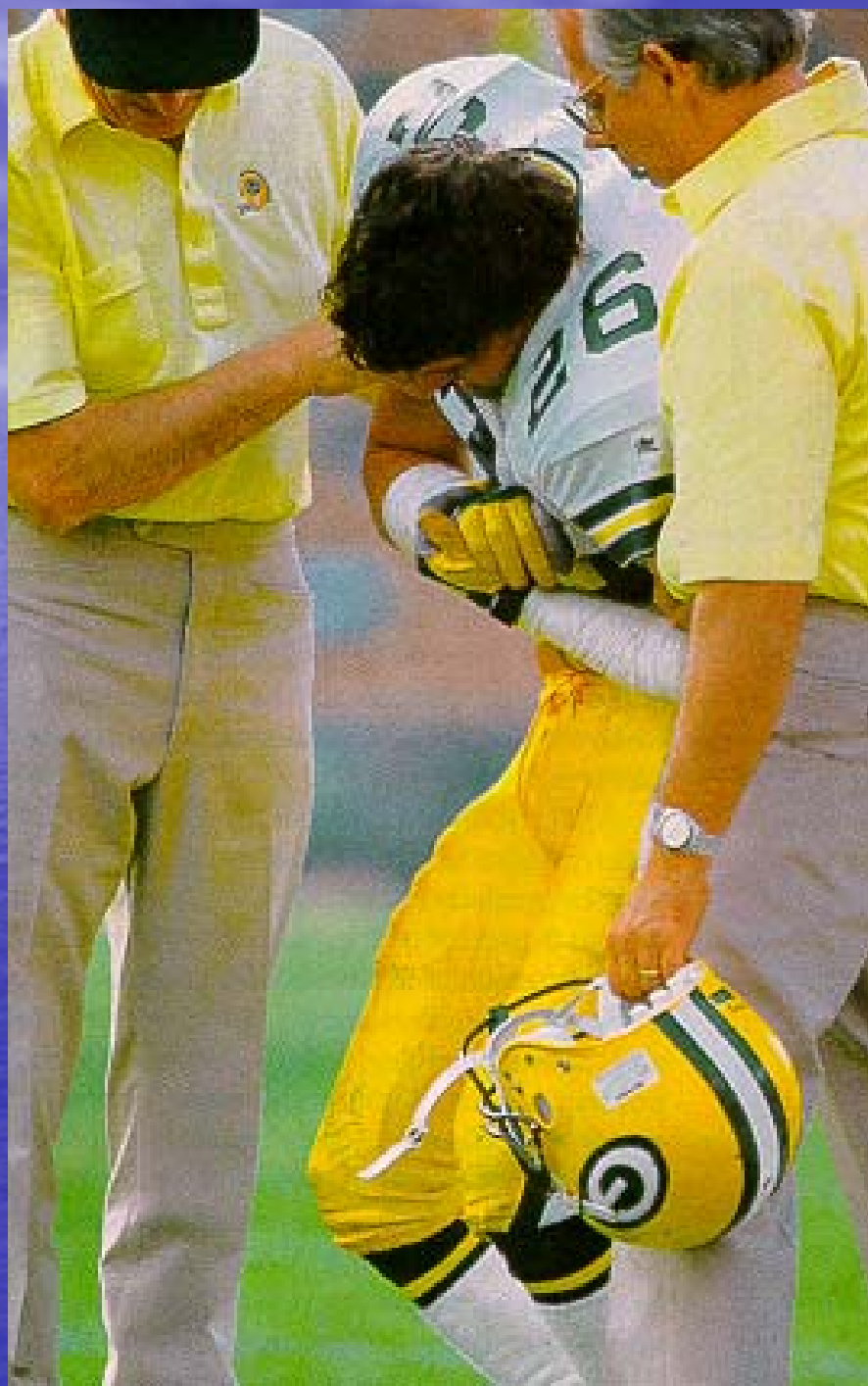


Clinical Examination of the Hand and Wrist

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OBJECTIVES

- Review the clinical anatomy and physical exam of the wrist and hand
- Formulate a pathoanatomic diagnosis in the clinical setting
- Discuss common clinical conditions that can be elicited from the physical exam

INTRODUCTION: Hand and Wrist

- Series of complex, delicately balanced joints
- Function is integral to every act of daily living
- Most active portion of the upper extremity

INTRODUCTION

- The least protected joints
- Extremely vulnerable to injury
- Difficult and complex examination
- Diagnosis often vague
 - If no fracture = “wrist strain or sprain”
- Bilateral comparison useful

Bony Anatomy

- Phalanges: 14
- Sesamoids: 2
- Metacarpals: 5
- Carpals
 - Proximal row: 4
 - Distal row: 4
- Radius and Ulna

Lister's tubercle

anterior-posterior:
adult hand







ANATOMY

- Muscles /Tendons
 - Volar wrist- 6
 - Dorsal wrist- 9
 - 6 compartments
 - Volar hand- 10
 - Dorsal hand- dorsal interossei
- Nerves - 3
 - Median
 - Ulnar
 - Radial
- Arteries - 2

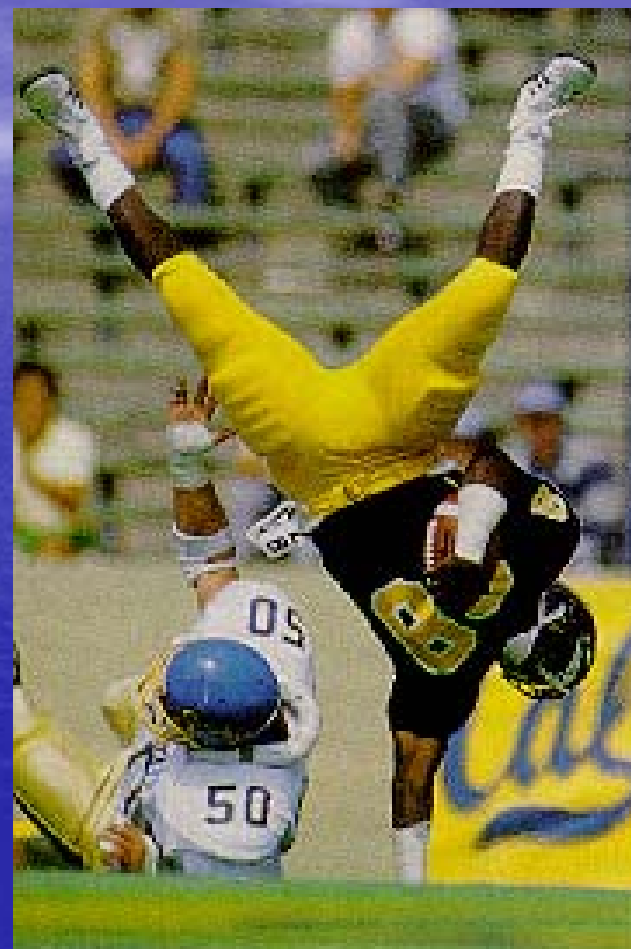


HISTORY

- Age
- Handedness
- Chief complaint
- Occupation
- Previous injury
- Previous surgery
- Sx related to specific activities
- What exacerbates
- What improves
- Frequency
- Duration

HISTORY

- 4 principle mechanisms of injury
 - Throwing
 - Weight bearing
 - Twisting
 - Impact



PHYSICAL EXAM

- Inspection
- Palpation
- Range of Motion
- Neurologic Exam
- Special Tests

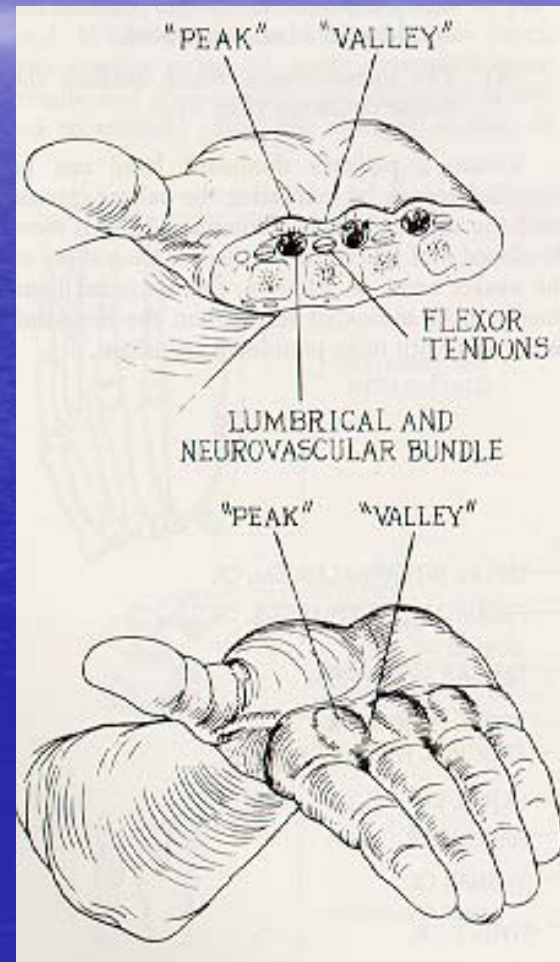
INSPECTION

- Observe upper extremity as patient enters room
- Examine hand in function
- Deformities
- Attitude of the hand

INSPECTION

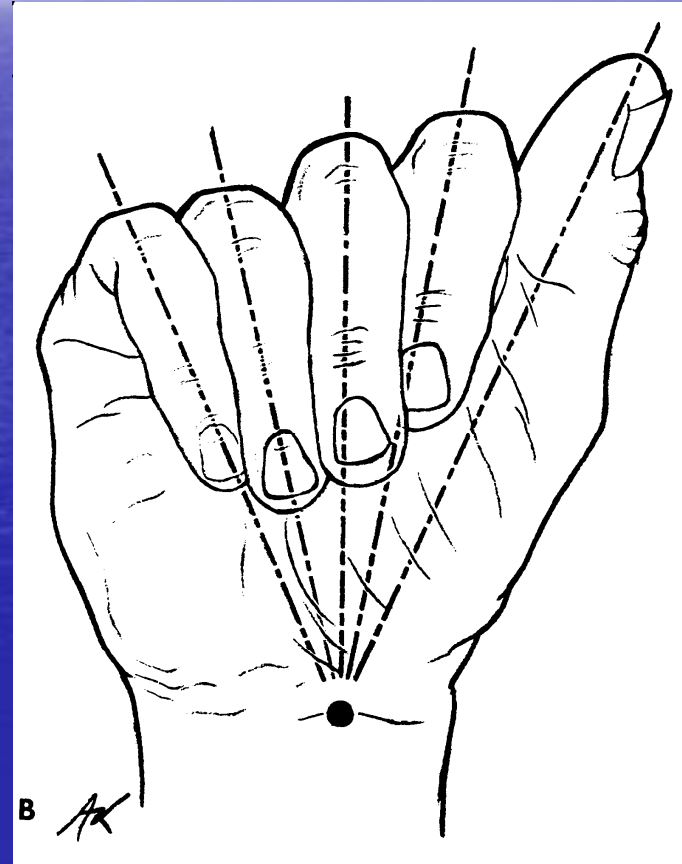
Palmar Surface

- Creases
- Thenar and Hypothenar Eminence
- Arched Framework
- Hills and Valleys
- Web Spaces



Cascade sign

- Assure all fingers point to scaphoid area when flexed at PIPs



INSPECTION of Dorsal Hand and Wrist

- Hills and Valleys
- Height of metacarpal heads
- Finger nails
 - Pale or white=anemia or circulatory
 - Spoon shaped=fungal infection
 - Clubbed=respiratory or congenital heart
- Deformities

