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
"sad lonely travis pushes his cart through texas"
Bony Anatomy

- Phalanges: 14
- Sesamoids: 2
- Metacarpals: 5
- Carpals
  - Proximal row: 4
  - Distal row: 4
- Radius and Ulna
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
- Range of Motion
- Palpation
- 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
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
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
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
PALPATION of Skin

- Warmth?
- Dryness?
  - Anhydrosis $\equiv$ nerve damage
- Scars
PALPATION of Wrist Dorsal to Volar

- 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

Fig. 22. The trapezium/first metacarpal is palpated radially. The navicular tubercle palpated proximally.
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
Shuck and Shift test
Ulnar Styloid palpation
Lister’s Tubercle palpation

Ulnar styloid
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: 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

Tunnel of Guyon

PISIFORM

HOOK OF HAMATE
Hamate Hook Fracture

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

Individual Muscles of Forearm
Flexors of Wrist

Lateral epicondyle
Medial epicondyle
Common flexor tendon

Flexor carpi radialis muscle
Palmaris longus muscle
Flexor carpi ulnaris muscle

Radius
Ulna

Pisiform bone
Hamulus of hamate bone
Palmar aponeurosis (cut)

Note: brachioradialis muscle not shown because it is flexor of elbow

Right forearm: anterior (palmar) view
PALPATION
Palm of Hand

• Thenar Eminence
  – 3 muscles of thumb
  – Atrophy seen in carpal tunnel syndrome

• Hypothenar Eminence
  – 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
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. 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
Extension Wrist

- Primary ECRL and Brevis (radial nerve) and ECU (ulnar nerve)
Wrist Flexion

- Primary include FCR (median nv) and FCU (ulnar nv)
- FCR radial deviation
- FCU ulnar deviation
Fingers

- **Extension**: radial \( nv \)
- **Flexion**: FDP, FDS, lumbricales; primarily median nerve.
- **Abduction**: dorsal interossei and ADM; ulnar nerve.
- **Adduction**: palmar interosseous; ulnar \( nv \)
Thumb

- Abduction: APL (radial), APB (median)
- Adduction: Adductor pollicis (ulnar)
- Extension: EPB (at MCP) EPL (at IP); radial nv
- Flexion: FPB (at MCP) FPL (at IP); Ulnar/median nv
- Opposition: Opponens Pollicis (median)
  Opponens Digiti Minimi (ulnar)
Sensation Testing

Dorsal hand:
- Median antebrachii Cutaneous nerve
- Radial nerve
- Ulnar nerve
- Dorsal cut. branch
- Median nerve

Radial hand:
- Musculacutaneous n. (Lateral antebrachial Cutaneous n.)
- Radial nerve (Superficial branch)
- Ulnar nerve
- Median nerve

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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