

Musculoskeletal Exams & Injections: Upper Extremity

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Disclosure

I have no financial interests or relationships
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OBJECTIVES

- ▶ Evaluate upper extremity injuries, diagnostic presentations and treatments
- ▶ Assess Dislocations
- ▶ Demonstrate proper treatments to patients
- ▶ Review injection techniques for the upper extremity

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ETIOLOGY

- ▶ Upper extremity injuries are commonly seen in the emergency room
- ▶ Common work-related injuries
- ▶ Swimming, tennis, golf, rowing, weightlifting and throwing sports

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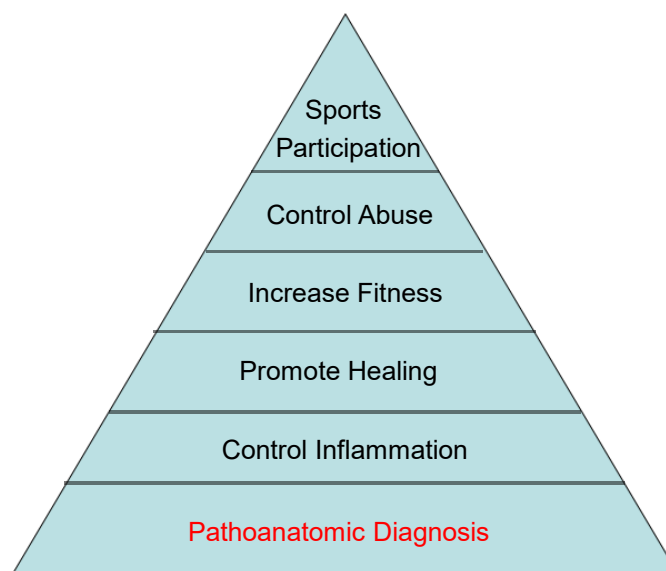
EVALUATION OF UPPER EXTREMITY



- ▶ History
- ▶ Physical exam
- ▶ Diagnostic tests
- ▶ Treatment pyramid

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INJURY TREATMENT PYRAMID



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HISTORY

- ▶ Onset
- ▶ Duration
- ▶ Activity/Mechanism
- ▶ Swelling /Ecchymosis
- ▶ Description of pain – (night pain?
pain with movement?)
- ▶ History of previous injury

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PHYSICAL



- ▶ Inspection
- ▶ Palpation
 - ▶ Soft tissue
 - ▶ Bony
- ▶ Range of motion
- ▶ Neurologic examination
- ▶ Special Tests
- ▶ Radiographs

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REGIONAL REVIEW

- ▶ Shoulder
- ▶ Upper arm
- ▶ Elbow
- ▶ Forearm
- ▶ Wrist and hand

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SHOULDER ANATOMY

- ▶ Rotator cuff tendon
- ▶ Glenohumeral Joint
- ▶ AC joint
- ▶ Shoulder capsule
- ▶ Biceps tendon
- ▶ Supporting musculature

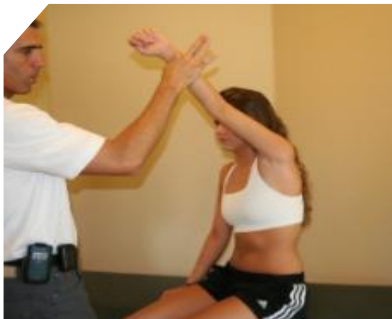
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SHOULDER INJURIES

- ▶ Rotator cuff tendinopathy
 - ▶ Swimming, baseball, laborers
 - ▶ Posterolateral pain, pain with internal and external rotation
 - ▶ Pain with “firing” of rotator cuff tendons
 - ▶ + “Jobe”/ “empty can” test

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SHOULDER INJURIES

- ▶ Impingement Syndrome
 - ▶ Older patients (50-70 y.o.)
 - ▶ Often noted after sleeping
 - ▶ Internal vs. external impingement
 - ▶ + “Hawkin’s” and “Neer’s” test

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SHOULDER DISLOCATION - THE MOST COMMON DISLOCATION YOU WILL SEE

- ▶ History:
 - ▶ Egyptian tombs
 - ▶ Hippocrates
- ▶ Accounts of 50% of major dislocations seen in ED
- ▶ Incidence: 1.7% population
 - ▶ Age: 20-30yrs: Male 9:1
 - ▶ Age: 61-80yrs: Female 3:1

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SHOULDER DISLOCATIONS: PRESENTATION

↓ Anterior: 95-98%....