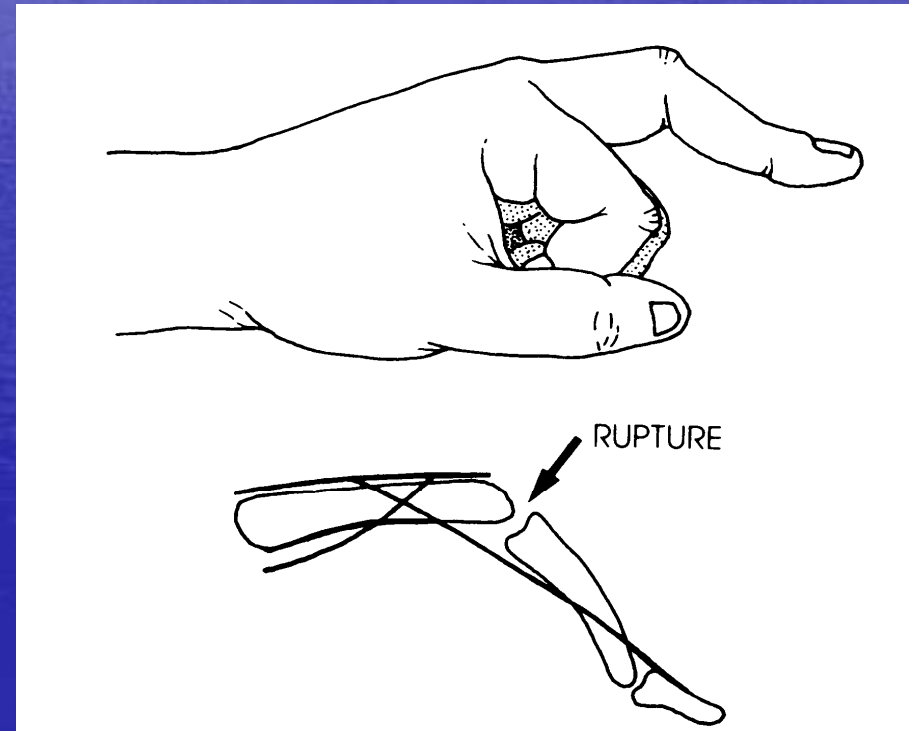
Ganglion

- Cystic structure that arises from synovial sheath
- Discrete mass
- Dull ache
- Dorsal or Volar aspect



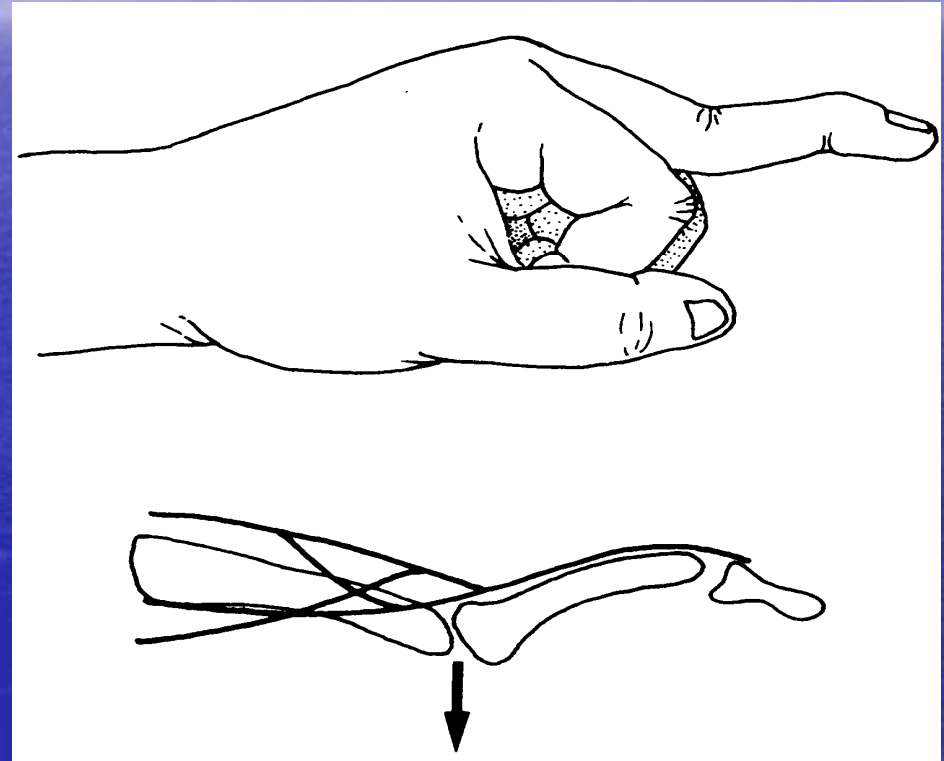
Boutonniere Deformity

- Tear or stretch of the central extensor tendon at PIP
- Note: unopposed *flexion* at PIP
- Extension at DIP
- Trauma or inflammatory arthritis



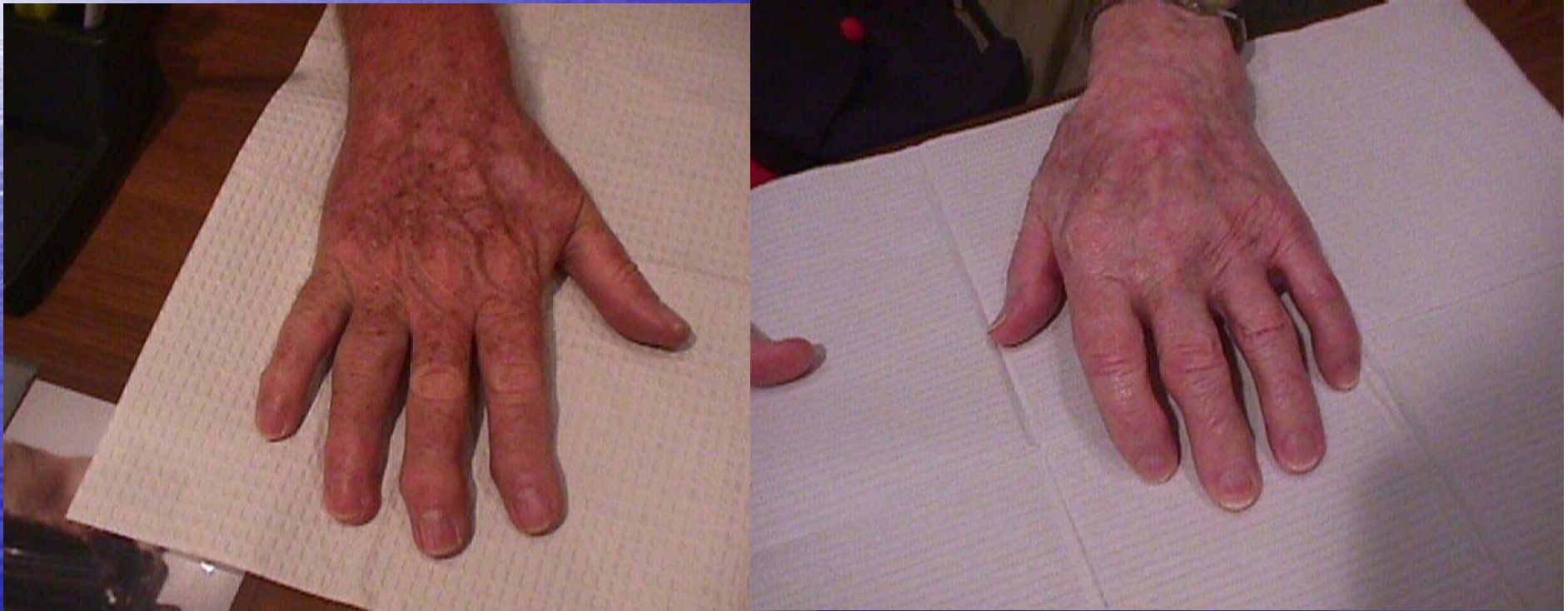
Swan Neck Deformity

- Contraction of intrinsic muscles (trauma, RA)
- NOTE: *Extension* at PIP



Osteoarthritis

- Heberden's nodes:
DIP
- Bouchard's nodes:
PIP



Rheumatoid Arthritis

- MCP swelling
- Swan neck deformities
- Ulnar deviation at MCP joints
- Nodules along tendon sheaths



Mallet Finger

- Hyperflexion injury
- Ruptured terminal extensor mechanism at DIP
- Incomplete extension of DIP joint or extensor lag
- Treatment:
 - stack splint

Figure 5: Joan Kozel, University of Wisconsin Hospitals and Clinics

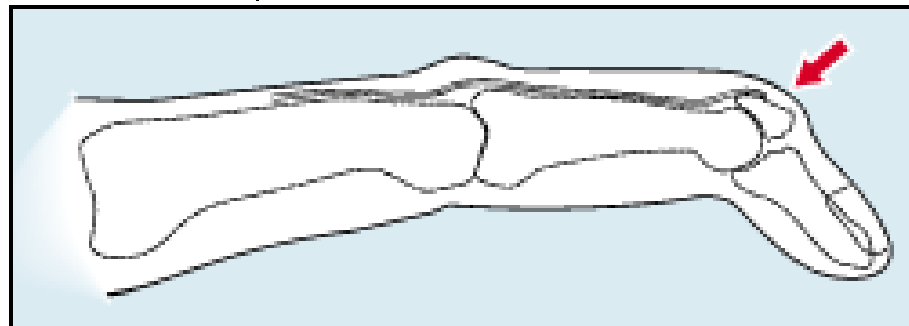
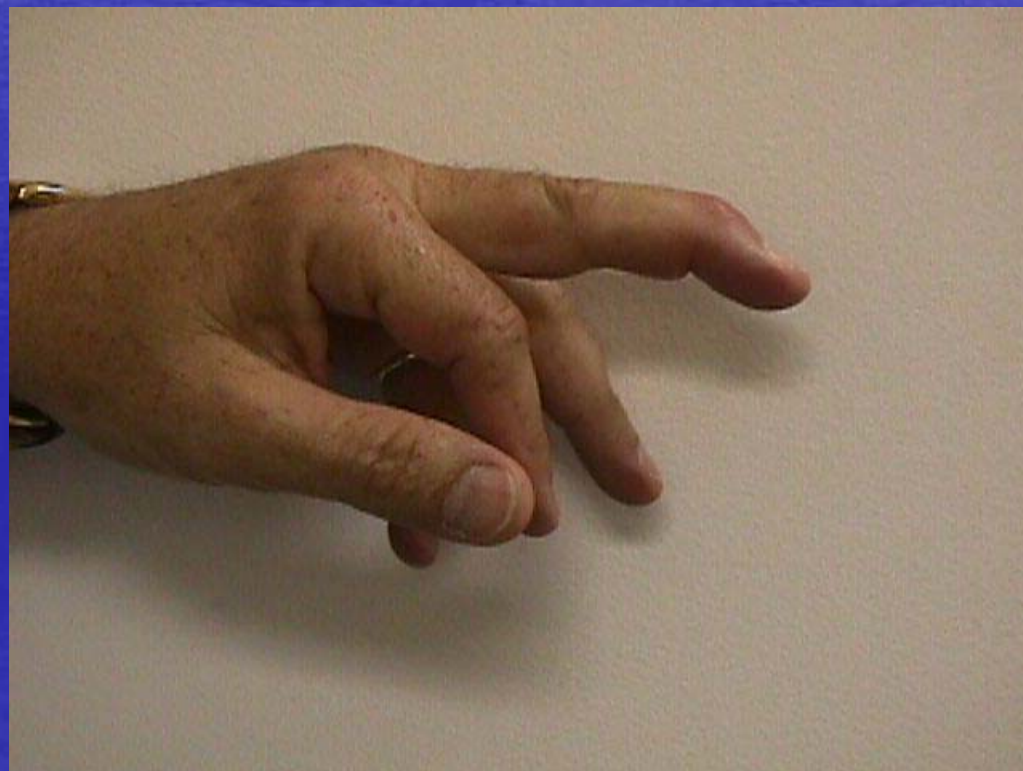


Figure 5. A mallet finger occurs with the loss of bony (arrow) or ligamentous attachment of the extensor mechanism into the distal phalanx.



