Orthopedics and Neurology of the Elbow

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Elbow Examination
- What do you observe with these four elbows?

Osseous Anatomy of the Elbow
- Ginglymus or hinge joint
- Relatively stable joint
- Firm osseous support
- Composed of three articulations

Three Elbow Articulations
1. Humeroulnar
2. Humeroradial
3. Radioulnar

Elbow Ligaments

Elbow Muscles
Elbow Muscle Conditions
- Strain
- Ruptured muscle or tendon
- Myofascial Pain
- Myositis ossificans

Myositis Ossificans of the Elbow
- What might cause myositis ossificans?

Causes of Myositis Ossificans
- Poor management of strain or contusion
- No RICE
  - Rest
  - Ice
  - Compression
  - Elevation

Causes of Myositis Ossificans
- Applying heat to muscle tissue in place of ice with an acute contusion or strain

Causes of Myositis Ossificans
- Premature return to activities

Causes of Myositis Ossificans
- Premature and/or aggressive massage or physical therapy
Palpation of the Elbow

Check for the following:

1. Crepititation
2. Pain
3. Swelling
4. Temperature elevation

Crepitation

- A grating or crackling sensation or sound, as that produced by rubbing two fragments of a broken bone together, or by pressing upon cellular tissue containing air.

Inspection of Elbow

Carrying Angle

- Carrying angle is a valgus angle
  - 5 degrees in males
  - 10-15 degrees in females

Varus Deformity

“Gunstock deformity”

Cubitus Valgus

- Increased carrying angle above 5-15 degrees
- May be caused by epiphyseal injury secondary to lateral epicondylar fracture
- May cause delayed ulnar nerve palsy

Cubitus Varus

- Decrease in the carrying angle is referred to as the “gunstock deformity”
- Post-traumatic childhood supracondylar fracture
- Malunion or growth retardation of the epiphyseal plate
**Olecranon Bursitis**

*Localized edema*

1. Swollen bump
2. Small, specific subcutaneous mass
3. Contained within a joint capsule or bursa
4. Normally visible

**Diffuse Edema**

1. May fill entire joint
2. Elbow flexed to 45 degrees
3. Fractures
   - Supracondylar of humerus
   - Crush injury of elbow

**Scars or Cicatrix Formations**

*Burn patients*

1. General surface scarring
2. May develop joint contractures

**Cicatrix Formations**

*Needle-puncture scarring*

1. Secondary to multiple injections from intravenous infusions
2. Drug abusers or addicts

**Elbow Palpation**

- Stand at patient’s side
- Hold anterior lateral aspect of arm
- Extend and abduct arm
- Have patient flex elbow to 90 degrees

**Elbow Palpation**

*Crepitation*

1. Synovial or bursal thickening
2. Fracture
3. Osteoarthritis or degenerative joint disease
Palpation of the Medial Epicondyle

1. Frequently fractured in children
2. Note tenderness, inflammation, and temperature elevation
3. May indicate medial epicondylitis or strain

Posterior Elbow

Isosceles triangle

Place thumb on lateral epicondyle, index finger upon the olecranon and middle finger upon the medial epicondyle with elbow flexed

Isosceles Triangle

Use this process to reveal any deviations that may indicate anatomical problem that warrants further investigation

Palpation of the Olecranon process and bursa

Thick, boggy feeling may indicate olecranon bursitis
Posterior nodules may indicate rheumatoid arthritis

Palpation of the Lateral Epicondyle

Note tenderness, inflammation, and temperature elevation
May indicate lateral epicondylitis or strain

Palpable Pain in Radial Head

1. Synovitis
2. Osteoarthritis or degenerative joint disease
3. Congenital or traumatic dislocation
4. Strain or sprain
Palpation of Ulnar Nerve
- Tenderness may indicate nerve compression
- Thickening may indicate cicatrix formation

Ulnar Nerve Injury
- Cicatrices may cause nerve compression
- Too much force with palpation may cause temporary paresthesia
- May be injured secondary to supracondylar or epicondylar fracture or by direct trauma

Ulnar Nerve Entrapment
- Josh Johnson incurred ulnar nerve irritation upon throwing on a flat surface.
- What does that indicate to you?