Loss of deltoid curvature
Slight abduction/external rotation

↓ Posterior.....

Violent mechanism
Adduction/internal rotation

↓ Luxatio erecta.....
(inferior)

Arm over head

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SHOULDER DISLOCATIONS: COMPLICATIONS



- ▶ Associated fractures:
 - ▶ Hill-Sachs Deformity -
 - ▶ Compression fx results in a groove
 - ▶ In the posterolateral humeral head
- ▶ Bankart Lesions:
 - ▶ Fx of anterior rim of the glenoid fossa

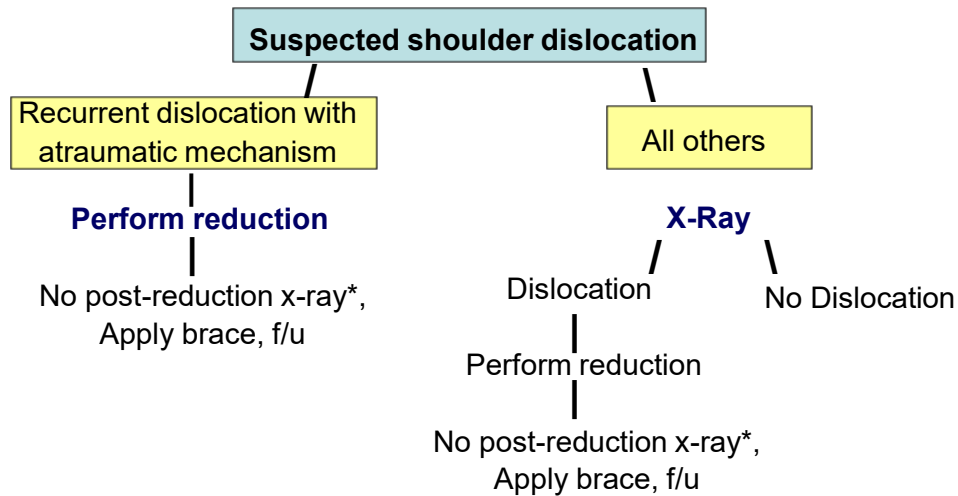
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SHOULDER DISLOCATION COMPLICATIONS:

- ▶ Rotator cuff tears
 - ▶ More common in elderly
- ▶ Axillary nerve injury: 3%
 - ▶ Document deltoid sensation
- ▶ Brachial plexus injury
 - ▶ Luxatio erecta: 3% vascular compromise rate

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SUGGESTED ALGORITHM FOR X-RAYS



****Post reduction x-ray not required if clinician comfortable with reduction***

Adapted from Hendey, GW, et al. J Emerg Med, 2006

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KEYS TO GOOD PHYSICAL EXAM

- ▶ Observation/inspection
- ▶ Active & passive ROM
- ▶ Strength testing
- ▶ Palpation
- ▶ Provocative testing
- ▶ Imaging

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INSPECTION INSIGHTS

- ▶ Glenohumeral rhythm
- ▶ Glenohumeral scapulothoracic rotation 2:1
- ▶ Atrophy – may indicate RC tear (56% sensitivity/73% specificity)



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RANGE OF MOTION

- ▶ Flexion - 180°
- ▶ Extension - 40°
- ▶ Abduction - 120°/180° (int/ext rotation)
- ▶ Adduction - 40°
- ▶ External rotation - 45°
- ▶ Internal rotation - 55°
- ▶ 30% sensitivity and 78% specificity for RC injury

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PALPATION POINTERS

- ▶ At rest and with motion
- ▶ Bony structures
- ▶ Joints
- ▶ Soft tissues
- ▶ AC joint – 96% sensitivity and 10% specificity

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STRENGTH

- ▶ Weakness can be cause and result
- ▶ Grade muscles groups on 0-5 scale
- ▶ Compare to other side
- ▶ Rotator cuff testing
 - ▶ Empty-can supraspinatus
 - ▶ Lift-off subscapularis
 - ▶ External rotation/infraspinatus

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EMPTY CAN SUPRASPINATUS

- ▶ Arm in 45° abd., 90° flex, internal rotation (thumb down, emptying can)
- ▶ Lift against resistance
- ▶ Positive if painful or weakness
- ▶ 44% sens. and 90% spec.