Dupuytren's Contractures

- Palmar or digital fibromatosis
- Flexion contracture
- Painless nodules near palmar crease
- Male > Female
- Epilepsy, diabetes, pulmonary dz, alcoholism



RANGE OF MOTION

- Active range of motion
- Passive range of motion if unable to actively move joint
- Bilateral comparison
 - To determine degrees of restriction

RANGE OF MOTION

Wrist

- Flexion
- Extension
- Radial deviation
- Ulnar deviation
 - Ulnar deviation is greater than radial

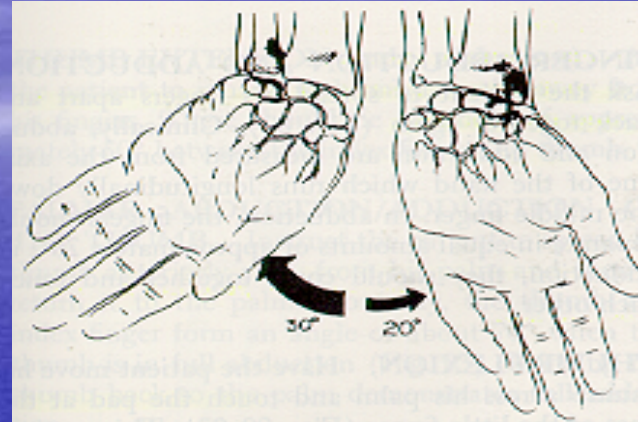


Fig. 84. Ulnar and radial deviation of the wrist.

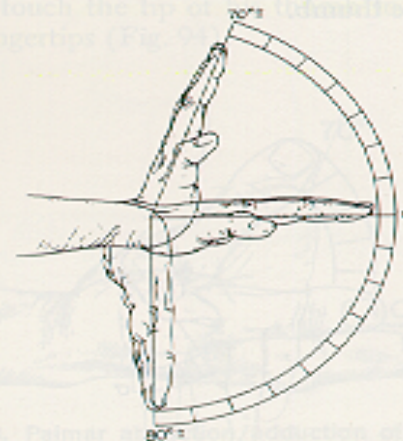


Fig. 85. Palmar flexion of the wrist.

RANGE OF MOTION

Fingers

- Flexion/extension at MCP, PIP, DIP
 - Tight fist and open
 - Do all fingers work in unison
- ABDuction/ADDuction at MCP
 - Spread fingers apart and then back together

PALPATION of Skin

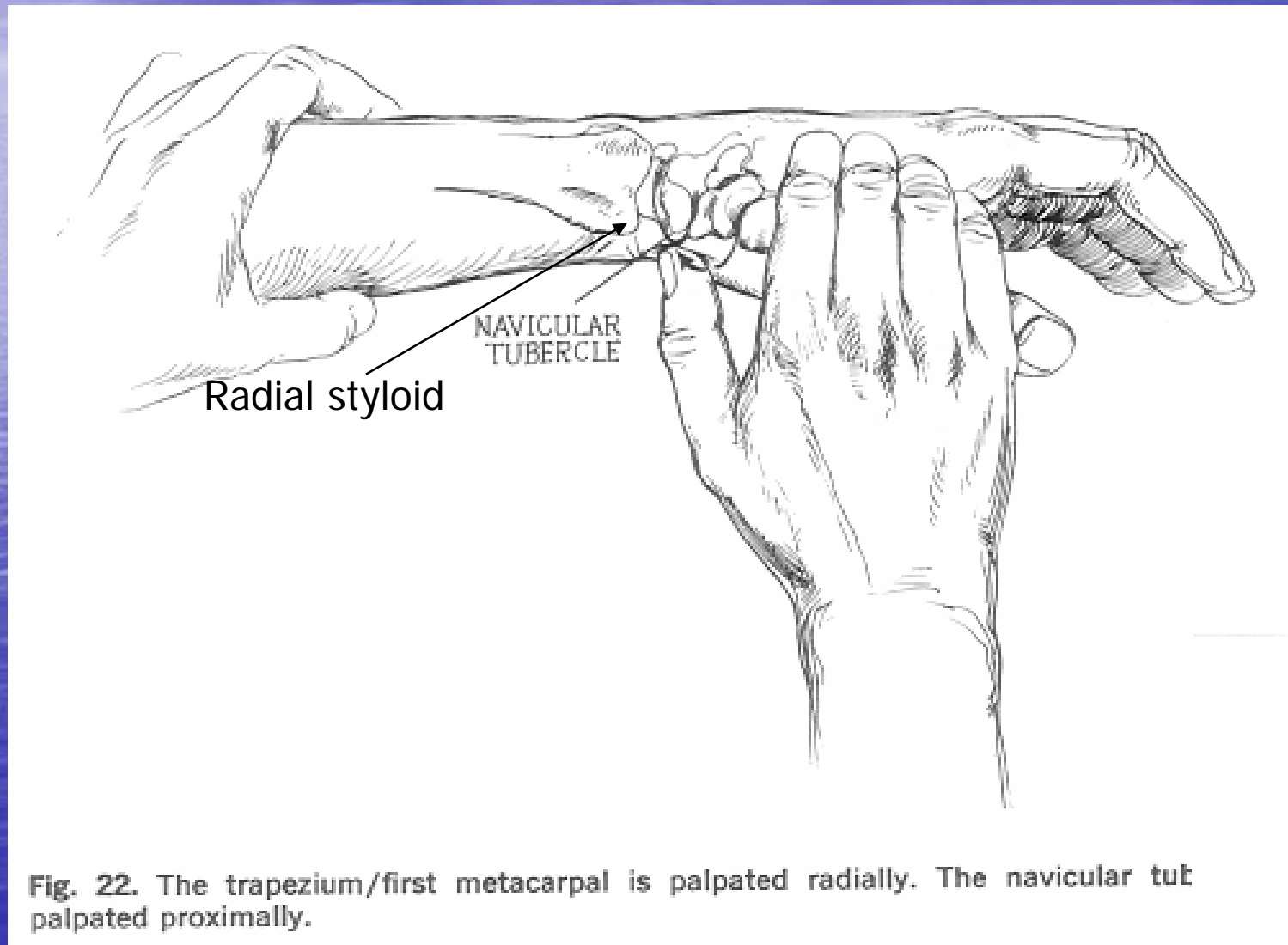
- Warmth?
- Dryness?
 - Anhydrosis= nerve damage
- Scars

PALPATION of Wrist Dorsum

- Radial Styloid
- Scaphoid
- 1st MC/Trapezium jt
- Lunate
- Lister's Tubercle
- Ulnar Styloid
- TFCC
- Triquetrum
- Pisiform
- Hook of Hamate
- Guyon's Tunnel

Radial Styloid palpation

Scaphoid Bone palpation



Scaphoid Fracture

- Most commonly fractured carpal bone
 - 70-80% of all carpal bone injuries
 - 8% of all sports related fractures
 - 1 in 100 college football players
- Most susceptible to injury
 - Bridges proximal and distal rows of the carpal bones
 - Load to the dorsiflexed wrist as in fall onto outstretched hand

Scaphoid Fracture

- Painful, swollen wrist after a fall
- Tenderness in snuffbox
- High frequency of nonunion and avascular necrosis
- Initial x-rays often unremarkable

1st MC/Trapezium joint palpation

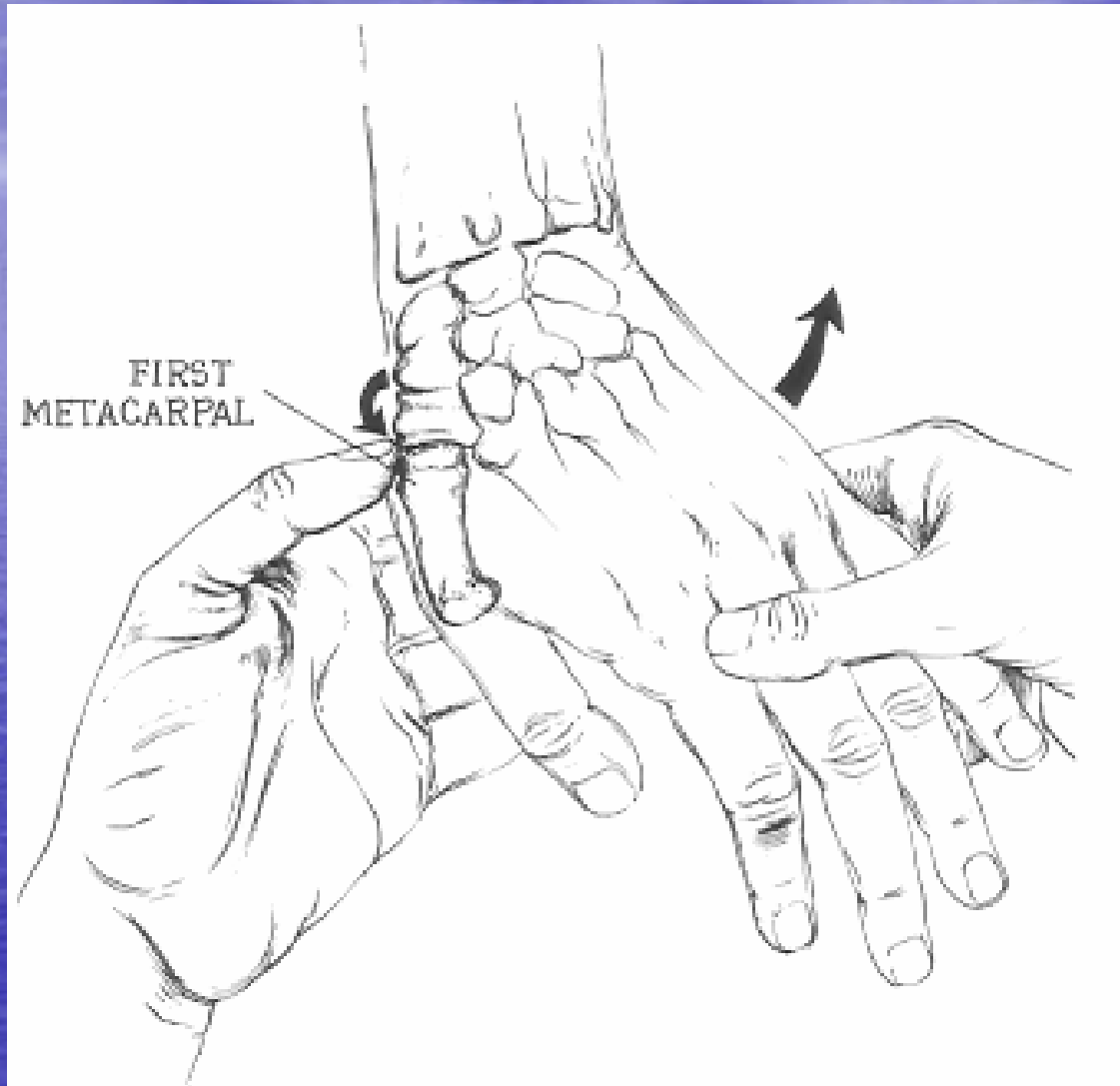


Fig. 21. The trapezium/first metacarpal articulation.

