Elbow, Wrist & Hand Evaluation

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Common Injuries to the Elbow, Wrist, Hand & Fingers

- Lateral epicondylitis – “tennis elbow”
- Medial epicondylitis – “golfer’s elbow”, “little league elbow”
- Hyperextension
- Sprains
- DeQuervain’s disease
- Dislocations
- Bursitis
- Carpal tunnel syndrome
- Mallet finger
- Boutonniere deformity
- Subungual hematoma
- Contusions
- Pathological hand/finger positions (S & R, p.295-300)
- Fractures
  - Colles’ fx
The Elbow – Joints & Movement

- Ginglymus or hinge-joint
- Humeroulnar joint & Radioulnar joint – 2 interrelated joints

Movements:
- Flexion & Extension – primarily between ulna & humerus
  - 0° to 145° -150°
The Elbow – Joints & Movement

- Radioulnar joint
- Trochoid or pivot-type joint
- Syndesmosis – interosseus membrane

Movements:
- Supination - 80°-90° from neutral
- Pronation - 70°-90° from neutral
Anatomy Elbow

**Humerus:**
- Trochlea
- Capitulum
- Coronoid Fossa
- Medial & Lateral Epicondyle

**Radius:**
- Radial head
- Radial neck
- Radial tuberosity
- Radial Fossa

**Ulna:**
- Coronoid Process
- Olecranon Process
- Ulna Tuberosity
Muscles - Elbow

- **Flexion**
  - Biceps Brachii
  - Brachialis
  - Brachioradialis
  - **Pronator Teres - weak**
Muscles - Elbow

► Extension
  - Triceps Brachii
  - Anconeus
Muscles - Elbow

- Pronation
  - Pronator Teres
  - Pronator Quadratus
  - Brachioradialis
Muscles - Elbow

- **Supination**
  - Biceps Brachii
  - Supinator
  - Brachioradialis
Neuroanatomy

► Brachial Plexus – C5, C6, C7, C8, & T1

► Branches:
  - Radial Nerve (C5, C6, C7 & C8)
  - Median Nerve (C6 & C7)
  - Ulnar Nerve (C8 & T1)
  - Musculocutaneous Nerve (C5 & C6)
Neuroanatomy – Musculocutaneous & Ulnar Nerves

- Musculocutaneous nerve
- Lateral cord of brachial plexus
- Medial cord of brachial plexus
- Posterior cord of brachial plexus
- Biceps brachii m.
- Coracobrachialis m.
- Brachialis m.

- Ulnar nerve
- Flexor carpi ulnaris m.
- Deep digital flexor m.
- Deep head of flexor pollicis brevis m.
- Adductor pollicis m.
- Hypothenar mm.
- Medial lumbricales mm.
- Palmar and dorsal interossei mm.
Neurovascular Anatomy

_forearm arteries_

_downward arrow to Palmar Aspect_

_upward arrow to Dorsal Aspect_
Wrist & Hand
Palmar Aspect

Phalanges
Metacarpals
Carpals
Carpals

- Scaphoid (boat shaped)
- Lunate (moon shaped)
- Triquetrum (3 cornered)
- Pisiform (pea shaped)
- Trapezium
- Trapezoid
- Capitate (head shaped)
- Hamate (hooked)
Carpal Bones

- Concave on palmar side
- Bony arch is spanned by transverse carpal & volar ligaments
- Creates carpal tunnel
- Median nerve & all flexor tendons except flexor carpi ulnaris & palmaris longus pass through carpal tunnel
Anatomical Snuffbox

- Extensor pollicis longus (medial side)
- Extensor pollicis brevis (lateral side)
- Abductor pollicis longus (lateral side)
Figure 2: In a complex dorsal dislocation of the MCP joint, the torn volar plate is trapped between the metacarpal head and the proximal phalanx, while the metacarpal head is caught between the lumbrical muscle on the radial side and the flexor digitorum profundus on the ulnar side. A complex dislocation usually requires surgical reduction.
Ligaments
Dorsal Aspect
Triangular Fibrocartilage Ligament (TFCC)

* extends from ulnar side of distal radius & attaches to ulna @ base of ulnar styloid process

* disc provides stability to wrist

* major stabilizer of distal radioulnar joint
Joints & Movements

► Wrist joint

- Condyloid-type

- Flexion, extension, abduction (radial deviation), adduction (ulnar deviation)