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LIFT-OFF SUBSCAPULARIS

- ▶ Patient sitting or standing
- ▶ Extension, adducted and back of hand against small of back
- ▶ Patient asked to “lift off” hand against resistance
- ▶ 62% sens. and 100% spec.



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EXTERNAL ROTATION/INFRASPINATUS STRENGTH

- ▶ Shoulder neutral
- ▶ Elbow flexed and against body
- ▶ Attempt external rotation against resistance
- ▶ 42% sens. and 90% spec.



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STRENGTH

- ▶ Rotator cuff
 - ▶ SITS
- ▶ Biceps
- ▶ Triceps
- ▶ Pectorals
- ▶ Neck



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ANTERIOR AND POSTERIOR DRAWER

- ▶ Instability
- ▶ Grasp humeral head, slide anterior and posterior while securing rest of shoulder
- ▶ + if greater than 50° displacement (graded 1-3)



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SPEED'S

- ▶ Long head of biceps
- ▶ Forward flex to 60°, thumb up
- ▶ Apply downward force to distal arm
- ▶ Pain = + test
 - ▶ Weakness w/o pain = m. weakness or rupture



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YERGASON'S TEST

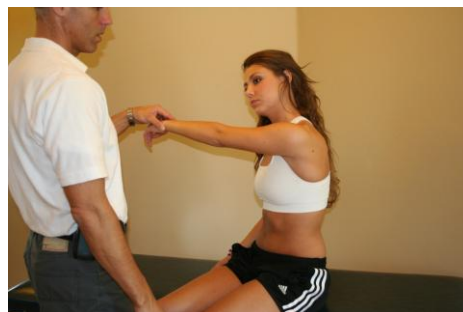
- ▶ Biceps tendon in bicipital groove
- ▶ Elbow flex to 90°, thumb up, pt. supine & flex against resistance
- ▶ Pain/painful pop = tendonitis/instability



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CROSS-BODY ADDUCTION

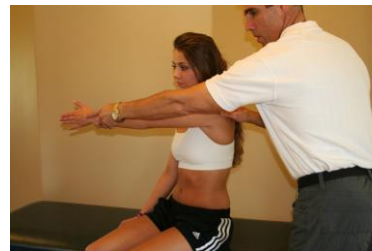
- ▶ Sitting
- ▶ Patient fully adducts across body.
- ▶ Positive if pain at AC joint
- ▶ 77% sens. and 79% spec.



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O'BRIEN'S COMPRESSION TEST

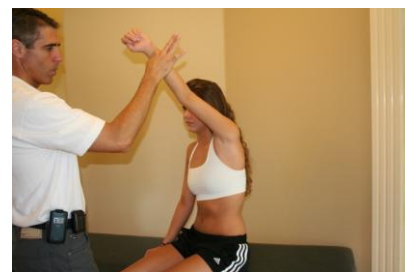
- ▶ Labral and AC etiologies
- ▶ Arm flexed to 90°, elbow extended, add 10-15°, resist downward force
- ▶ + if AC pain or internal pain/click
- ▶ Supination should be pain free



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NEER'S

- ▶ Int. rotation then forward flexion
- ▶ Reproduction of pain with flexion
- ▶ Impingement sign



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HAWKIN'S

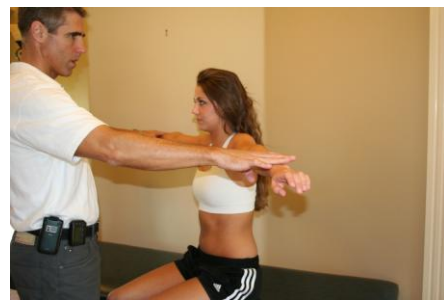
- ▶ “Pour the can” maneuver
- ▶ 90° of flexion of shoulder and elbow
- ▶ Internal rotation
- ▶ Painful movement
- ▶ 72% sensitivity
- ▶ 66% specificity



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DROP ARM TEST

- ▶ Rotator cuff tear
- ▶ Slowly lower fully abd. Arm
- ▶ At 90° abd. arm will suddenly drop, may add slight pressure
- ▶ + drop = + test
- ▶ 27% sens. and 88% spec.