Thumb CMC Joint Arthritis

- Painful pinch or grasp
- "Grind Test"
 - Axial pressure to thumb while palpating CMC joint



Lunate Bone palpation

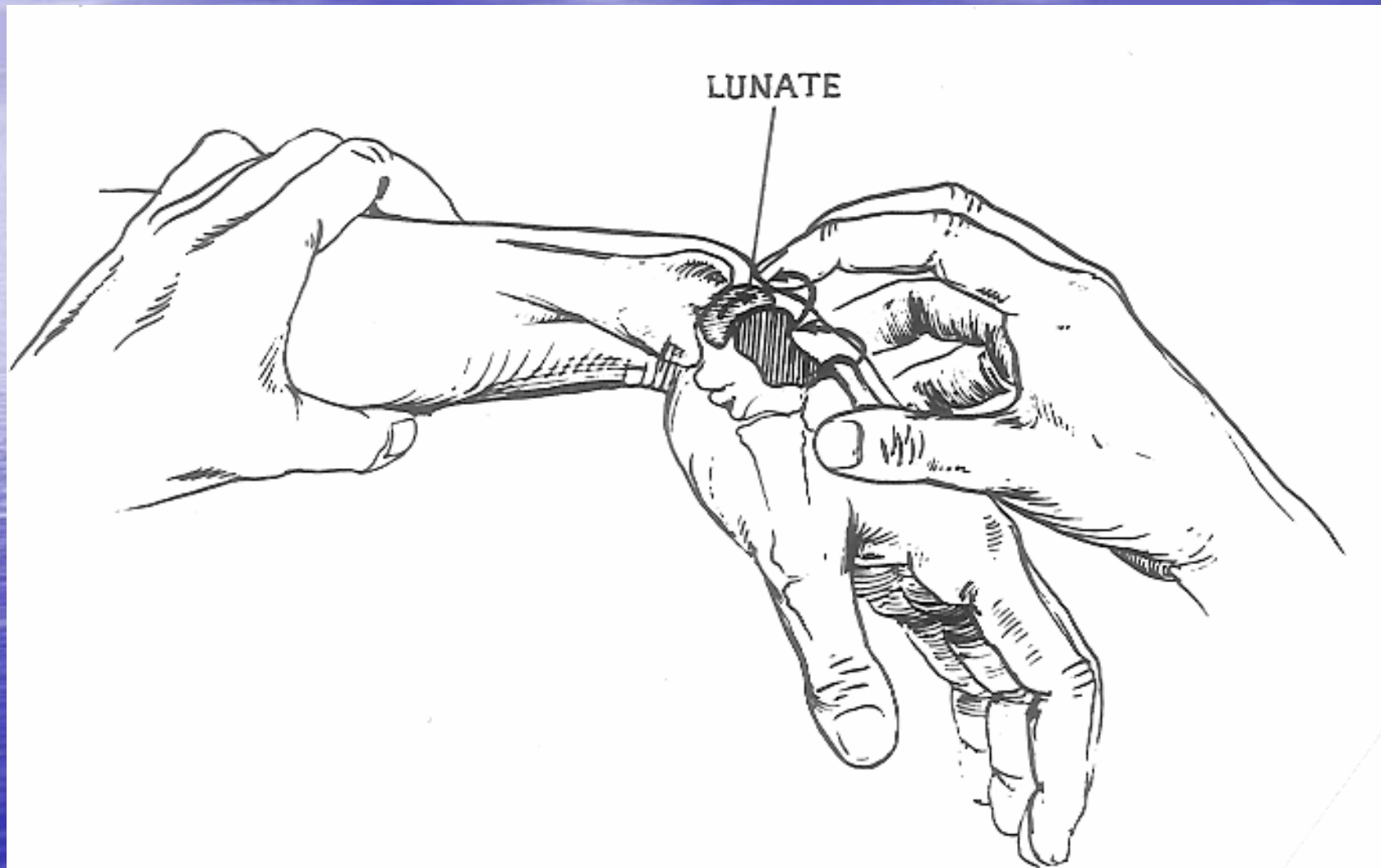


Fig. 27. Flexion of the wrist facilitates palpation of the lunate.

Kienbock's Disease

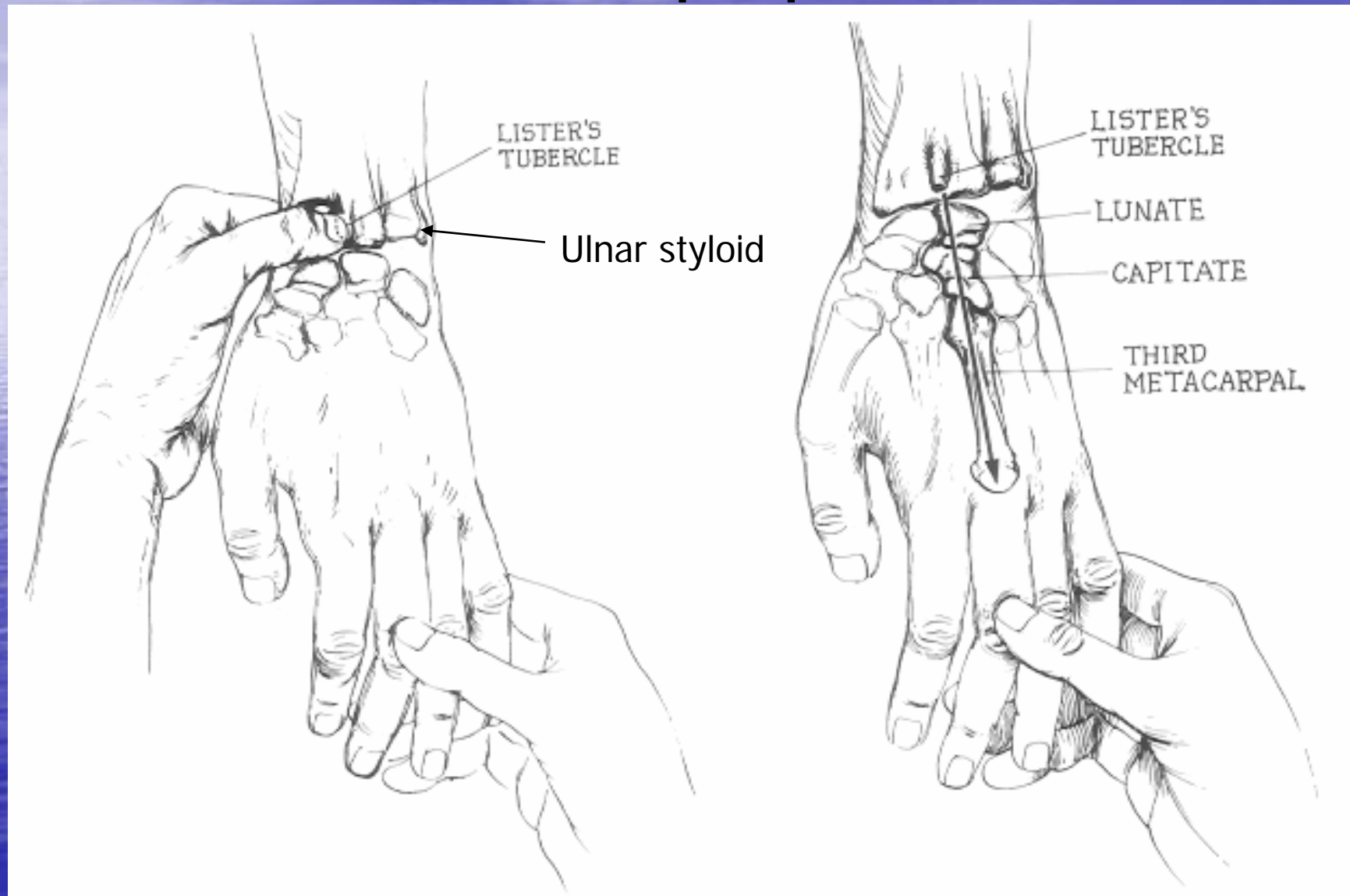
- Idiopathic osteonecrosis of lunate
- Stress or compression fracture of the lunate
 - Disruption of blood supply with collapse and secondary fragmentation
- Pain and stiffness of the wrist in the ABSENCE of TRAUMA

Scapholunate Dissociation

- Diagnosis often missed
- Pain, swelling, and decreased ROM
- Pressure over scaphoid tuberosity elicits pain
- Greatest pain over dorsal scapholunate area, accentuated with dorsiflexion
- X-ray shows widening of scapholunate joint space by at least 3 mm

Ulnar Styloid palpation

Lister's Tubercle palpation



Triangular Fibro-Cartilage Complex palpation (TFCC)



Triangular Fibrocartilage Complex Injuries

- Thickened pad of connective tissue that functions as a cushion for the ulnar carpus as well as a sling support for the lunate and triquetrum
- Injury from compression between lunate and head of ulna
 - Breaking fall with hand
 - Rotational forces-racket and throwing sports

Triangular Fibrocartilage Complex Injuries

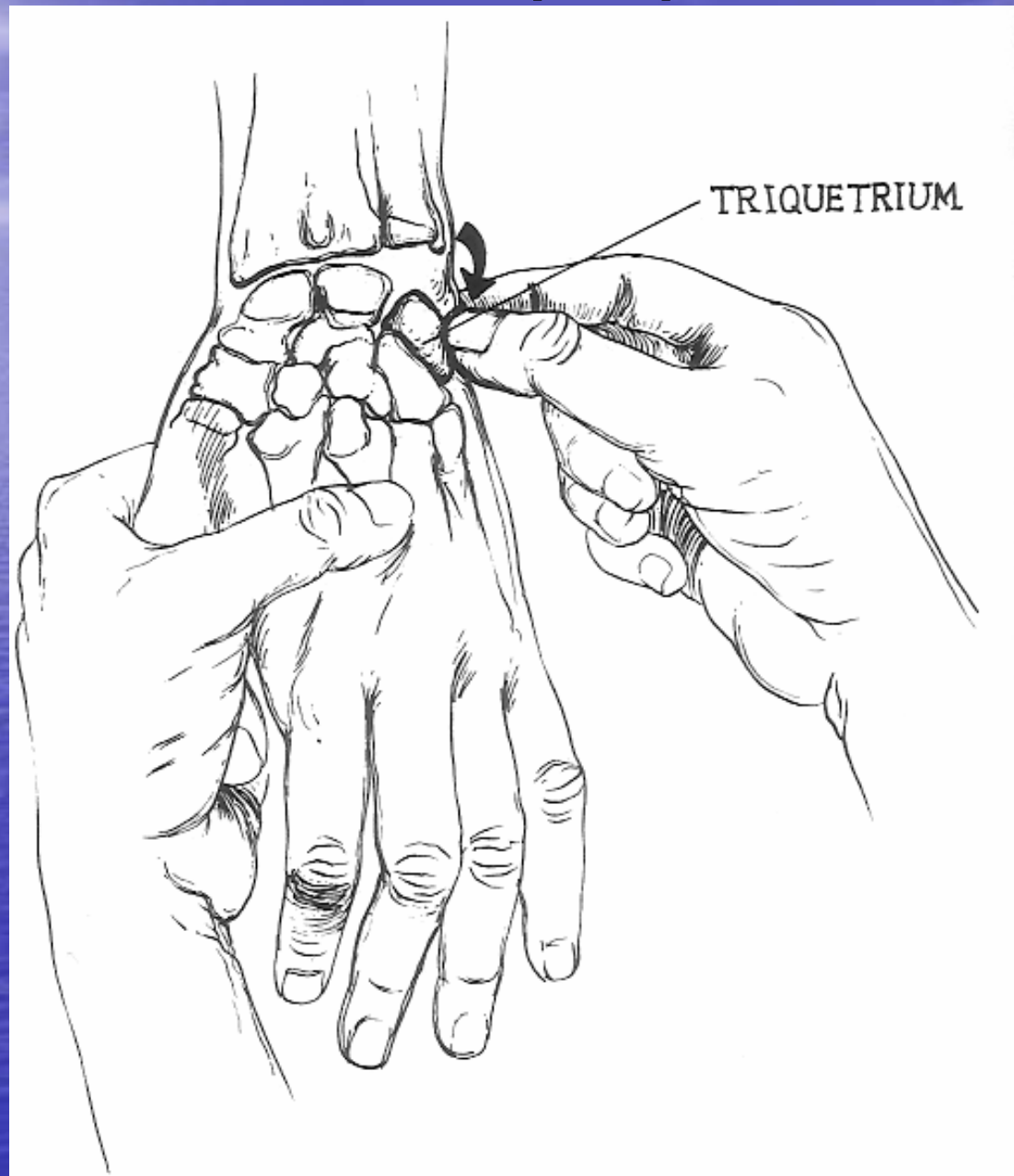
- Ulnar sided wrist pain, swelling, loss of grip strength
- "Click" with ulnar deviation
- Point tenderness distal to ulnar styloid
- TFCC load test

Figure 11: Courtesy of Eric W. Honing, MD



Figure 11. In the triangular fibrocartilage complex (TFCC) load test, an axial load is applied across the patient's ulnarly deviated wrist (arrow). The test reproduces pain in patients with TFCC tears. Supination and pronation of the hand with the forearm fixed also will provoke pain in a TFCC disorder.