Ulnar Nerve
- Situated in sulcus between the medial epicondyle and the olecranon process
- Palpates as a soft, round, and tubular
- Follow course up arm and down to sulcus
- Gently palpate and attempt to displace from its groove

Paresthesia
- An abnormal sensation of the skin, such as numbness, tingling, pricking, burning, or creeping on the skin that has no objective cause. Paresthesia is the usual American spelling and paraesthesia the preferred English spelling.
- Pronounced par·es·the·sia. From the Greek para-(abnormal) + esthesis (feeling) = an abnormal feeling.
- Common Misspellings: parasthesia, parathesia

Active Elbow Range of Motion
1. Flexion = 135 degrees
2. Extension = 0 to –5 degrees
3. Supination = 90 degrees
4. Pronation = 90 degrees
Passive Elbow Range of Motion

1. Performed when active ROM is limited
2. Compare passive with active
3. Differentiate strain/sprain

Muscle Test for Supination

Muscle Test for Pronation

Tinel’s Sign

Lateral Epicondylitis

- Repetitive injury to the extensor tendon of the elbow
- Extensor carpi radialis brevis, digitorum, digitii minimi, and carpi ulnaris

Lateral Epicondylitis Examination

How would we test for this condition?
Lateral Epicondylitis
Tennis Elbow Test or Cozen’s test

Specialized Tests
- A positive Mill’s test indicates lateral epicondylitis
- Presence of a Kaplan’s sign with reduced pain and increased strength

Treatment
- How should we treat this condition?

Aircast Brace Support
- RICE
  - Rest
  - Ice or cryotherapy
  - Compression
  - Elevation

Medial Epicondylitis
“Golfer’s elbow”
- Repetitive injury to the flexor tendon
- Microavulsion or microtearing of the flexor carpi radialis tendon

Lateral Epicondylitis
- ICE is nice
- Rest is best
- Stretching
- Manipulation
- Exercise
- Support

Lateral Epicondylitis
"Tennis Elbow Test or Cozen’s test"

Lateral Epicondylitis
Specialized Tests
Medial Epicondylitis
Examination
- Golfer’s elbow test is a reverse “Cozen’s” test

Valgus Testing
- Challenge the flexor muscles
- Strain the medial ulnar collateral ligaments

Ligamentous Instability
- Extremely rare
- Radial collateral ligament (lateral)
- Ulnar collateral ligament (medial)
- Trauma

Ligamentous Instability
Mechanisms of injury
- Forced abduction will injure the ulnar ligament
- Forced adduction will injure the radial ligament
- Arm is extended

Ligamentous Instability
Adduction and Abduction Stress Tests
- Gapping and pain indicate a positive test for instability

Elbow Neuropathy and Compression Syndromes
- Ulnar nerve most often affected
Ulnar Neuropathy

- Excessive use
- Repetitive injury
- Cubital tunnel compression
- Postural habits
- Recurrent nerve subluxations or dislocations

Ulnar Nerve Compression or Entrapment
Clinical signs and symptoms

- Forearm and/or hand paresthesia
- Forearm and/or hand weakness
- Tinel’s sign present
- Wartenberg’s Sign present

Tinel’s Sign

- Palpate or tap the ulnar nerve with neurological reflex hammer to elicit pain

Tinel’s Sign

- Tap the ulnar nerve, which is located at the groove between the olecranon process and the medial epicondyle

Froment’s Sign
Test for ulnar nerve palsy

- Tests the action of adductor pollicis
- Patient holds a piece of paper between the thumb and a flat palm as the paper is pulled away.