  - Motion occurs mostly in proximal carpal row & distal radius

  - 70° – 90° of flexion
  - 65° – 85° of extension
  - 15° – 25° of abduction
  - 25° – 40° of adduction
Joints & Movements

► Fingers
- Metacarpophalangeal Joint (MCP)
  - Condyloid
  - 0° – 40° of extension
  - 85° – 100° of flexion
- Proximal interphalangeal Joint (PIP)
  - Ginglymus
  - Full extension to 90° – 120° of flexion
- Distal interphalangeal Joint (DIP)
  - Ginglymus
  - Flex 80° – 90° from full extension
Thumb Joints

- 2 joints
  - Metacarpophalangeal (MCP)
    - Ginglymus
    - Full extension into 40° – 90° of flexion
  - Interphalangeal (IP)
    - Ginglymus
    - Flex 80° – 90°
- Carpometacarpal (CMC) joint
  - Saddle joint
  - 50° – 70° of abduction
  - Flex 15° – 45° & extend 0° – 20°
Finger Movement

- Middle phalange is reference point to differentiate abduction & adduction
  - Thumb, index & middle fingers abduct when they move laterally toward radial side of hand
  - Ring & little fingers abduction when they move medially toward ulnar side of hand
  - Medial movement of thumb, index & middle fingers toward ulnar side of hand is adduction
  - Lateral movement of ring & little finger toward radial side of hand is adduction
Extrinsic Muscles of Hand

Extrinsic muscles of wrist & hand grouped according to function & location

► 6 muscles move wrist but not fingers & thumb
  ▪ 3 wrist flexors
    ► flexor carpi radialis
    ► flexor carpi ulnaris
    ► palmaris longus
  ▪ 3 wrist extensors
    ► extensor carpi radialis longus
    ► extensor carpi radialis brevis
    ► extensor carpi ulnaris
Extrinsic Muscles of Hand

- 9 muscles primary movers of phalanges
  - Also involved in wrist joint actions
  - Generally weaker in their wrist actions
  - Flexors
    - Flexor digitorum superficialis
    - Flexor digitorum profundus
    - Flexor pollicis longus (thumb flexor)
  - Extensors
    - Extensor digitorum
    - Extensor indicis
    - Extensor digiti minimi
    - Extensor pollicis longus (thumb extensor)
    - Extensor pollicis brevis (thumb extensor)
  - Abductor of thumb & wrist
    - Abductor pollicis longus
Wrist Abductors & Adductors

► Wrist abductors
  - Generally cross wrist joint anterolaterally & posterolaterally to insert on radial side of hand
    ▶ Flexor carpi radialis
    ▶ Extensor carpi radialis longus
    ▶ Extensor carpi radialis brevis
    ▶ Abductor pollicis longus
    ▶ Extensor pollicis longus
    ▶ Extensor pollicis brevis

► Wrist adductors
  - Cross wrist joint anteromedially & posteromedially to insert on ulnar side of hand
    ▶ Flexor carpi ulnaris
    ▶ Extensor carpi ulnaris
Anterior Aspect of Elbow

- Pronator teres
- Flexor carpi radialis
- Palmaris longus
- Flexor carpi ulnaris
- Radius
- Ulna
- Brachioradialis
- Flexor digitorum superficialis
- Medial epicondyle of humerus
- Lateral epicondyle of humerus
- Supinator
- Flexor pollicis longus
- Pronator quadratus
- Ulna
- Flexor digitorum profundus
- Lumbricales
Posterior Aspect of Elbow

- Medial epicondyle of humerus
- Anconeus
- Extensor digiti minimi (cut)
- Extensor carpi ulnaris (cut)
- Extensor indicis
- Supinator (deep)
- Extensor digitorum (cut and reflected)
- Extensor carpi radialis longus
- Extensor carpi radialis brevis
- Abductor pollicis longus
- Extensor pollicis longus
- Cut tendons of extensor digitorum
- Extensor pollicis brevis
Intrinsic Hand Muscles

