Let Me Give You A Hand in Diagnosing and Managing Upper Extremity Injuries and Conditions

Karen M. Myrick, DNP, APRN, ANP-BC, FNP-BC, APRN
Nurse Practitioner

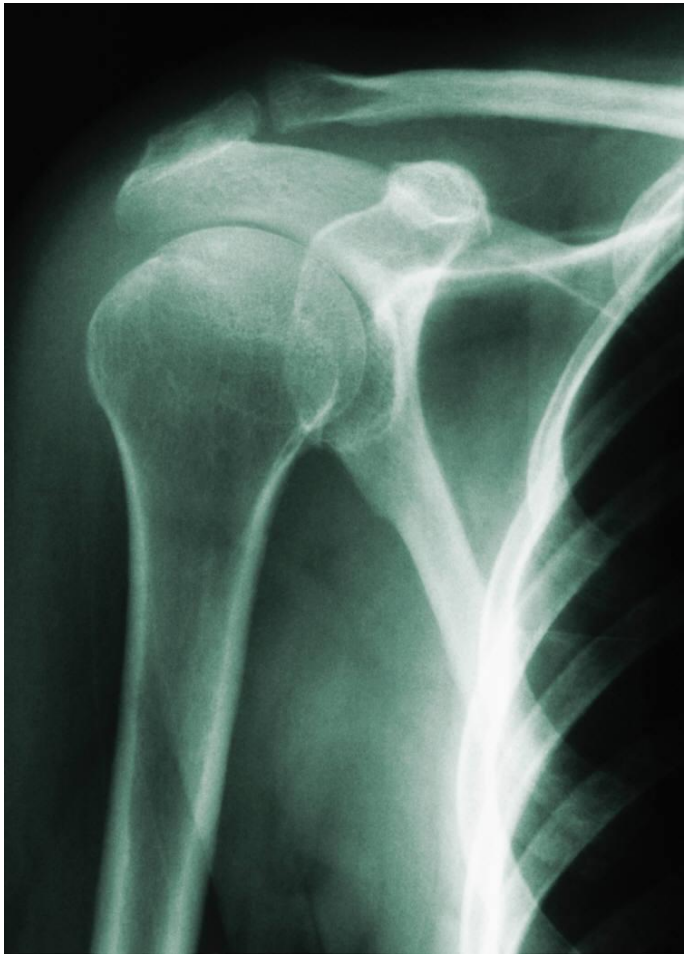
Objectives

- Learners will be able to describe common upper extremity conditions and injuries.
- Learners will be able to identify important components of the patient's history that are key to arriving at accurate diagnoses for upper extremity conditions and injuries.
- Learners will describe sensitive and specific physical examination techniques for patient's with upper extremity conditions and injuries.

Conflict of Interest

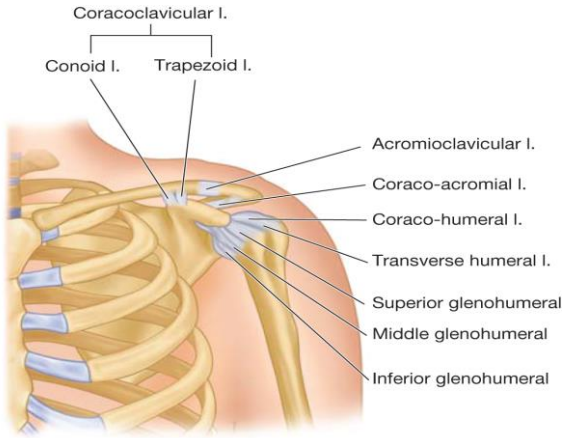
- I have no conflicts of interest to disclose

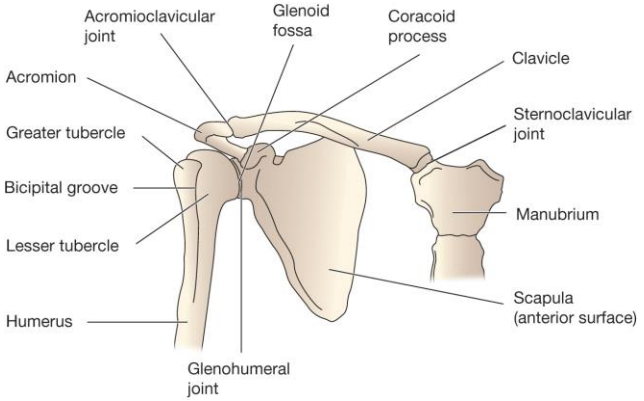
Shoulder



OVERVIEW OF ANATOMY AND PHYSIOLOGY OF THE MUSCULOSKELETAL SYSTEM

- THE SHOULDER
  - Structure and Function
    - The shoulder has a large range of motion and is reliant upon the soft tissues to provide stability.
    - Responsible for moving the upper extremity in space. It serves important functions of daily living (bathing, feeding oneself, recreational and sports activities such as throwing).
  - Bones and Ligaments
    - Major bones and joints of the shoulder.
    - Major ligaments of the shoulder.





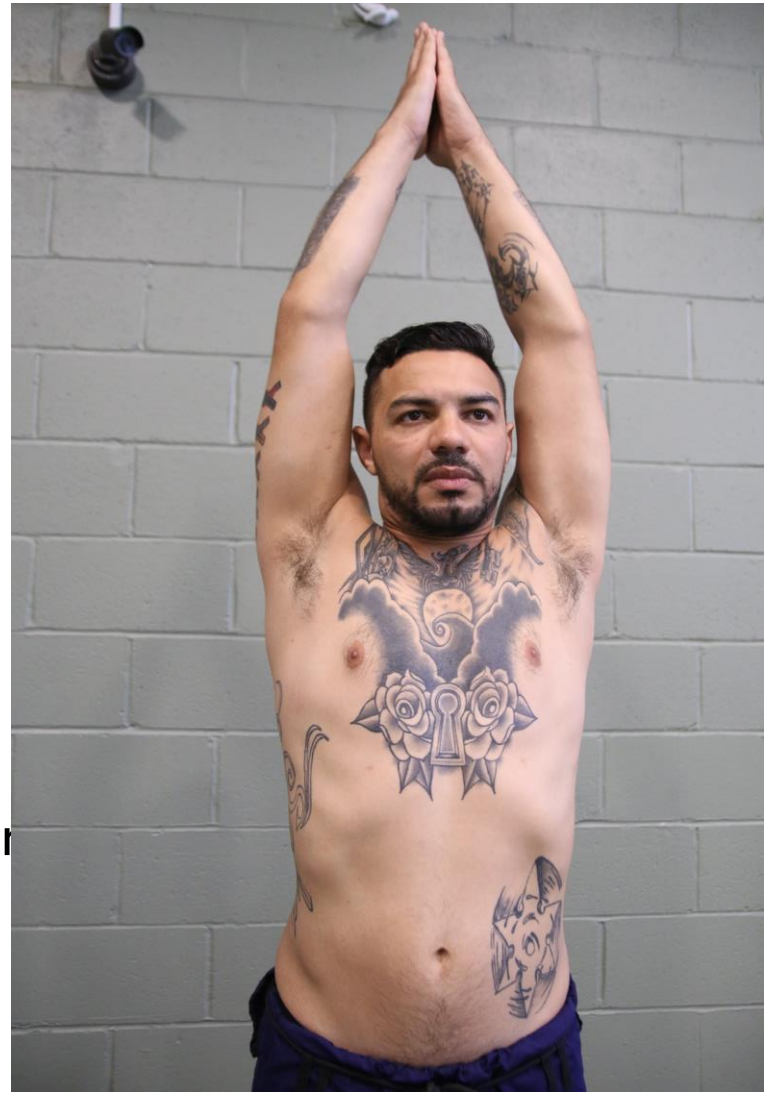
History

- Chief complaint
  - Acute or chronic
  - Pain or instability
- Patient's age
  - Younger
  - Older