Triquetrum Bone palpation



Triquetrum Fracture

- 2nd most common carpal fracture
- Fall onto outstretched hand with wrist in dorsiflexion and ulnar deviation
- Swelling and tenderness over the dorsal ulnar aspect of the wrist

PALPATION of HAND Bone

- Metacarpals - 5
- Phalanges - 14
- Palpate for swelling, tenderness
- Assess for symmetry

PALPATION

Soft tissue

- 6 Dorsal Compartments
 - Transport extensor tendons
- 2 Palmar Tunnels
 - Transport nerves, arteries, flexor tendons



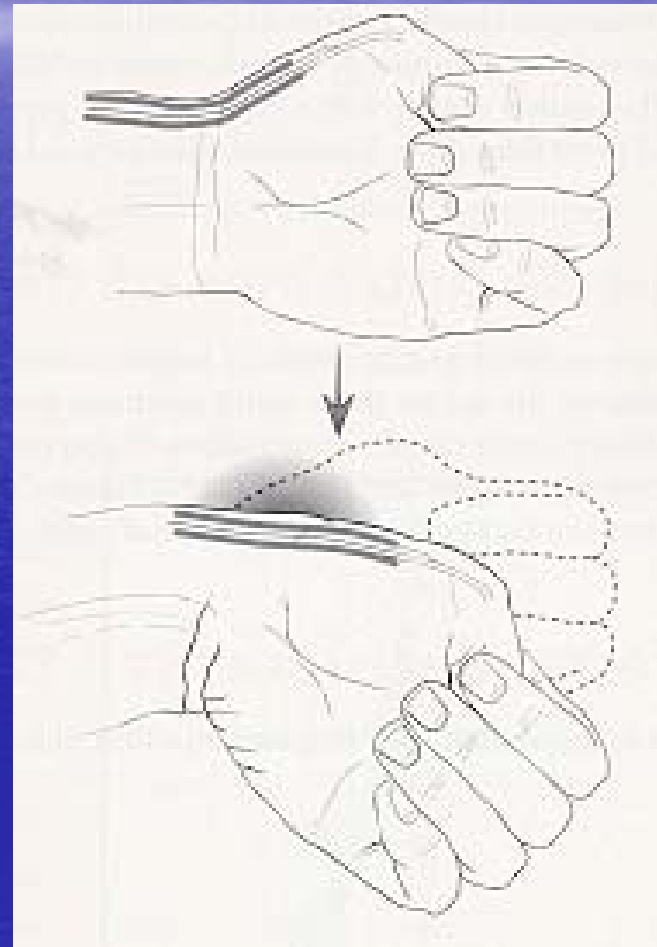
1st Dorsal Compartment

- Abductor Pollicis Longus and Extensor Pollicis Brevis
- Radial border of Anatomic Snuff Box
- Site of stenosing tenosynovitis
 - De Quervain's Tenosynovitis
 - Finkelstein's Test



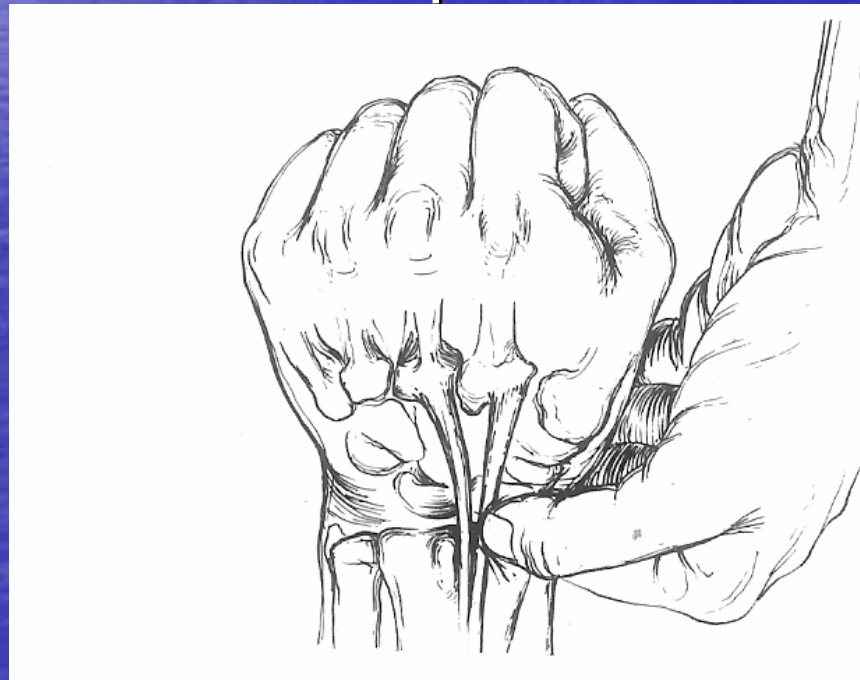
DeQuervain's Tenosynovitis

- Inflammation of EXT Pollicis Brevis and ABD Pollicis Longus tendons
- Tenderness - 1st Dorsal Compartment
- Finkelstein's Test



2nd Dorsal Compartment

- Extensor Carpi Radialis Longus and Extensor Carpi Radialis Brevis
- Make fist—becomes prominent



Intersection Syndrome (Squeaker Wrist)

- Similar to DeQuervain's tenosynovitis
- Peritendinitis related to bursal inflammation at the junction of the 1st and 2nd dorsal compartments
- Overuse of the radial extensor of the wrist



Intersection Syndrome (Squeaker Wrist)

- Seen in gymnasts, rowers, weightlifters, racket sports
- Proximal to DeQuervain's- 4-6 cm from radiocarpal joint
- Crepitation or squeaking can be heard with passive or active ROM

3rd Dorsal Compartment

- Extensor Pollicis Longus
- Ulnar side of Anatomic Snuff Box
- Can rupture secondary to Colles' Fracture or Rheumatoid Arthritis
- Extensor Pollicis Longus Tenosynovitis



4th Dorsal Compartment

- Extensor Digitorum Communis and Extensor Indicis
- Palpate from the carpus to the metacarpophalangeal joints
- Frequent site of ganglion cysts



5th Dorsal Compartment

- Extensor Digiti Minimi
- May become involved in rheumatoid arthritis
- May be subject to attrition
 - friction due to dorsal dislocation of the ulnar head
 - synovitis



6th Dorsal Compartment

- Extensor Carpi Ulnaris
 - Tendinitis -repetitive wrist motion or snap of wrist
- May dislocate over the styloid process of the ulna
 - Seen with Colles' fracture with associated fracture of the distal ulnar styloid
 - Audible snap



Extensor Carpi Ulnaris Tenosynovitis and Subluxation

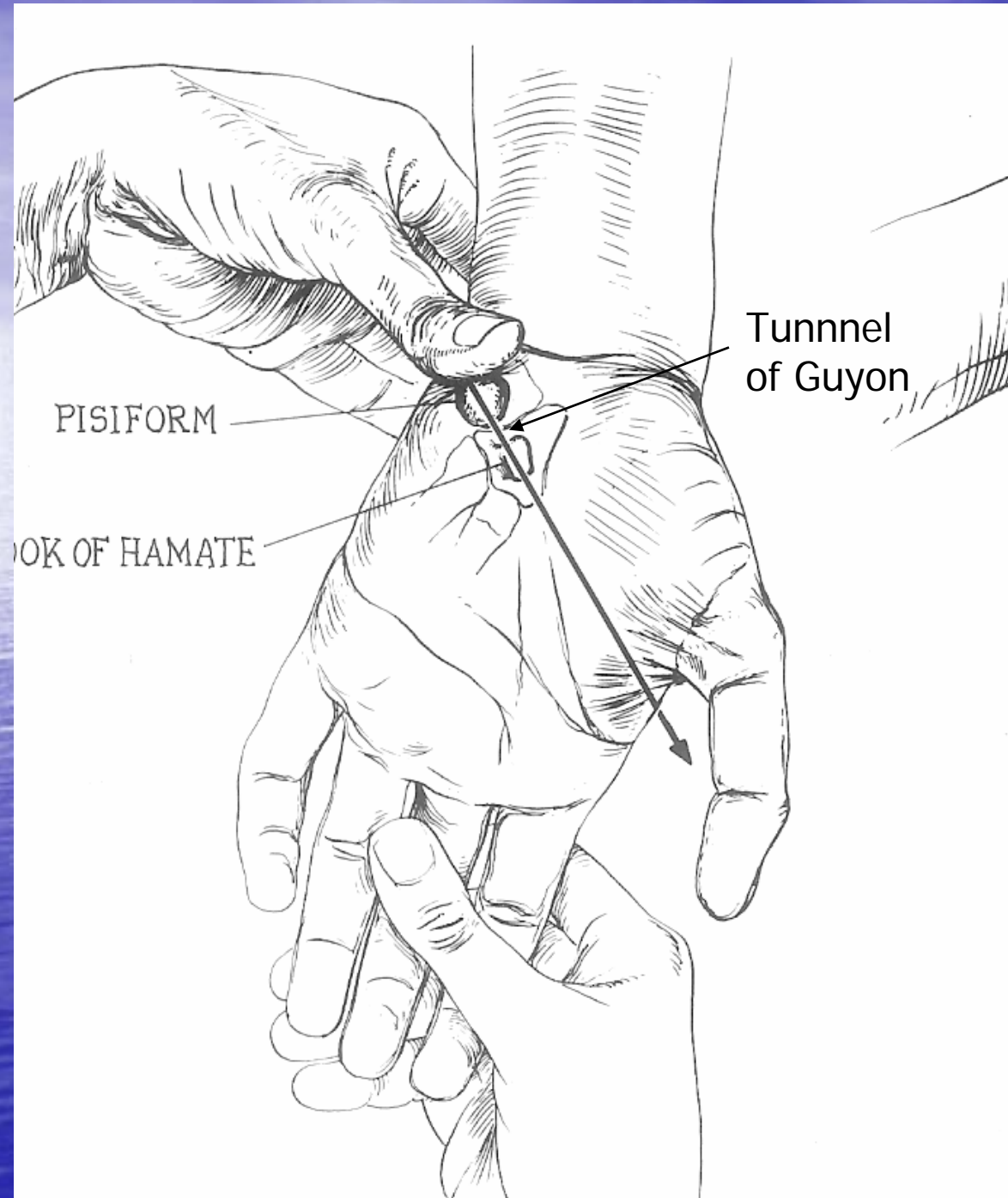
- 6th Dorsal Compartment
- Second most common site of tenosynovitis (after DeQuervain's)
- Common in racket and rowing sports
- Pain and tenderness with ulnar deviation
- Suspect subluxation when clicking on ulnar side of forearm