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SPURLING TEST

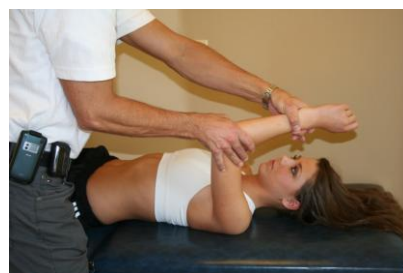
- ▶ Cervical root irritation
- ▶ Axial load on cervical spine in extension and rotation to affected shoulder
- ▶ + if neck, shoulder, or arm pain



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CRANK

- ▶ Glenoid labral tear
- ▶ Sitting and supine
- ▶ Elevate arm to 160° in scapular plane, apply load on humeral axis with rotation
- ▶ + if catches or painful



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LEVERAGE-CLICK TEST

- ▶ Anterior instability
- ▶ Abd. arm to 90-120° with patient supine, elbow secured with one hand axial load at shoulder with other
- ▶ + if audible/painful click is noted



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APPREHENSION

- ▶ Anterior and Posterior instability
- ▶ Shoulder at 90° abd., slight anterior pressure & ext. rot
- ▶ + test = dislocation
- ▶ Some false +
- ▶ 72% sens., 96% spec.



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RELOCATION

- ▶ After positive apprehension
- ▶ Apply post force while ext. rotation
- ▶ + test = increased ext. rot tolerance
- ▶ 81% sens., 92% spec.



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UPPER ARM INJURIES



- ▶ Biceps Tendinopathy
 - ▶ Vague anterior shoulder pain
 - ▶ Repetitive overhead activities
 - ▶ Positive Speed's and Yergason's test
- ▶ Triceps Tendinopathy
 - ▶ Repetitive elbow extension
 - ▶ Pain at posterior elbow and upper arm
 - ▶ Tenderness at insertion

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ELBOW INJURIES

- ▶ Lateral Epicondylitis
 - ▶ “Tennis Elbow”
 - ▶ Occurs in tennis, throwing sports, golf, swimming, etc.
 - ▶ Pain over lateral aspect of the elbow
 - ▶ Pain with wrist extension, gripping, and supination



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ELBOW INJURIES



- ▶ Medial Epicondylitis
 - ▶ “Golfer’s elbow”
 - ▶ Medial elbow pain
 - ▶ Occurs in golf, tennis, baseball, volleyball, etc.
 - ▶ Pain with palmar flexion, pronation, and sometimes elbow flexion

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ELBOW INJURIES



- ▶ Olecranon bursitis
 - ▶ Inflammation at bursa over olecranon
 - ▶ Direct trauma or chronic friction
 - ▶ Occurs in football, wrestling, volleyball, basketball, etc.
 - ▶ Fluctuant bulge posterior to olecranon process, decreased range of motion

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ELBOW INJURIES

- ▶ Cubital Tunnel Syndrome
 - ▶ Ulnar nerve entrapment at medial elbow
 - ▶ Second most common nerve entrapment
 - ▶ Occurs in throwing athletes, racquet sports, skiing, and weightlifters
 - ▶ Medial elbow pain, paresthesias along ulnar nerve, grip weakness
 - ▶ Positive Tinel's sign at elbow, sometimes nerve subluxation

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ELBOW DISLOCATIONS



- ▶ Most common dislocation in children
 - ▶ Second most common in adults
- ▶ 90% are posterior
- ▶ FOOSH mechanism
- ▶ Presentation: ---it's a doorway diagnosis

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NURSEMAID'S ELBOW

- ▶ Subluxation of the radial head
 - ▶ Really, it's a slippage of the head of the radius under the annular ligament.
- ▶ Peak age 1-4
- ▶ X-rays not needed - with a good history
- ▶ How do you reduce?
- ▶ - flex and supinate? OR flex and pronate?