Physical Examination

Inspection/Palpation

- Anterior view
  - Look for abnormal contours and bony prominences
    - AC separation
      - Prominent distal clavicle
    - Anterior shoulder dislocation
      - Prominent acromion and anterior fullness of the deltoid

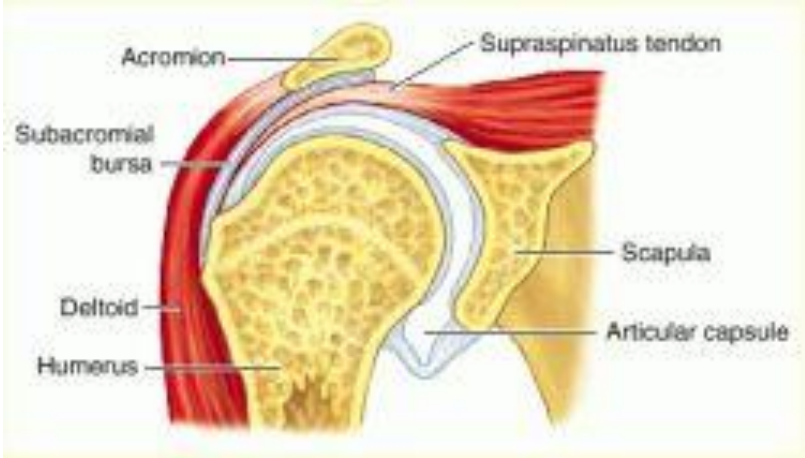


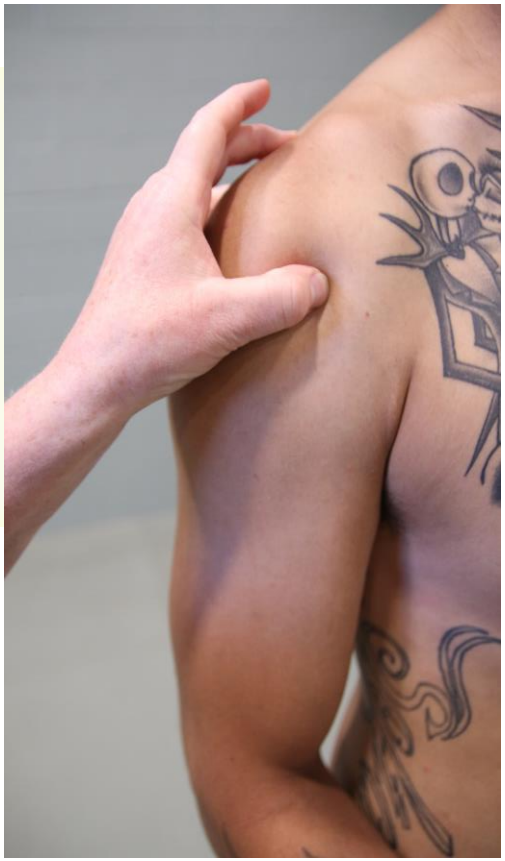
Inspection / Palpation (Cont.)

- Posterior View
  - Note symmetry
  - Look for atrophy
- AC Joint
  - End of clavicle

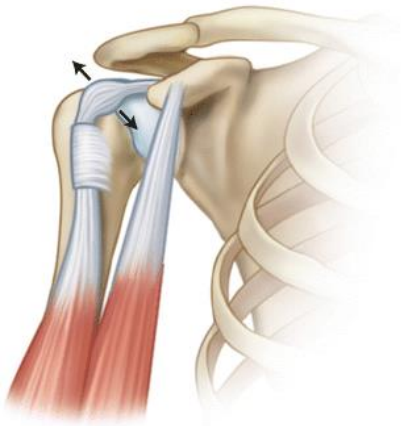
Inspection / Palpation (Cont.)

- Subacromial Bursa
  - Palpate anterolateral portion of acromion, moving toward the deltoid until you feel the sulcus

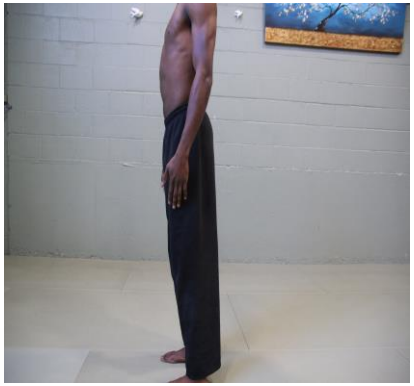




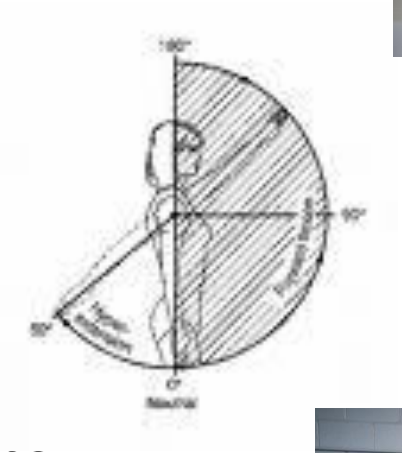
- Long Head of Biceps Tendon
  - Palpate over the humeral head in region of the bicipital groove

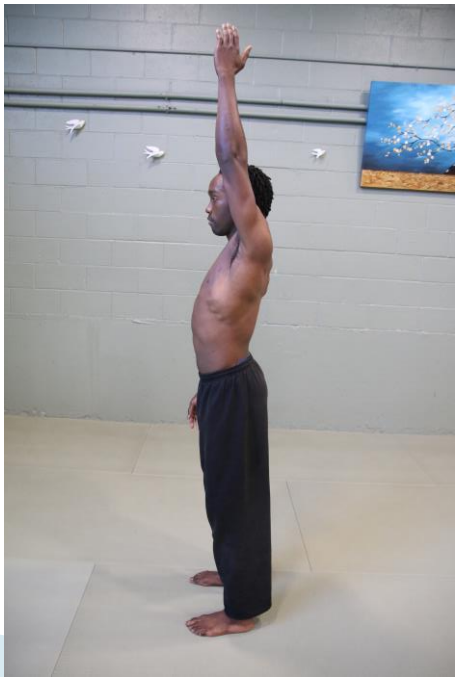


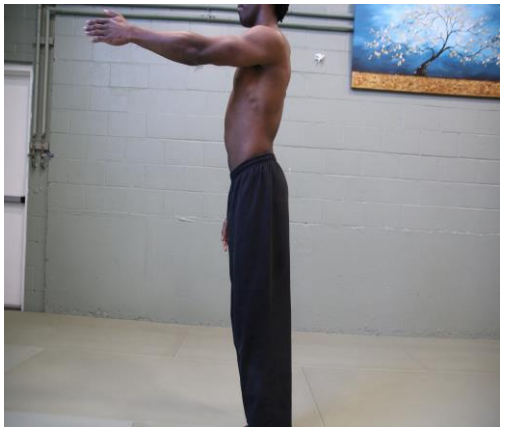
Range of Motion



- Flexion :
  - Zero Starting Position
  - Normal = 160 – 180 degrees







Range of Motion (Cont.)