PALPATION

Palmar Aspect

- Pisiform and Hamate
- Tunnel of Guyon
- Ulnar Artery
- Carpal Tunnel
- Flexor Carpi Radialis
- Flexor Carpi Ulnaris

Pisiform and Hamate palpation



Hamate Hook Fracture

- Frequently misdiagnosed as tendonitis or sprain
- Pain, swelling, and tenderness over hypothenar eminence
- Suspect when patient complains of painful gripping and swinging

Tunnel of Guyon

- Depression between pisiform and hook of hamate
- Contains ulnar nerve and artery
- Site of compression injuries
 - unusually tender if pathology is present

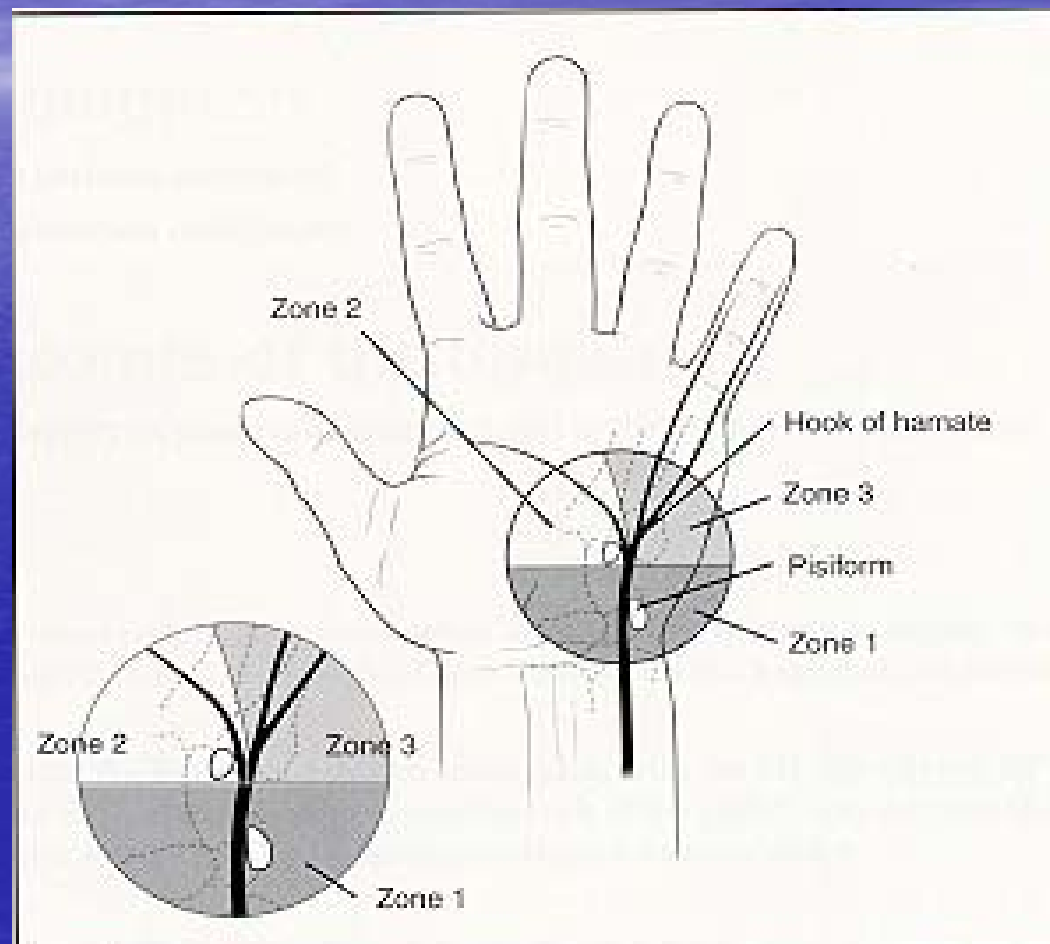


Figure 1

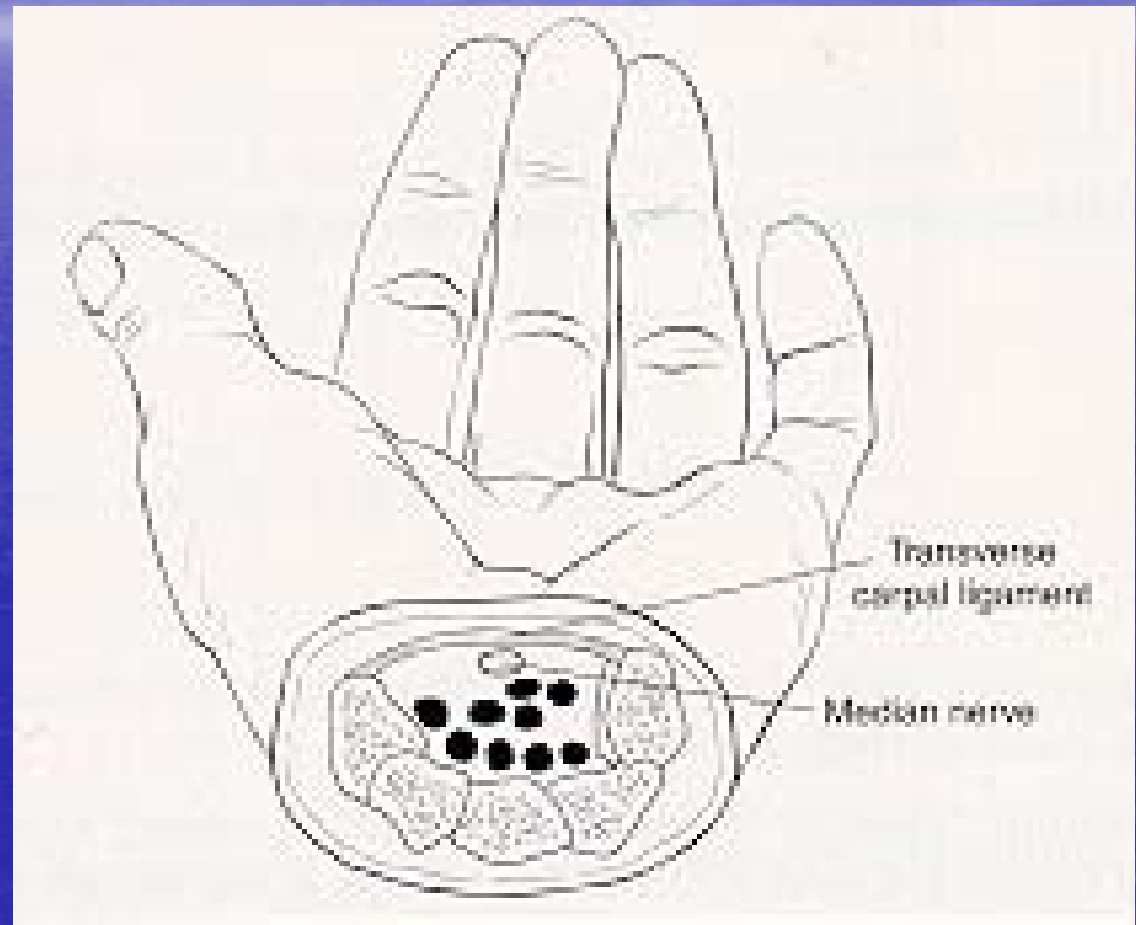
Distal ulnar tunnel showing the three zones of entrapment. Lesions in zone 1 give motor and sensory symptoms; lesions in zone 2 cause motor deficits; and lesions in zone 3 create sensory deficits

Ulnar Nerve Compression

- Tunnel of Guyon
- Seen in direct or repetitive trauma, fractures of hamate or pisiform, or sports related
 - Operating a jackhammer
 - repetitive power gripping (ex. Cycling)
- Sx= pain, weakness, paresthesias in ulnar sensory distribution

Carpal Tunnel

- Deep to palmaris longus
- Contains median nerve and finger flexor tendons
- Most common overuse injury of the wrist

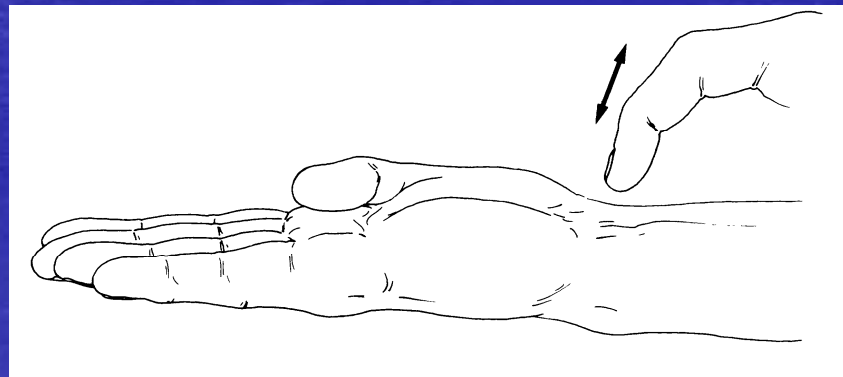
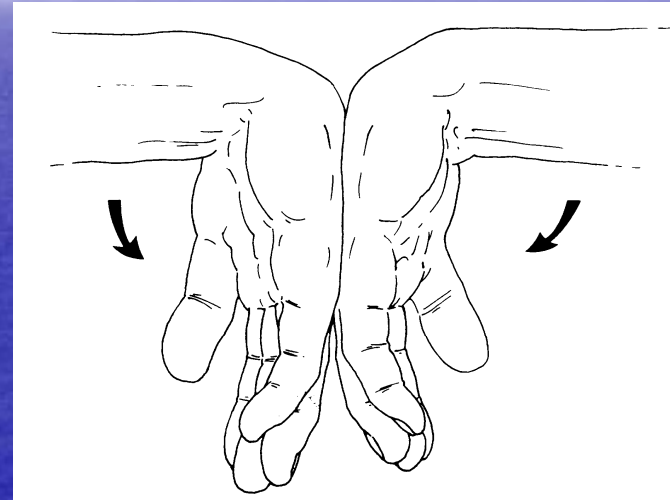


Carpal Tunnel Syndrome

- Entrapment of the median nerve
 - Phalen's and Tinel's Test
 - 2 point discrimination
- Symptoms
 - Aching in hand and arm
 - Nocturnal or AM paresthesias
 - "Shaking" to obtain relief

Carpal Tunnel Tests

- Neurologic exam
 - Median nerve sensation and motor
- **Phalen's Test:**
both wrists maximally flexed for 1 minute
- **Tinel's Test**