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FOREARM INJURIES

- ▶ Pronator Syndrome
 - ▶ Compression of median nerve just distal to elbow
 - ▶ Occurs in activities with repetitive pronation like throwing sports, racquet sports, weightlifting, archery, rowing, etc.
 - ▶ Insidious onset of pain at proximal forearm
 - ▶ May radiate, numbness and paresthesias along median nerve

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WRIST AND HAND INJURIES



- ▶ De Quervain's Tenosynovitis
 - ▶ Stenosis around tendons in first dorsal compartment of the wrist
 - ▶ More common in women
 - ▶ Pain at wrist near thumb (dorsoradial)
 - ▶ Positive Finkelstein's test

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WRIST AND HAND INJURIES



- ▶ Carpal Tunnel Syndrome
 - ▶ Compression of median nerve
 - ▶ Usually after age 30
 - ▶ More common in women
 - ▶ Repetitive motions of hands and wrist
 - ▶ Racquet sports, driving, vibratory tools, typing
 - ▶ Positive Phalen's, Tinel's, and carpal compression tests

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WRIST AND HAND INJURIES



- ▶ Guyon's canal syndrome
 - ▶ Chronic repetitive insults to the hypothenar area
 - ▶ Most common in cycling and weightlifting
 - ▶ Entrapment of ulnar nerve at the wrist
 - ▶ Weakness and paresthesia in ulnar distribution

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WRIST AND HAND INJURIES

- ▶ Trigger finger
 - ▶ Stenosing tenosynovitis of flexor tendons
 - ▶ Pain at PIP joint (A1 pulley)
 - ▶ Nodule may be palpated, digit locks then “triggers”

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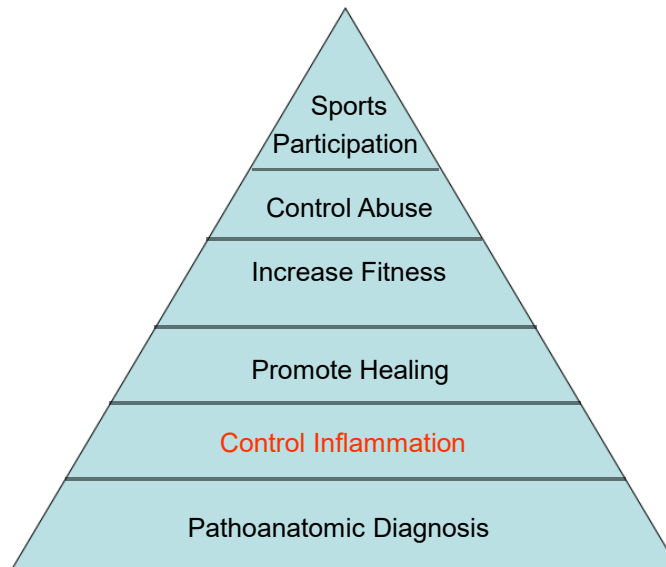
DIAGNOSTIC TESTS



- ▶ X-rays
- ▶ CT scans
- ▶ US
- ▶ MRI
- ▶ Nerve conduction test

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INJURY TREATMENT PYRAMID



Nonpharmacologic and Pharmacologic Management of Acute Pain From Non-Low Back, Musculoskeletal Injuries in Adults: A Clinical Guideline From the American College of Physicians and American Academy of Family Physicians
Annals of Internal Medicine
Volume 173 • Number 9 • 3 November 2020
Pages: 739 - 748

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CONTROL INFLAMMATION



- ▶ PRICEMM
 - ▶ Protection
 - ▶ Rest
 - ▶ Ice
 - ▶ Compression
 - ▶ Elevation
 - ▶ Medications
 - ▶ Modalities