- External Rotation, Arm at Side
  - Zero starting position arm held against thorax, elbow flexed to 90, forearm parallel to saggital plane
  - Measure by maximum outward rotation of arm
    - DJD and Adhesive capsulitis commonly have decreased ER

Range of Motion (Cont.)

- External Rotation, Arm Abducted to 90
  - Zero starting position, arm abducted 90, aligned with the plane of scapula, elbow flexed to 90, forearm parallel to floor
  - Measure by how many degrees the forearm moves away from the floor

Internal Rotation

- Evaluate patient's posterior reach, noting highest midline spinous process that can be reached by hitchhiking the thumb

Muscle Strength Testing

Supraspinatus

- 90 degrees abduction, 30 degrees forward flexion, and internal rotation. Elbow extended and thumb down
- Push down, patient resists

Infraspinatus and Teres Minor

- Arm at side and externally rotated to 30 degrees, flexed elbow
- Apply pressure to forearm and resistance to external rotation

Subscapularis

- Lift off test
- Hand behind back, palm out
- Lift away against resistance

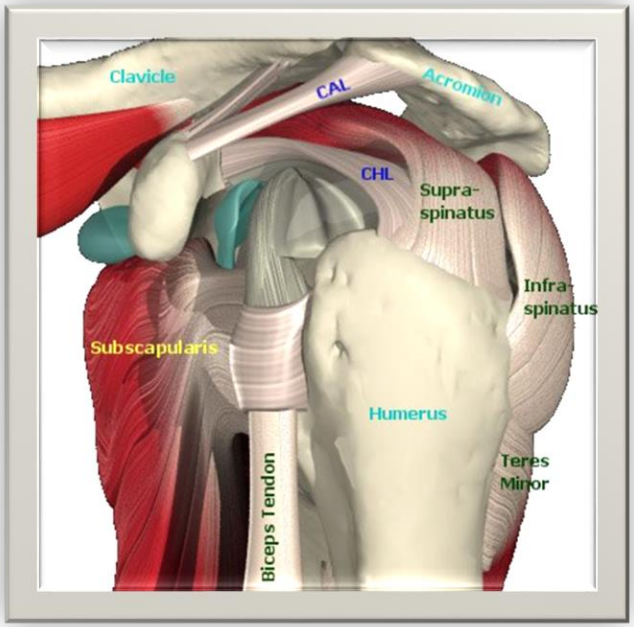
Shoulder pain

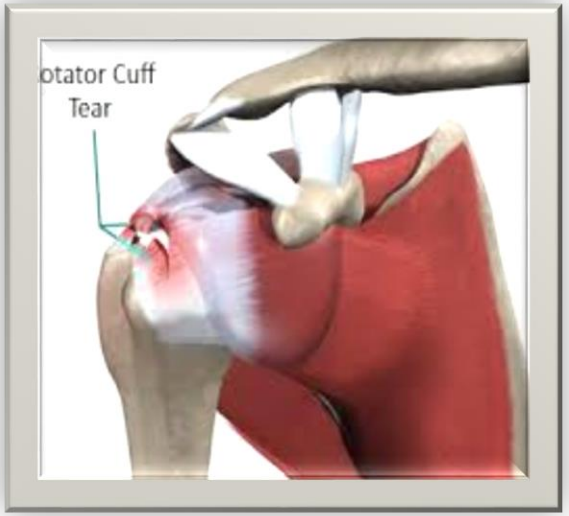
- Wide variety of differential diagnosis

- Focus on adhesive capsulitis and rotator cuff tear

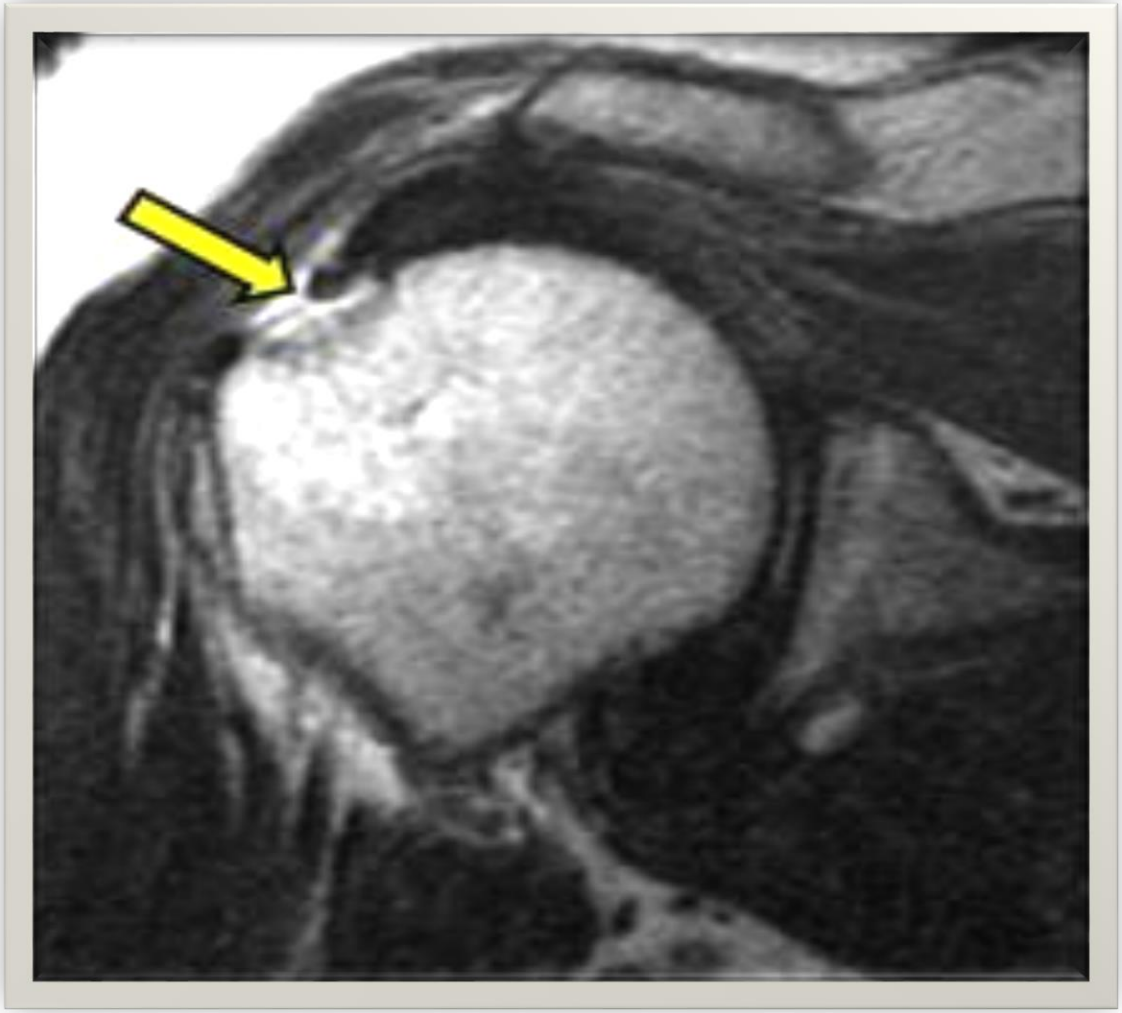
- What are the keys to differentiation?

