition goes too long without treatment, the pain may spread further into your thumb, back into your forearm or both. Pinching, grasping and other movements of your thumb and wrist aggravate the pain

Finkelsteins Test – determine the presence of de Quervain's

- Client is asked to make a fist with the thumb inside the fingers
- The therapist stabilizes the forearm and client deviates the wrist ulnarly
- A positive sign
  - pain over the abductor pollicis longus and extensor pollicis brevis tendons
  - The positive test indicates paratendonitis or either or both tendons

Test for Hand Nerve Pathology

- Pinch Grip- anterior interosseous nerve, branch of median nerve (only motor)
  - Client is instructed to make a an “O” shape with thumb and index finger, should be able to touch tips of fingers together, shape should not be an oval
- Fromet’s Sign – tests for paralysis of adductor pollicis muscle, ulnar nerve pathology
  - Client attempts to grasp a piece of paper between the thumb and index finger (thumb on top)
  - The therapist then tries to pull the paper out from the grasp
- Therapist is looking for the terminal phalynx of the thumb to flex indicating a positive sign of an ulnar nerve pathology

Allen's Test for Arterial Pathology

- determines the blood supply through ulnar and radial arteries
- Client is asked to open and close hand several times as quickly as possible while Therapist places their thumb and index finger over the radial and ulnar arteries, compressing them
- The client then opens the hand while the pressure is maintained
- One artery is tested by releasing the pressure over that artery to see if the hand flushes
- The other artery is then tested in the same way and compared
- This determines the which of the radial or ulnar arteries is the major blood supply to the hand

Referred Pain

- Brachioradialis – Lateral epicondyle, lateral forearm, and web space between thumb and index finger
- ECU – Medial side of dorsum of the wrist
- ECRB – Middle of dorsum of wrist
- ECRL – Lateral epicondyle, forearm and lateral dorsum of hand
- Extensor Digitorum – Forearm wrist to appropriate digit
- Extensor Indicis – Dorsum of wrist to index finger

Continued

- Palmaris longus – Anterior aspect of forearm to palm
- FCU – Anteromedial wrist into lateral palm
- FCR - Forearm to anterolateral wrist
- FDS –Palm into appropriate digit
- FPL – Thumb
- Adductor Pollicis – anterolateral and posterolateral palm into thumb
- Opponens Pollicis – Anterolateral thumb and into wrist
- Abductor digiti minimi – Dorsomedial surfaces of the hand into the little finger
- Interossei – Into adjacent digit, first interossei – dorsum of the hand

Joint Play

Long axis Distraction

- AKA long axis extension
- Stabilize radius and ulna with one hand (elbow may be flexed to 90 and stabilized at elbow if no pathology exists)
- Therapist places other hand just distal to the wrist and performs a long axis traction with the distal hand

Anteroposterior Glide

- Applied in two positions, stabilizing hand around distal end of radius and ulna, just proximal to radial carpal joint, then places the distal hand around the PROXIMAL row of carpal bones. (proper position will have the hands touching each other). Apply anterior to posterior glide
- Next move stabilizing hand distal ~1cm to stabilize proximal row, then distal hand moves distal to the distal row of carpal bones. Apply anterior to posterior glide

Side Glide

- Performed in a similar fashion to AP Glide however now the motion is a side to side motion

Side Tilt

- Side tilting of the carpals on the radius and ulna
- Stabilize distal ulna and radius just superior to the radial carpal joint, mobilizing hand around clients hand and perform ulnar and radial deviation

Kaltenborn's Carpal mobilizations

- Fixate the capitate, and move the trapezoid
- Fixate the capitate, and move the scaphoid
- Fixate the capitate and move the lunate
- Fixate the capitate and move the hamate
- Fixate the scaphoid and move the trapezoid and trapezium
- Fixate the radius and move the scaphoid
- Fixate the radius and move the lunate
- Fixate the ulna and move the triquetrum
- Fixate the triquetrum and move the hamate
- Fixate the triquetrum and move the pisiform

Intermetacarpal Joint play

- Anterior Posterior Glide
- Examiner stabilized one metacarpal joint and moves the adjacent one anteriorly and posteriorly

Finger Joint play

- Long axis Traction (extension) –
- Examiner stabilizes proximal bone with one hand then performs long axis traction with the mobilizing hand

Anterior posterior Glide

- Stabilize proximal bone, grasp distal portion of the joint, maintain parallel surfaces and apply anterior and posterior glide, some amount of traction may be applied prior to AP glide

Rotation & Side Glide

- Rotation - Proximal bone stabilized, mobilizing hand grasping distal portion of the joint apply traction and rotation
- Side Glide - performed as anterior and posterior glide except it is now a side to side motion

https://youtu.be/blk3oypLhf0