- Intrinsic hand muscles have origins & insertions on bones of hand
  - Radial side – four muscles of thumb
    - opponens pollicis
    - abductor pollicis brevis
    - flexor pollicis brevis
    - adductor pollicis
  - Ulnar side – three muscles of little finger
    - opponens digitii minimi
    - abductor digitii minimi
    - flexor digitii minimi brevis
  - Remainder of hand – 11 different muscles
    - 4 lumbricals
    - 3 palmar interossei
    - 4 dorsal interossei
Thenar eminence - muscular pad on palmar surface of 1st metacarpal
- abductor pollicis brevis
- opponens pollicis
- flexor pollicis brevis
- adductor pollicis

Hypothenar eminence - muscular pad that forms ulnar border on palmar surface
- abductor digiti minimi
- flexor digiti minimi brevis
- opponens digiti minimi
Intrinsic Muscles of Hand

- Tendons of flexor digitorum profundus
- Tendons of flexor digitorum superficialis
- Dorsal interosseous
- Tendon of flexor pollicis longus
- Traverse head
- Adductor pollicis
- Oblique head
- Flexor pollicis brevis
- Abductor pollicis brevis
- Opponens pollicis
- Tendon of extensor pollicis brevis
- Tendon of abductor pollicis longus
- Flexor retinaculum
- Radial artery
- Pronator quadratus
- Tendon of flexor carpi radialis
- Tendon of palmaris longus
- Median nerve
- Tendon of flexor carpi ulnaris
- Tendons of flexor digitorum superficialis
- Position of pisiform bone
- Tendon of flexor digitorum profundus
- Lumbricals
- Abductor digiti minimi
- Opponens digiti minimi
- Flexor digiti minimi brevis
- Tendons of flexor digitorum superficialis
- Palmar plates
Tendons
Dorsal Aspect

Ext. Pollicis Brevis
Ext. Pollicis Longus
Ext. Digitorum
Ext. Indicis
Ext. Digiti Minimi
Elbow & Forearm Evaluation

► History
- Ask Generic history questions - MOI, noises/sensations, Burning/Stinging?
- Ask Specific history questions - was your hand planted? Did you fall on an outstretched hand?

► Observation
- Carrying Angle (♀ > ♂)
  - ♀ 10°-15°  ♂ 5°-10°
- Cubital Recurvatum
- Cubital Valgus
- Bony alignment, Soft tissue
- Discoloration, swelling, etc.
Elbow & Forearm Evaluation

► Palpation
  - Bony landmarks, Soft tissue
  - Swelling, crepitus, temperature, etc.
  - Cubital fossa – brachial artery, median n., musculocutaneous n.
    ► Brachioradialis – lateral border
    ► Pronator teres – medial border

► Stress/Special Tests
  - ROM (AROM, PROM, RROM): ✓ - 0-145°; / - normally 0° but can have hyperextension; pronation/supination 170-180°
  - Valgus/Varus Stress tests
  - Tinel’s Sign
  - Compression/Squeeze Test
  - Neurologic
Wrist & Hand Evaluation

► History
  ▪ Ask Generic history questions - MOI, noises/sensations, Burning/Stinging?
  ▪ Ask Specific history questions - was your hand planted? Did you fall on an outstretched hand?

► Observation
  ▪ Discoloration, swelling
  ▪ Posture of hand
  ▪ Deformity, palmar creases, color of skin & fingernails, thenar & hypothenar eminences, thenar webspace
  ▪ Murphy’s sign, Silverfork deformity, Boutonniere deformity, mallet finger deformity, rotational malalignment, missing knuckle
Wrist & Hand Evaluation

► Palpation

- Ulna (styloid process), Radius (Lister’s tubercle, styloid process), Carpals, Metacarpals, Phalanges, joints, muscles, ligaments, Carpal Tunnel, Anatomical snuffbox
- Temperature, deformity, swelling

► Stress/Special Tests

- ROM, Grip strength, Pinch test, test ea. joint on a finger
- Valgus/Varus Stress tests of all joints, Glide testing of ligaments
- Phalen’s Test
- **Stress/Special Tests continued**
- Tinel’s Sign
- Glide tests – ulnar glide, superior glide, inferior glide
- Finkelstein Test
- Transverse Compression, Compression Test, Tap or Percussion (Long bone Compression) Test
- Watson Test – (Scaphoid shift)
- Reflexes
- Capillary refill
- Pulse
References

- Primal 3D Interactive Series