Rotator Cuff Tear

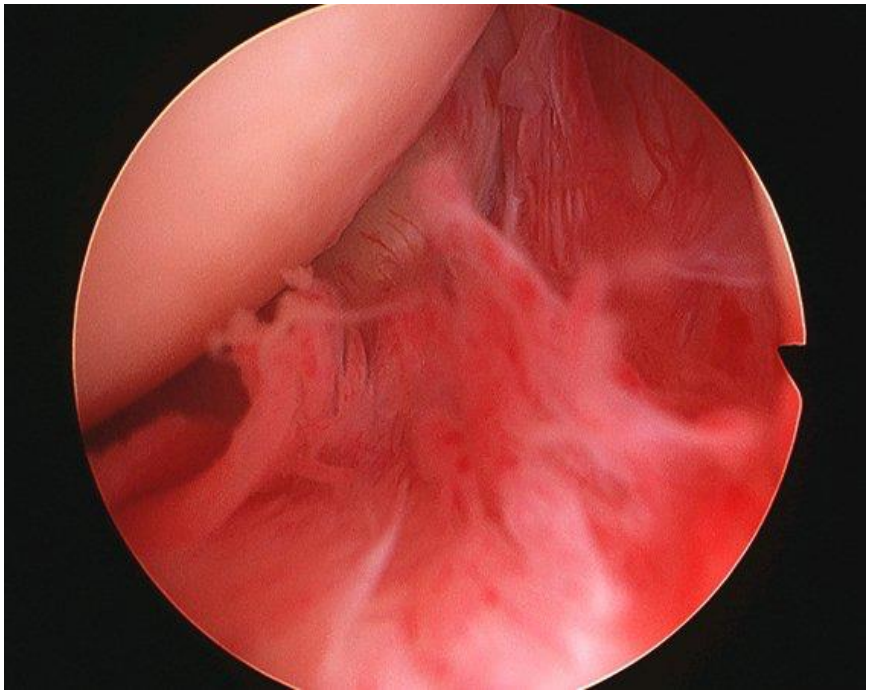




MRI Image of a Rotator Cuff Tear



Arthroscopic image of Adhesive Capsulitis



History – Mechanism of injury

- **Rotator cuff tear**
- Injury
- Overuse

- **Adhesive capsulitis**
- No known mechanism

History – Past medical history

Rotator Cuff Tear

- None pertinent

Adhesive Capsulitis

- Diabetes
- Female

History - Onset

Rotator Cuff Tendinitis

- Insidious
- Sudden

Adhesive Capsulitis

- Insidious
- Suddenly worse

Physical examination

- **Rotator cuff tear**
- Unable to raise arm actively, passive ROM is full

- **Adhesive capsulitis**
- Active and passive ROM is equal

Imaging?

- **Rotator cuff tear**
- MRI

- **Adhesive capsulitis**
- Not necessary

Treatment

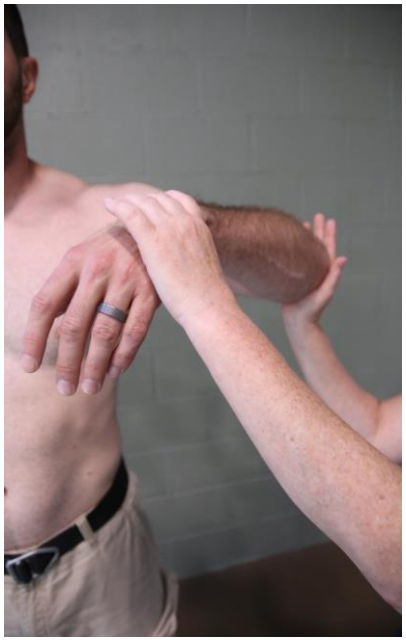
- **Rotator cuff tear**
- **Adhesive capsulitis**

Special shoulder tests

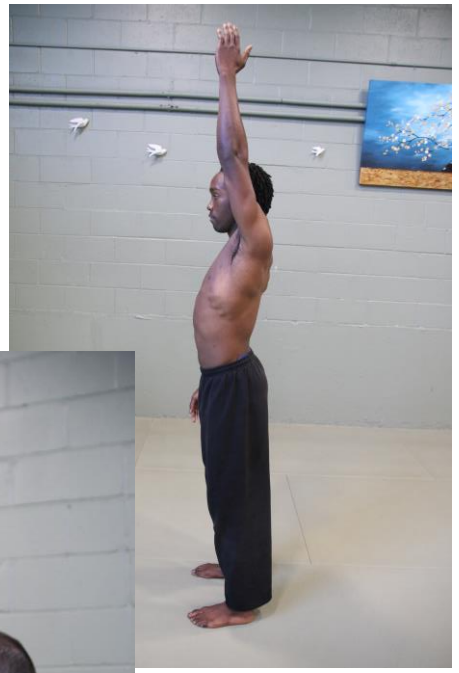
- Hawkins
- Neer
- Drop arm
- Empty can
- Infraspinatus

Hawkins Impingement Sign

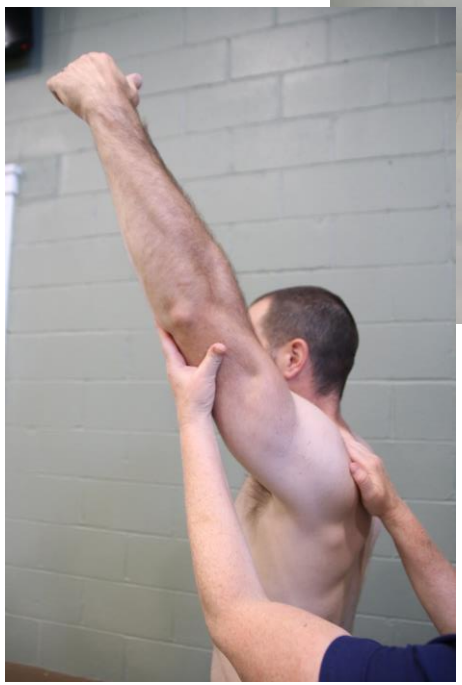
- Elevate shoulder to 90 degrees, flex elbow to 90 degrees, and place forearm in neutral
- Support arm and then internally rotate humerus
- Pain during this maneuver is a positive test indicating possible inflammation or rotator cuff tear

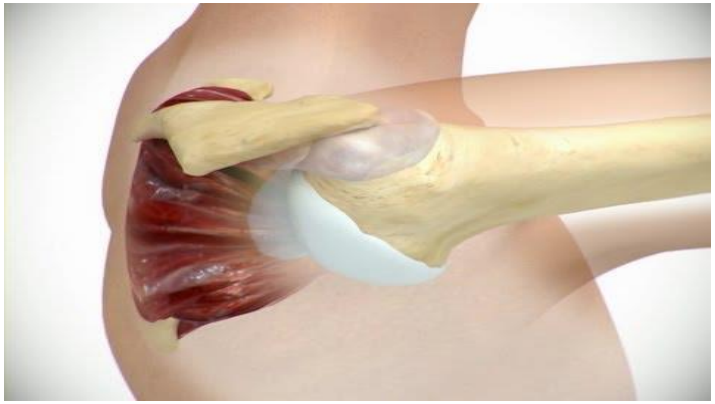


Neer Impingement Sign



- Elevate arm in forward elevation
- Depress scapula with other hand
- Pain may indicate possible inflammation
  - or rotator cuff tear