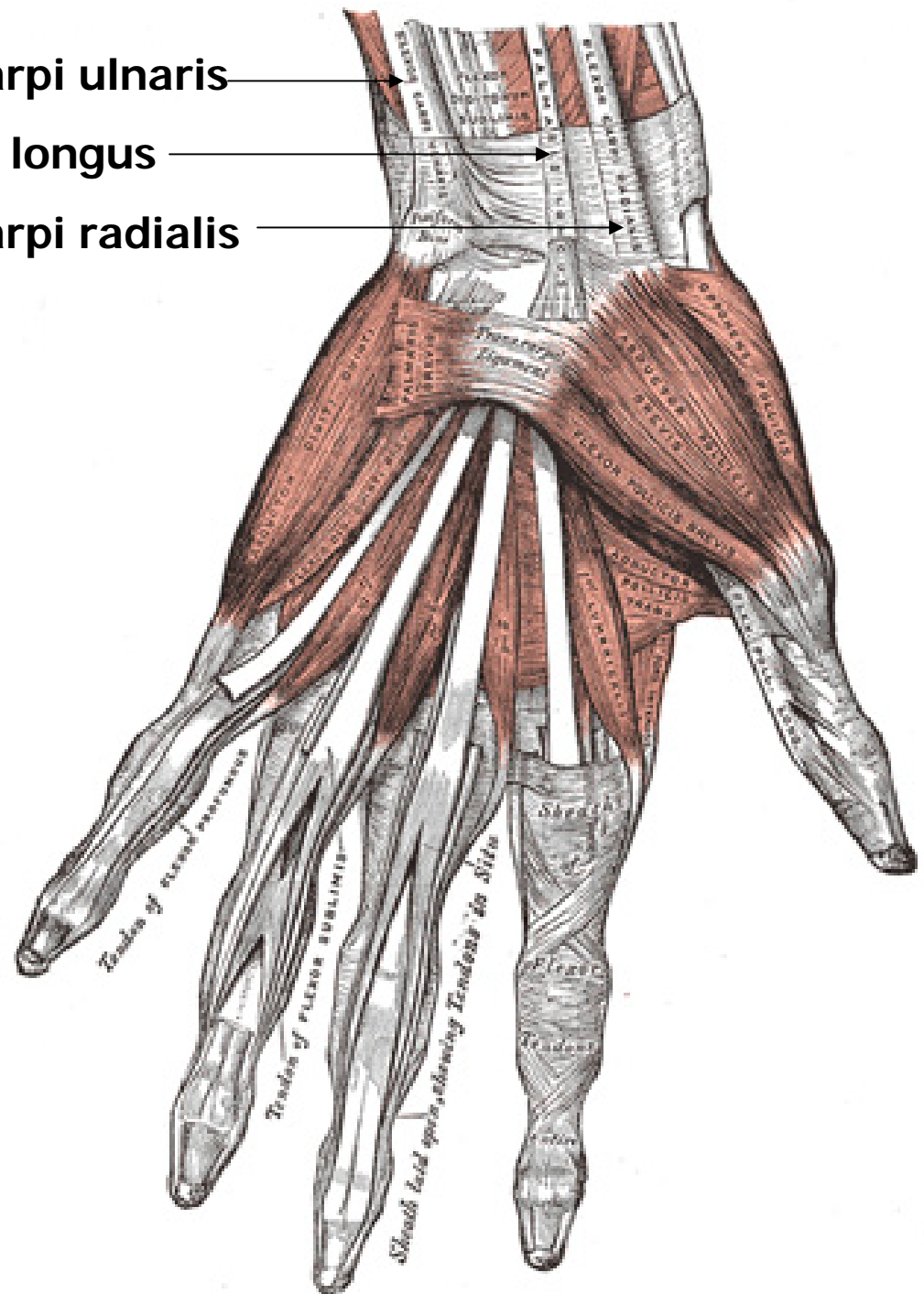


Volar flexor tendons

Flexor carpi ulnaris

Palmaris longus

Flexor carpi radialis



PALPATION

Palm of Hand

- Thenar Eminence
 - 3 muscles of thumb
 - Atrophy seen in carpal tunnel syndrome
- Hypothenar Eminance
 - 3 muscles of little finger
 - Atrophy with ulnar nerve compression
- Palmar Aponeurosis
 - Dupuytren's Contracture

PALPATION of Fingers

- Finger Flexor Tendons
 - Trigger Finger- sudden audible snapping with movement of one of the fingers
- Extensor Tendons
- Tufts of Fingers
 - Felon- local infection
 - Paronychia- hangnail infection

SPECIAL TESTS

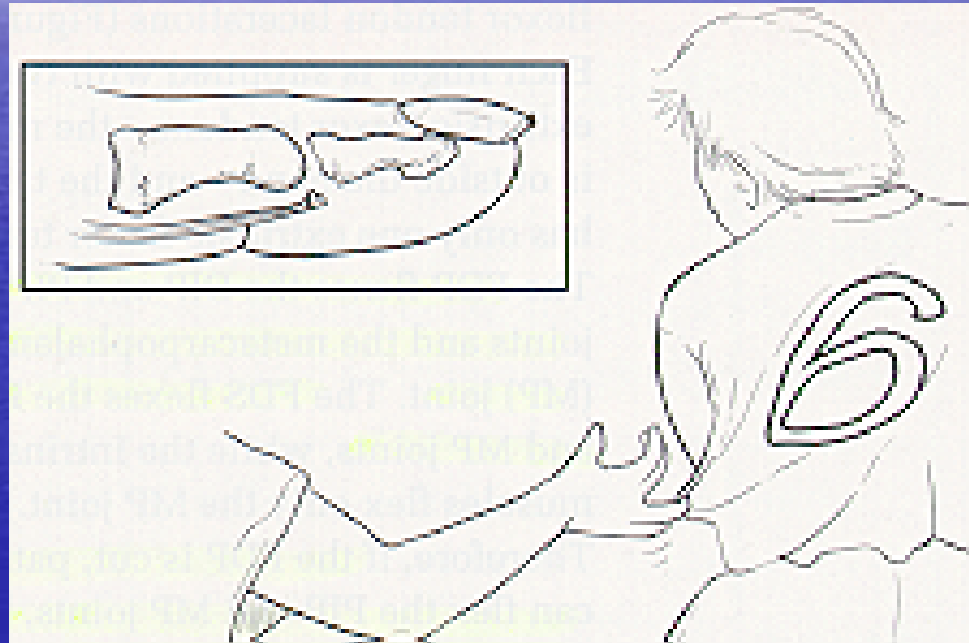
Long Finger Flexor Test

- Flexor Digitorum Superficialis Test
 - Flex finger at PIP
 - The only functioning tendon at the PIP
- Flexor Digitorum Profundus Test
 - Flex at DIP
- Inability to flex= tendon cut or denervated

Flexor Tendon Injury

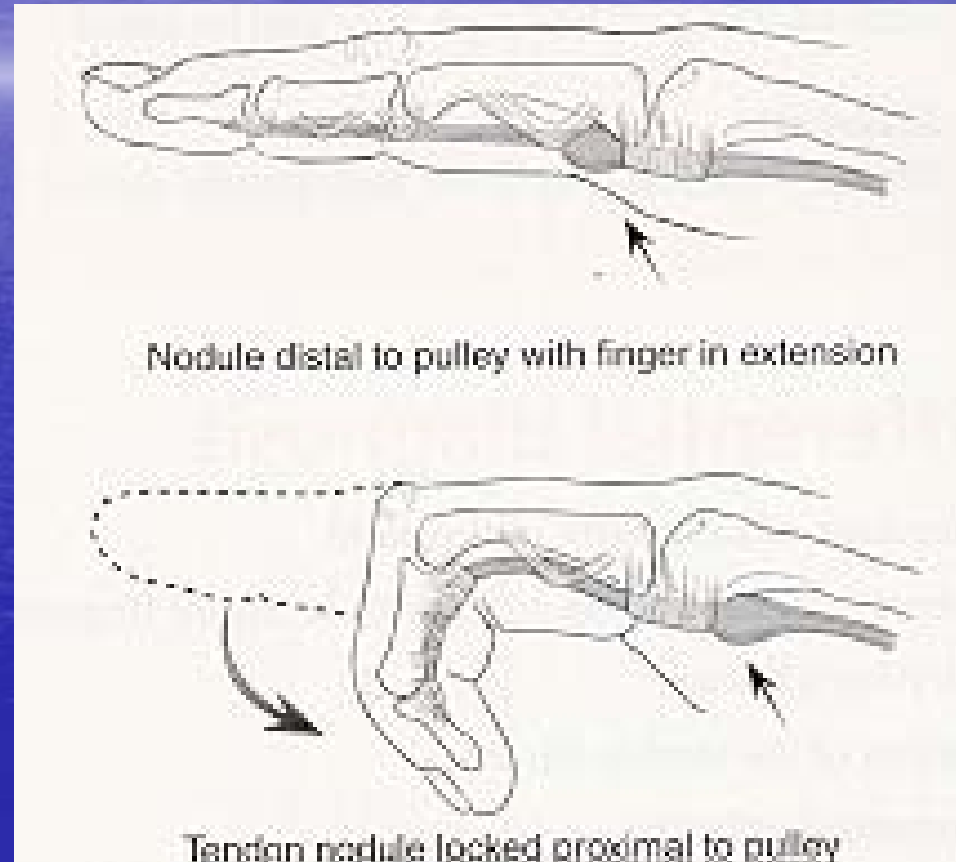
"Jersey Finger"

- Avulsion injury from rapid passive extension of the clenched fist
- Loss of flexion at PIP and/or DIP
 - "+" sublimus or profundus tests



Trigger Finger

- Stenosing flexor tenosynovitis
- Painful snap or lock
- Palpate nodule as digit flexed and extended



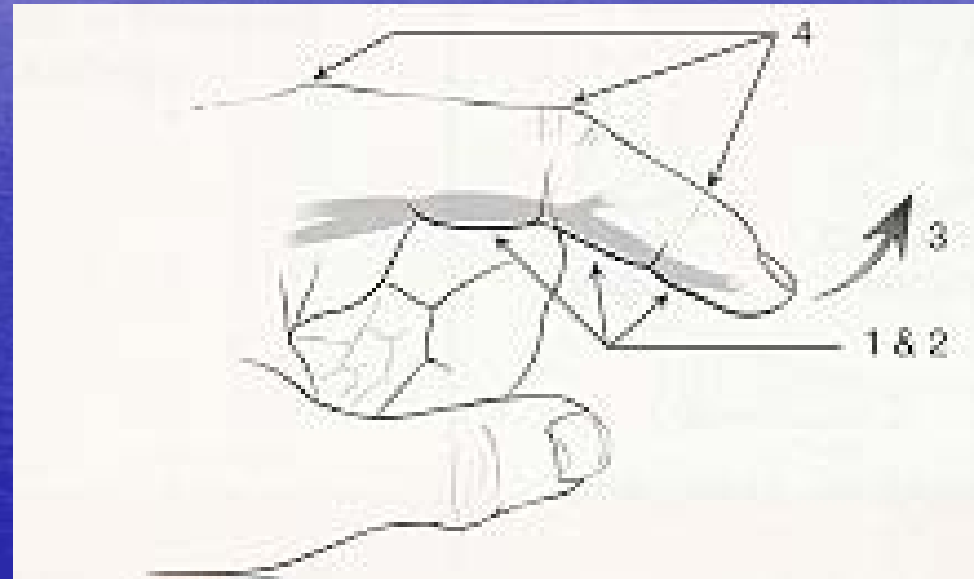
Flexor Tenosynovitis

- Tendon sheath infection
- Usually due to a puncture wound
- Bacterial skin flora
- Relative surgical emergency

Flexor Tenosynovitis

4 Cardinal Signs of Kanavel

- Uniform swelling of the finger
- Sensitivity along the course of the tendon sheaths
- Pain upon passive extension
- Fingers held in flexion



RANGE OF MOTION

Thumb

- Thumb flexion/extension at MCP and IP
 - Touch pad at base of little finger
- Thumb ABD/ADD at carpometacarpal joint
- Opposition
 - Touch tip of thumb to tip of each finger

Skier's Thumb

Gamekeeper's Thumb

- Ulnar Collateral Ligament rupture of the thumb MCP joint
- Instability, weak and ineffective pinch
- Radially directed stress at MCP joint-stable if opens <35 degrees