Froment’s Sign and Finger Pinch Test

- Patient with an ulnar nerve palsy will flex the thumb to try to maintain a hold on the paper.
- There are variations of this test
**Anterior Interosseous Nerve**
- Arises from median nerve, 5 cm above medial epicondyle
- Runs on volar surface of flexor digitorum profundus and along interosseous membrane between ulna & radius
- Supplies flexor pollicis longus, lateral half of flexor digitorum profundus & pronator quadratus
- May supply sensory branches to distal radius and ulna and carpal joints

**Martin Gruber Anastomosis**
- Occurs in 10-15% of all forearms and in half of these cases, the nerve communication arises from the anterior interosseous nerve branch
- Hence, palsy of the anterior interosseous nerve could lead to palsy of the hand intrinsics normally supplied to the ulnar nerve

**Causes of Anterior Interosseous Nerve Compression**
- Tendinous origin of deep head of pronator teres (most common)
- Enlarged bicipital tendon bursa may impinge anterior interosseous nerve

**Causes of Anterior Interosseous Nerve Compression**
- Aberrant or thrombosed radial artery in mid-forearm
- Thrombosed ulnar artery
- Fascial band at the origin of flexor digitorum profundus

**Causes of Anterior Interosseous Nerve Compression**
- Compression within deep palmar compartment from aberrant accessory muscles such as flexor profundus longus (gantzer’s) muscle, palmaris profundus mass, or enlarged flexor carpi radialis brevis

**Differential Diagnosis**
- Lateral cord lesion
- Flexor digitorum profundus or index profundus tendons avulsion
  - Tendon ruptures are noted by placing digits in different positions and applying tension to the flexor tendons
  - Electrical stimulation may indicate whether muscle belly is partially denervated
Exam

- Principal weakness
- Difficulty moving index & middle fingers with weakness in flexors of interphalangeal joint of thumb (FPL) & dip joints of index and middle fingers (FDP)

Pinch Grip Test

**Anterior interosseous nerve trauma**

- Observe pitch attitude of the hand
- Normally when individual pinches something between index finger & thumb, MP & IP joints of thumb and index finger are flexed;

Pinch Grip Test

**Anterior interosseous nerve trauma**

- With nerve deficit, terminal phalanges of thumb and index finger are extended or hyperextended
- EMG needle examination is difficult because of the deep location

Unusual innervation patterns of hand will confuse picture

- Median nerve hand (martin gruber) anastomosis
- Entire hand is innervated by the median nerve
- Cross over ulnar innervations of flexor digitorum profundus
- Superficial innervations by anterior interosseous nerve

Ulnar Nerve Compression

**Cubital Tunnel Syndrome**

- Affected patients often experience numbness and tingling along the little finger and the ulnar half of the ring finger.

Ulnar Nerve Compression

**Cubital Tunnel Syndrome**

- This discomfort is often accompanied by weakness of grip and, rarely, by intrinsic wasting.
**Elbow Flexion Test**

Ulnar nerve compression at cubital tunnel

- The elbow is the most common site of compression of the ulnar nerve.
- Second most common compressive neuropathy (after carpal tunnel syndrome).
- Cubital tunnel syndrome affects men 3-8 times as often as women.

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**Normal Pediatric Elbow**

- Do not confuse epiphyseal growth plates or centers with fractures

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**Normal Epiphyseal Growth Plates**

- Sprains and strains occur in growing children and often result in the potentially more serious growth plate or physeal fracture.

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**Partial Dislocation of Elbow**

- Is this an adult or a pediatric case?

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**Dislocation of Elbow**

- How would you manage this case of dislocation?

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**Complete Elbow Dislocation**

- An elbow dislocation may occur when the radial and ulnar ligaments are sprained
Elbow Dislocation
- An elbow sprain with dislocation may occur with a fall onto an extended elbow or due to a motor vehicle accident.

Reduced Dislocation of Elbow
- Are you trained to reduce a dislocated elbow?

Instability of Elbow
- Posterolateral instability following elbow dislocation, in a 25-year-old patient.

Radiographic Examination
- Radiographs taken under general anesthesia show posterolateral subluxation of the radial head during forearm supinating stress.

Complex Dislocation and Fracture
- Please explain your treatment plan?

Examination of Related Areas