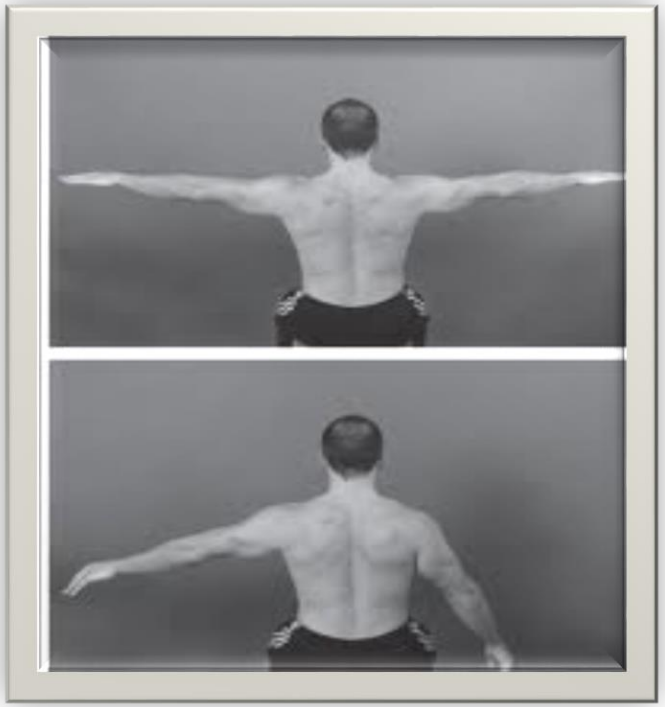




Drop Arm Sign

- Patient fully abducts arm to shoulder level (90 degrees) and lower slowly

- If patient cannot hold arm fully abducted at shoulder level or cannot control lowering arm = positive test (rotator cuff tear)



Empty Can Test (Supraspinatus Strength)

- Elevate arms to 90 degrees and internally rotate arms with thumbs pointing down.
- Ask the patient to resist you as you place downward pressure on arms
- Weakness = positive test (possible rotator cuff tear)

Belly press or lift off

- Tests subscapularis

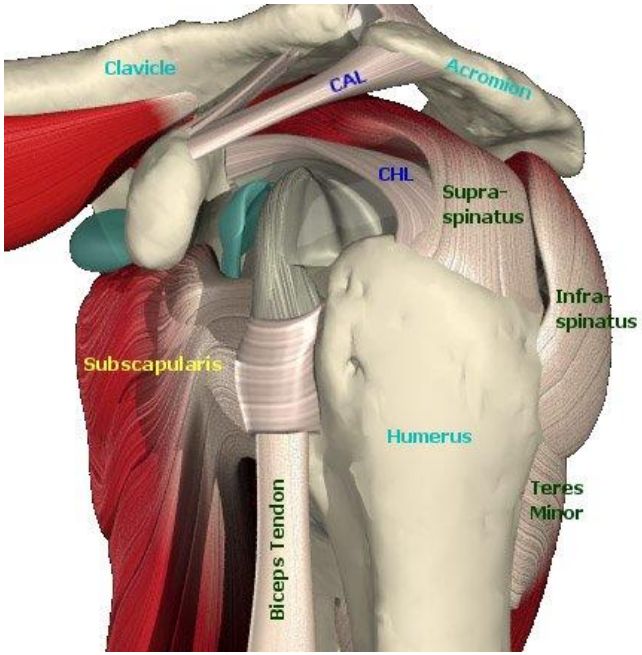
Infraspinatus Strength Test

- Arms at sides and flex the elbows to 90 degrees with thumbs turned up
- Provide resistance as the patient presses the forearms outward
- Weakness = positive test (possible rotator cuff tear or bicep tendonitis)

Shoulder

- Rotator cuff tendinitis
- Impingement syndrome
- Osteoarthritis
- Instability
- A-C separation
- Clavicle fracture

Rotator Cuff Tendinitis and Impingement



Definition / Background

- Inflammation of the tendons of the rotator cuff
- Continuum of tendinitis to tear
- Result of abduction and extreme external rotation and overuse

Clinical Symptoms

- Pain

- Decreased throwing velocity and accuracy
- Awakening with pain
- Progression to ROM decrease
  - Especially internal rotation
  - Abduction with external rotation

Tests

- Physical examination
  - ROM
  - Strength
  - Hawkins
  - Neer
- Diagnostic tests
  - X-rays
  - MRI

Adverse Outcomes

- Inability to practice, live without discomfort and play

Treatment

- Active rest
- Rotator cuff and peri-scapular strengthening
- Flexibility
- Core

Referral Red Flags

- Athletes
- Comfort level
- Not improving
- Weakness with muscle strength testing, likely rotator cuff tear

Osteoarthritis

Definition/Background

- Destruction of joint cartilage with loss of joint space
- Generally over 50

Clinical Symptoms

- Diffuse or deep pain
- Progressive ROM decrease
- Painful and difficult ADL’s

Tests

- Crepitus
- Decreased ROM
- With rotator cuff tear, less active than passive ROM[4]
- X-Rays
  - Decreased joint space
  - Osteophytes

- [4]Myrick, K (2016)

Adverse Outcomes

- Chronic shoulder pain
- Severe loss of strength and motion

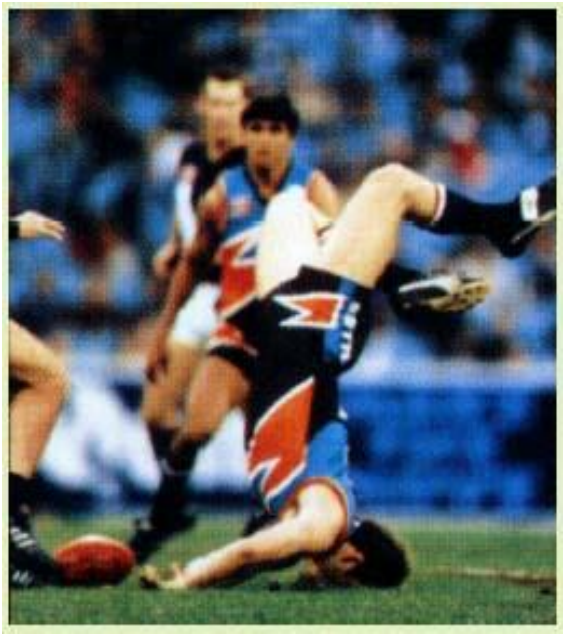
Treatment

- Non-operative
  - NSAIDS
  - PT
  - Corticosteroid injections
- Operative
  - Shoulder replacement

Referral Red Flags

- No improvement with conservative measures

Instability



Instability

- Classified by frequency of symptomatic episodes, as well as direction and degree of instability
- Episode can be partial, or complete
- Most traumatic dislocations are anterior
- Multidirectional instability

Definition / Background

- Mobile joint
- Anterior most common
- TUBS (Traumatic, Unidirectional, Bankart, Surgical)
- AMBRI (Atraumatic, Multidirectional, Bilateral, Rehab, Instability)