Figure 9: Joan Kozel, University of Wisconsin Hospitals and Clinics

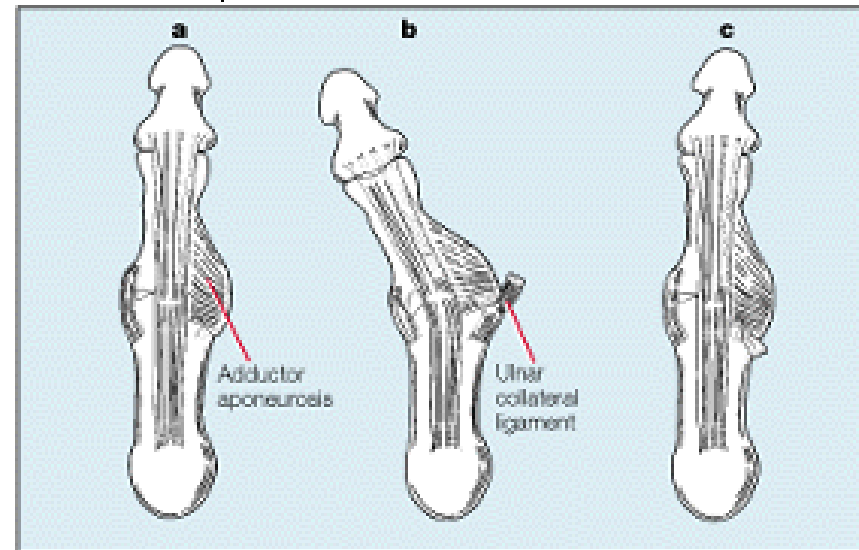


Figure 9. In the thumb metacarpophalangeal joint, the adductor aponeurosis covers the ulnar collateral ligament (a). When thumb angulation is sufficient, the ligament can rupture and be displaced (b). If the ligament becomes trapped outside the aponeurosis (c), a Stener lesion results. A trapped ligament that is not surgically repaired leads to chronic instability.

NEUROLOGIC EXAM

- Muscular assessment using grading system
- Sensation testing
- Bilateral comparison

NEUROLOGIC EXAM

Muscle Testing

- WRIST

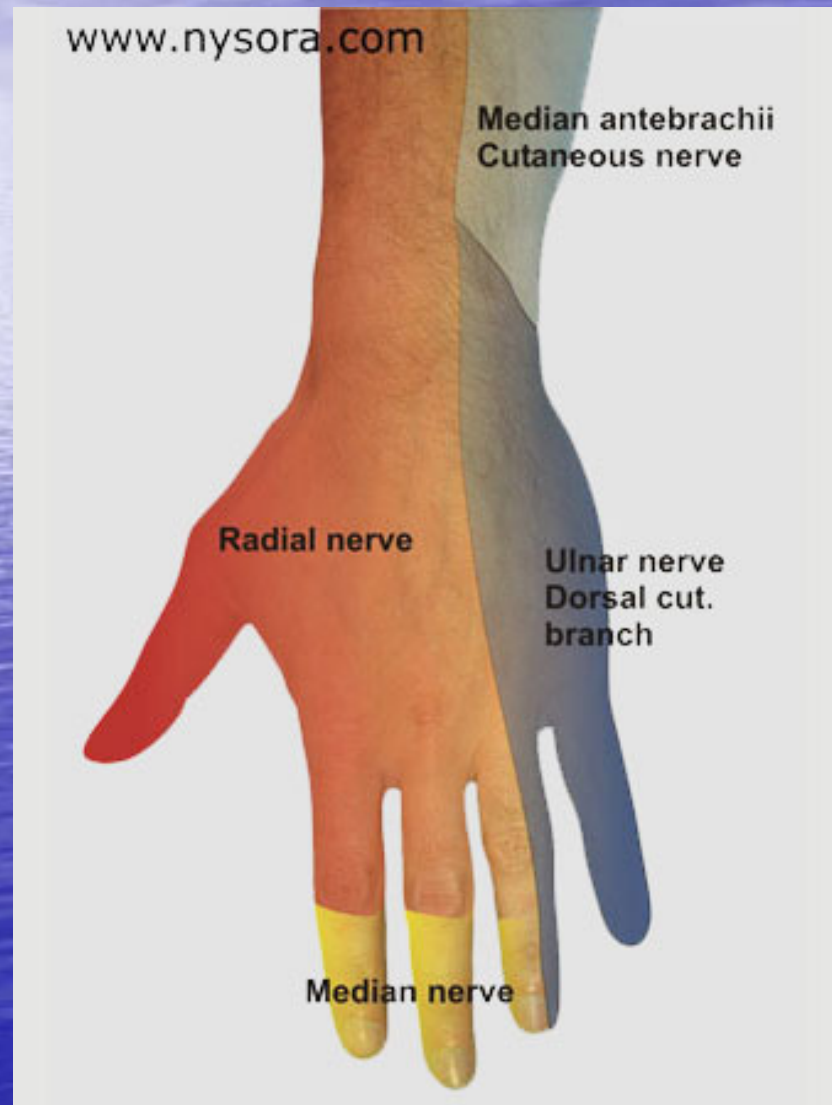
- EXT C6
- FLEX C7

- FINGERS

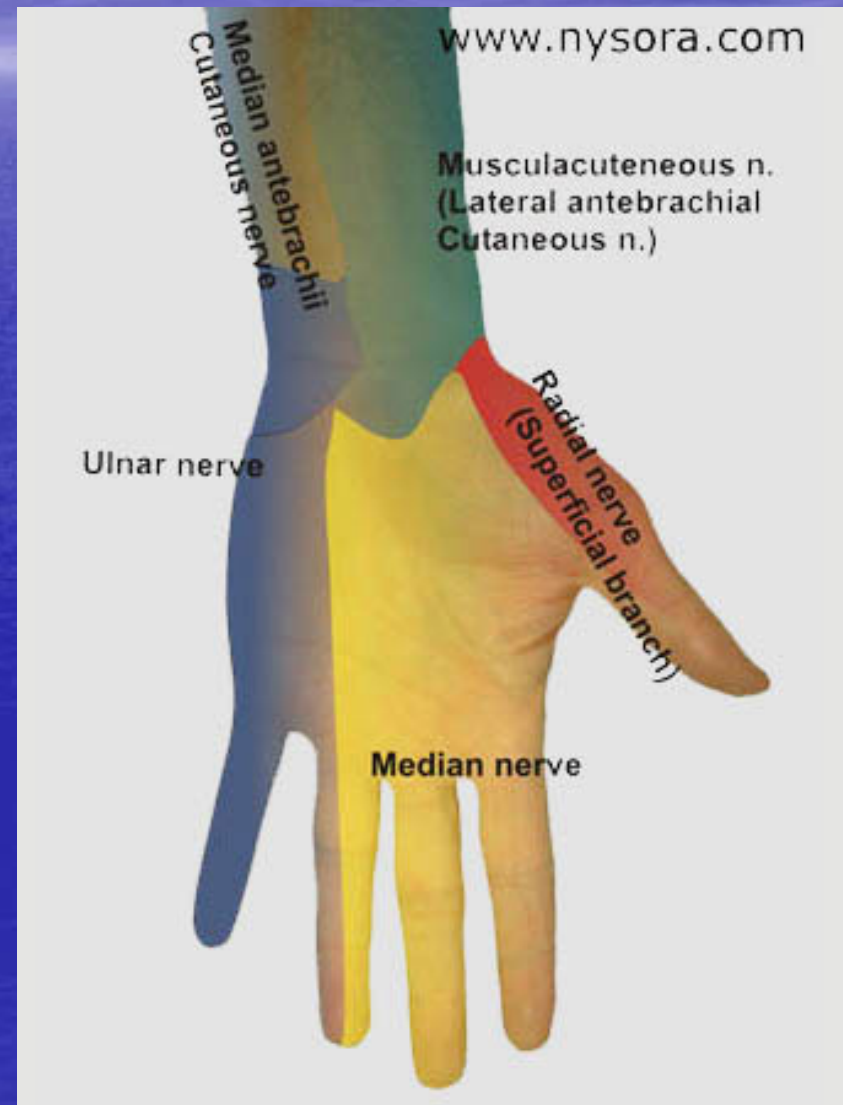
- EXT C7
- FLEX C8
- ABD T1
- ADD T1

Sensation Testing

Dorsal hand



Radial hand



NEUROLOGIC EXAM

Sensation Testing

- Neurological Level
 - Dermatomes- 3 neurologic levels
 - C6, C7, C8

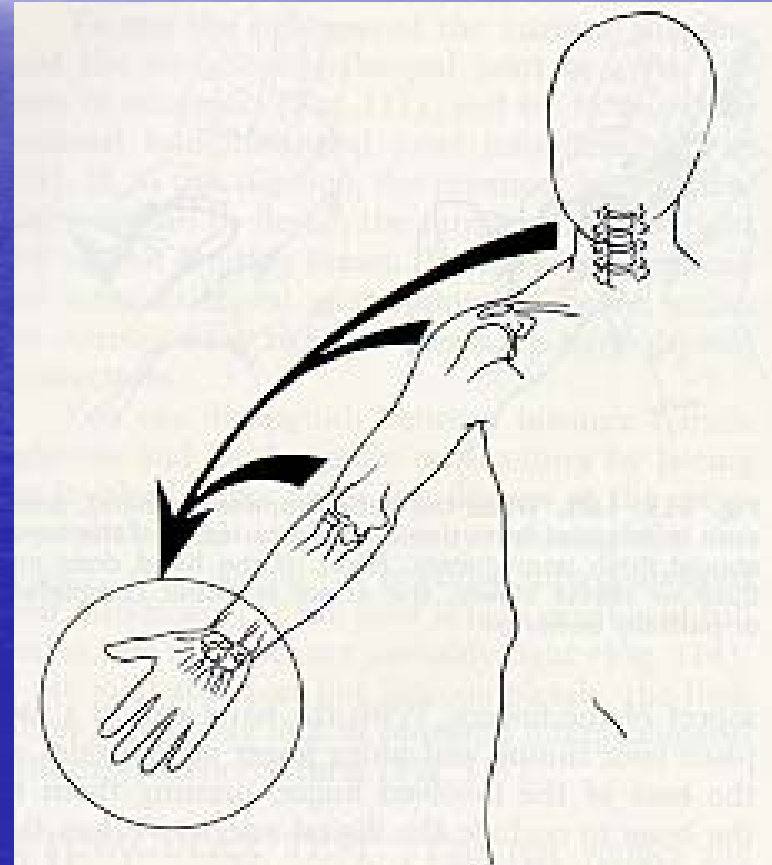
RADIOLOGIC STUDIES

- AP and Lateral of hand and wrist
- Consider Obliques and special views if fracture suspected but not seen on AP and Lateral



EXAMINATION OF RELATED AREAS

- Referred pain can be due to:
 - Herniated cervical discs
 - Osteoarthritis
 - Brachial plexus outlet syndrome
 - Elbow and shoulder entrapment syndrome



Sites of Pain and Common Pathology

- Dorsal pain
 - Ganglion (#1 cause of dorsal pain)
 - Extensor tendonitis (overuse)
 - Kienbach's Disease
- Volar Pain
 - Ganglion
 - Flexor tendinitis
 - Carpal tunnel syndrome
 - Thumb CMC joint arthritis

Site of Pain and Common Pathology

- Radial pain
 - Thumb CMC DJD
 - DeQuervain's tendinitis
 - Scaphoid fracture
- Ulnar pain
 - EXT carpi ulnaris tendinitis
 - Synovitis
 - Triangular fibrocartilage complex tear