Clinical Symptoms

- Sensation of shoulder slipping out of joint

- Abduction external rotation

Tests

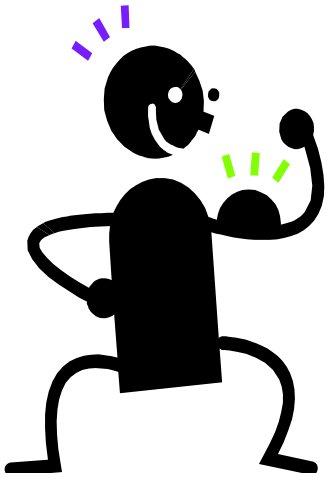
- Physical Examination
  - Apprehension sign
  - Generalized laxity
- Diagnostic Tests
  - X-rays
  - MRI
  - MRI arthrogram

Adverse Outcomes

- Axillary nerve injury
- Risk of recurrent instability

Treatment

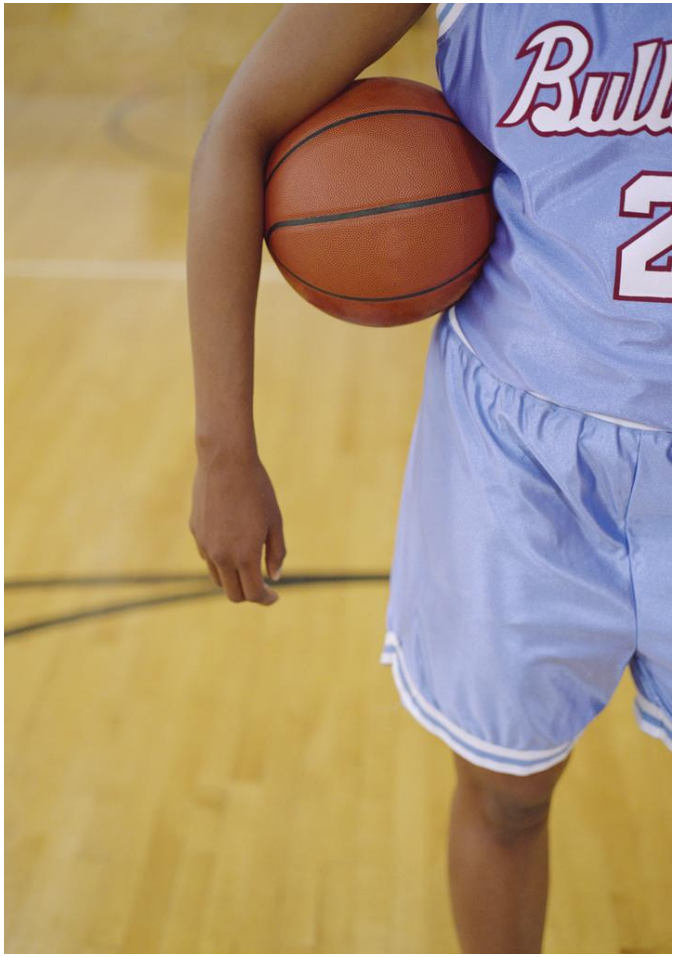
- PT
  - Strengthen periscapular muscles



Referral Red Flags

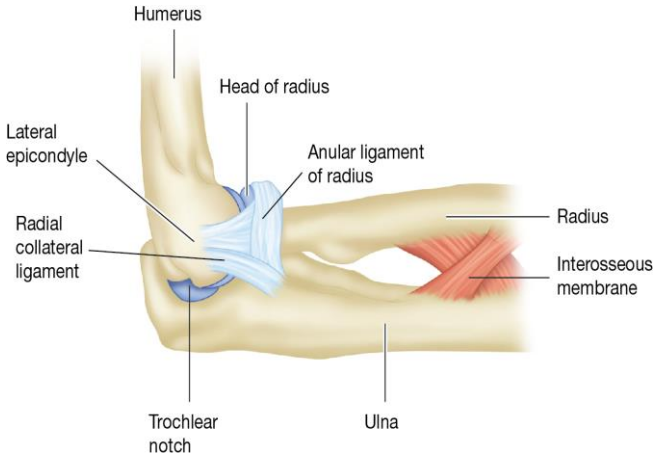
- First time traumatic dislocators
- Athletes

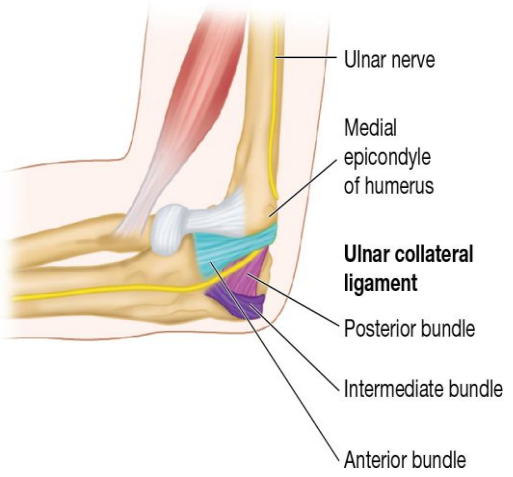
Elbow Forearm Hand



OVERVIEW OF ANATOMY AND PHYSIOLOGY OF THE MUSCULOSKELETAL SYSTEM

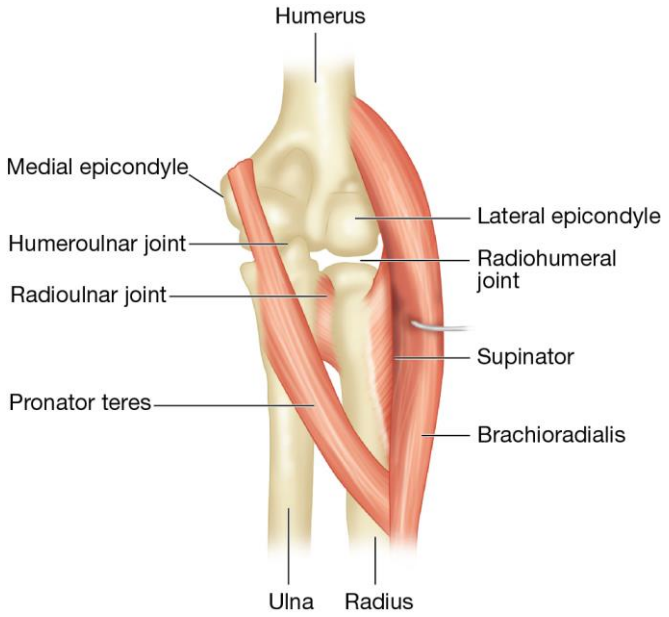
- THE ELBOW
  - Function
    - The elbow functions to position the hand in space and stabilize the lever action of the forearm.
  - Bones and Ligaments
    - The humerus, radius, and ulna bones of the forearm complete the hinge joint articulation of the elbow joint at three articulations: the humeroulnar joint, the radiohumeral joint, and the radioulnar joint.
    - Bones and ligaments of the elbow.





OVERVIEW OF ANATOMY AND PHYSIOLOGY OF THE MUSCULOSKELETAL SYSTEM

- THE ELBOW (CONT'D)
  - Muscles and tendons
    - The muscles and tendons that comprise and move the elbow are the biceps and brachioradialis, the brachialis, the triceps brachii, the pronator teres, the pronator quadratus anoconeus, and the supinator
    - The olecranon bursa is a thin sac of synovial fluid that cushions the olecranon process, helping the soft tissue structures to glide and move freely.



Elbow pain in the skeletally immature patient

- Osteochondral defect

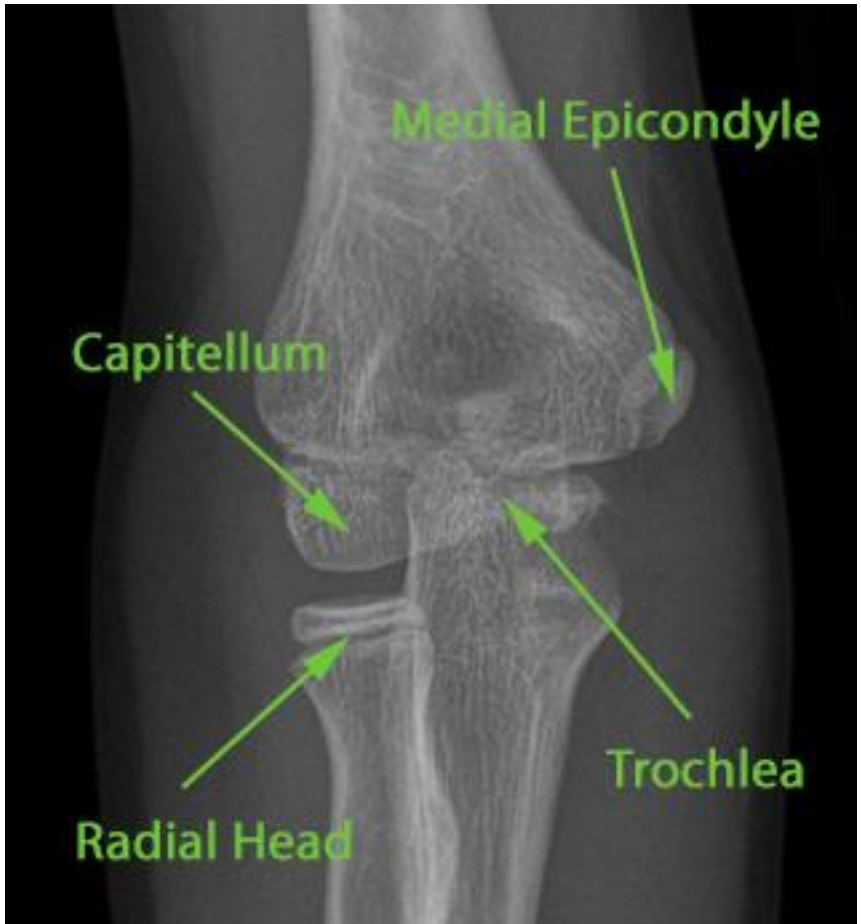
- Medial epicondyle apophysitis

History

- 7 attributes
- Activities

Imaging

- Comparison views?



Medial epicondyle apophysitis (Little Leaguer's Elbow)

Osteochondral defect (Panner's disease)

Location of Pain

- Lateral Elbow
  - Extensor origin of the muscles
  - Tennis elbow
  - Exacerbated by forearm supination and wrist extension against resistance
  - Lift chair with forearm pronated = pain, same test with forearm supinated = no pain

Location of Pain (Cont.)

- Medial Elbow
  - Usually one of two:
    - Ulnar nerve entrapment
    - Medial epicondylitis (golfers elbow)
  - Ulnar nerve
    - Cubital tunnel

Stiffness

- Normal elbow range of motion is 0 to 150 of flexion
- Normal forearm rotation is from 80 of pronation to 80of supination
- Predisposition to stiffness!
- Functional ROM 30 to 130, and 50 of pronation and supination

Physical Examination

Inspection and Palpation

- Anterior view
  - Swelling and ecchymosis
  - Carrying angle
  - Biceps tendon

Inspection and Palpation (Cont.)

- Lateral View
  - Effusion
  - Pain with palpation over laterial epicondyle
    - Lateral epicondylitis

Inspection and Palpation (Cont.)

- Medial View
  - Pain and tenderness just distal to medial epicondyle
    - Medial epicondylitis
  - Palpation and light percussion with paresthesias to p 4 and p 5
    - Ulnar nere entrapment

Inspection and Palpation (Cont.)

- Posterior View
  - Fullness over olecranon
    - Olecranon bursitis
  - Fullness above olecranon with hx of trauma or overuse
    - Olecranon fracture

Range of Motion

- Flexion Extension, Zero Starting Point
  - Children begin in hyperextension
  - 0 to 150

- Expression of limited ROM
  - “Elbow flexes from 30 to 90, or the elbow has a flexion contracture of 30 with further flexion to 90”

Range of Motion (Cont.)

- Forearm Rotation
  - Measure by stabilizing the arm against the chest wall and flexing the elbow to 90
  - Zero starting point is with thumb aligned with the humerus
  - 50 and 50

Muscle Testing

- Resisted Flexion
  - Maximum effort to flex supinated forearm
  - Tests flexors, especially biceps
  - Weakness
    - Biceps tendinitis or rupture
    - C5 C6 nerve roots

Muscle Testing

- Resisted Extension
  - Extensors of the elbow, primarily the triceps
  - Resist maximum effort to extend elbow with forearm in neutral position
  - Weakness with triceps tendinitis or rupture, or C7 or C8 nerve root lesions

Muscle Testing (Cont.)

- Resisted Supination
  - Test forearm supinators, biceps most powerful
  - Grasp forearm and resist patients maximal effort to turn palm up
  - Weakness with rupture or tendinitis of the biceps at the elbow, subluxation of the biceps at the shoulder, lesion of C5 C6
  - Pain with lateral epicondylitis

Muscle Testing (Cont.)

- Resisted Pronation
  - Forearm pronator strength
  - Grasp distal forearm, and resist pts effort to turn palm down
  - Weakness with rupture of pronator at origin of medial epicondyle, fracture of medial elbow, or lesions involving median nerve or C6 and C7
  - Pain with medial epicondylitis

Muscle Testing (Cont.)

- Resisted Wrist Flexion
  - Keep wrist flexed while you try to extend
  - Weakness with muscle rupture, medial elbow fracture, lesions of ulnar nerve C8 and T1, or median nerve C6 and C7
  - Pain with medial epicondylitis

Muscle Testing (Cont.)

- Resisted Wrist Extension
  - Ask patient to hold in extension, push into flexion
  - Weak with rupture of extensor origin, fracture of lateral elbow, lesion of radial nerve or C6 to C8
  - Pain with lateral epicondylitis

Tests

- Physical examination
  - ROM
  - Bony point tenderness
  - Swelling
  - Ecchymosis
- Diagnostic tests
  - X-rays
  - Comparison views
  - Fat pad and sail sign
    - Don’t miss radial head fxs!

Adverse Outcomes

- Growth disturbance
- Malunion
- Nonunion

Treatment

- Minimal immobilization

Referral Red Flags

- Most elbow fractures should be seen in consultation

Forearm Fractures

Background / Definition

- Distal third most common
- 20-40% all pediatric fractures
- Distal forearm uncommon before 4
- After age 10, fractures involving the growth plate more common

Clinical Symptoms

- FOOSH
- Pain
- Swelling
- Deformity

Tests

- Physical Examination
  - Bony point tenderness
  - Neurovascular status
  - Open fractures
- Diagnostic Tests
  - 3 views
  - Comparison views

Adverse Outcomes

- Reangulation
- Synostosis
- Growth arrest

Referral Red Flags

- Neurovascular compromise
- Angulation greater than 10-15
- Athletes
- Snuff box tenderness

Treatment

- Most closed
- Considerable remodeling
- Loss of rotational alignment only absolute indication for reduction and remanipulation

Hand

Overview

- Carpal tunnel syndrome, trigger finger,ganglion, CMC arthritis of the thumb, and fractures = most common hand and wrist problems in primary care

- History

- Handedness

Pain

- Location – 1 finger
  - Radial pain
    - Younger than 30 usually trauma
    - Posttraumatic tenderness
    - Radial styloid de Quervains
      - Finkelsteins
    - Intersection syndrome
      - Tenosynovitis of the radial wrist extensors
    - CMC arthritis
      - Pain base of thumb over 40
      - Grind test

Pain (Cont.)

- Dorsal
  - Radiocarpal arthritis
  - Associated with mass
    - Ganglion
  - Kienbock disease
    - Osteonecrosis of the lunate

Pain (Cont.)

- Volar
  - CTS
    - Numbness and tingling in radial three digits
  - Ganglion
    - Associated with mass
  - Tenosynovitis

Swelling

- Synovitis
  - Secondary to OA, infection, systemic inflammatory disease (RA, Gout)
  - History of trauma?

Weakness

- May be secondary to pain
- Without pain, suggestive of peripheral nerve entrapment
- Wasting of intrinsic muscles
- Ulnar nerve entrapment at the elbow will result in decreased grip and pinch strength and loss of sensation in p 4 and p 5

Numbness

- Median, ulnar, radial distribution
- Note provocative signs
  - Tinel
  - Phalen
  - Elbow compression test
- RULE OUT THE NECK!

Physical Examination

Inspection / Palpation

- Dorsum
  - Observe the alignment of the fingers
  - Look for swelling and synovitis
  - Note osteophytes or bony prominences
  - Muscle atrophy

Inspection / Palpation (Cont.)

- Palm
  - Atrophy of thenar muscles
    - median nerve innervated
  - Atrophy of hypothenar muscles
    - Ulnar nerve innervated
  - Note thickening of the palmar fascia
    - Dupuytren contracture
  - Pain over thumb MP joint
    - Arthritis or instability

Inspection / Palpation (Cont.)

- Side View
  - Palms facing eachother to visualize atrophy of thenar muscles
  - Joint swelling

Inspection / Palpation (Cont.)

- Wrist flexion / extension zero starting position
  - Normal palmar flexion 75 to 80
  - Normal palmar extension 75-85

Inspection / Palpation (Cont.)

- Wrist radial / ulnar deviation
  - Radial deviation 20 to 25
  - Ulnar deviation 35 to 40

Inspection / Palpation (Cont.)

- Finger flexion / extension
  - Finger joint motion occurs primarily in flexion – extension plane, with flexion accounting for most finger joint motion

Range of Motion

- Thumb opposition
    - Test tip of thumb to middle finger
- Thumb flexion / extenion

Muscle Testing (Cont.)

- Thumb abduction strength
  - Hand on table
  - Ask pt to abduct thumb
  - Resist your attempt to push it down to the table (abduction and extension)
  - Weakness indicates damage to motor branch of median nerve

Sensory Testing

- Median, ulnar and radial nerves
  - Median
    - Tip of thumb
  - Ulnar
    - Tip of small finger
  - Radial
    - Dorsum of thumb metacarbal

Sensory Testing (Cont.)

- Tinel
  - Lightly percuss the median nerve at the wrist flexion crease in line with the metacarpal of long finger
  - Reproductions of paresthias into the median nerve distribution is +

Sensory Testing (Cont.)

- Finkelstein
  - Test for de Quarvain tenosynovitis
  - Make fist, thumb inside fingers
  - Wrist into ulnar devaition
  - Pain = +

Sensory Testing (Cont.)

- Phalens
  - Test for CTS
  - Sharp flexion of wrists
  - Reproduction of symptoms before 60 seconds = +

Metacarpal and Phalangeal Fractures

Background / Definition

- Metacarpal fractures are more common with growth plate closure
- Phalangeal fractures are more common in children

Clinical Symptoms

- History of trauma
- Pain
- Deformity
- Swelling
- Ecchymosis

Tests

- Physical Examination
  - Swelling over fracture site
  - Depressed knuckle
  - Bony point tenderness
  - Rotational deformity
  - Neuro vascular exam
- Diagnostic Tests
  - X-rays

Adverse Outcomes

- Malunion
- Nonunion
- Growth arrest
- Loss of motion

Treatment

- Metacarpal neck fracture
  - 10, 20, 30, 40
- Nondisplaced fractures metacarpal and phalangeal shafts
  - 3-4 weeks casting or splinting
  - Include joint above and below
  - Early ROM to prevent stiffness

Referral Red Flags

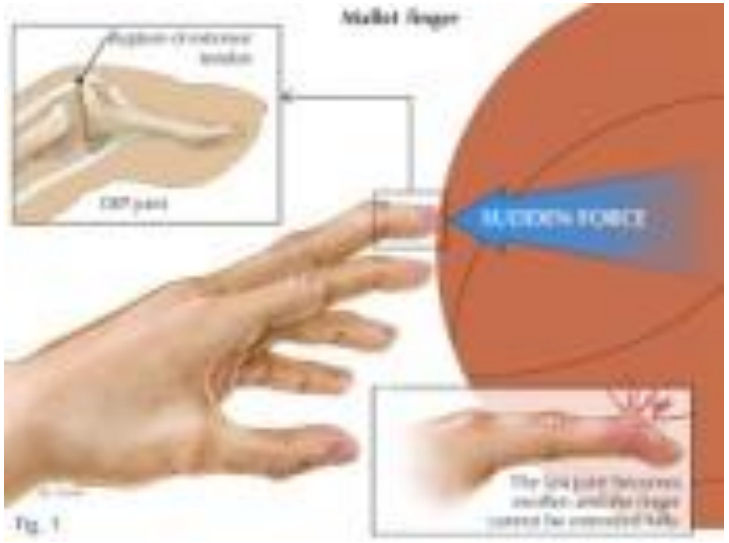
- Displaced fractures
- Dominant hand
- Athletes
- Intra-articular

Mallet Finger

Background / Definition

- Deformity caused by rupture, laceration or avulsion of the insertion of extensor tendon at base of distal phalanx

- Common in baseball, basketball



Clinical Symptoms

- Inability to straighten the finger tip

Tests

- Physical Examination
  - DIP joint in flexion
  - Patient unable to actively extend the joint
  - Passive extension possible
  - Not very painful
- X-rays
  - Rule out “bony” mallet

Adverse Outcomes

- Permanent flexion of the DIP

Treatment

- Continuous splinting of the DIP in extension is critical to restoring full function
- Can be volar or dorsal
- Acute – splint 6 weeks

Referral Red Flags

- Volar subluxation of the distal phalanx
- Bony mallet
  - Avulsed fragment
  - Involves more than 1/3 of the joint surface

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Thank you!