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TREATMENT OPTIONS



- ▶ Bracing
 - ▶ May be helpful
 - ▶ Seems to be beneficial in De Quervain's, tennis elbow and carpal tunnel
 - ▶ SORT evidence category B
- ▶ Activity Modification
 - ▶ No clear recommendations
 - ▶ Widely accepted
 - ▶ SORT evidence category C

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TREATMENT OPTIONS



- ▶ Cryotherapy
 - ▶ Acute relief of pain
 - ▶ Widely accepted
 - ▶ Repeated applications of melting ice through a wet towel for 10 minutes is most effective
 - ▶ SORT evidence category B

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TREATMENT OPTIONS

- ▶ NSAIDs
 - ▶ Good for short term pain relief
 - ▶ No good long-term outcomes
 - ▶ Widely used
 - ▶ Unclear whether NSAIDs work better than other analgesics
 - ▶ SORT evidence category B

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TREATMENT OPTIONS



- ▶ Oral Corticosteroids
 - ▶ Widely used by some
 - ▶ Evidence of improvement in carpal tunnel syndrome
 - ▶ Variable results based on area
 - ▶ Consider side effects

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TREATMENT OPTIONS



- ▶ Locally injected Corticosteroids
 - ▶ Widely used and accepted
 - ▶ Many precautions
 - ▶ Effective in carpal tunnel and tennis elbow. May be partly effective in others
 - ▶ No evidence to show long-term outcome improvements
 - ▶ SORT evidence category B

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TREATMENT OPTIONS



- ▶ Physical Therapy Modalities
 - ▶ Ultrasound, Iontophoresis, Phonophoresis
 - ▶ Uncertain of the benefit
 - ▶ Widely accepted by most
 - ▶ SORT evidence category B
 - ▶ Eccentric strengthening
 - ▶ Effective in reversing degenerative changes
 - ▶ Becoming more accepted
 - ▶ SORT evidence category B

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TREATMENT OPTIONS



- ▶ Shock wave therapy
 - ▶ Mixed results for tendinopathies
 - ▶ Appears to be safe but expensive
 - ▶ Increases inflammatory process
- ▶ Surgery
 - ▶ Effective on well selected patients who have failed 3-6 months of conservative management

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INJURY TREATMENT PYRAMID



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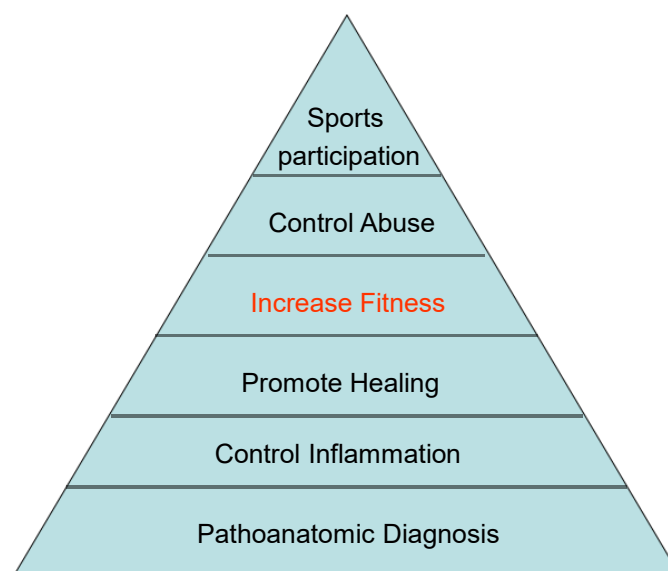
PROMOTE HEALING



- ▶ Rehabilitative exercise
 - ▶ Enhance tissue oxygenation and nutrition
 - ▶ Restore normal ROM, strength and flexibility
- ▶ Cardiovascular conditioning
 - ▶ Increase perfusion, neurologic stimulus, minimize weakness, minimize psych. effect, control weight
- ▶ Indications for surgical intervention
 - ▶ Above failed, weakness, atrophy and/or persistent pain

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INJURY TREATMENT PYRAMID



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INCREASE FITNESS



- ▶ Prepare for increased demands of sports
- ▶ Sport-specific rehabilitative exercise
 - ▶ Interval training
 - ▶ Plyometrics
 - ▶ Interactive eccentric/concentric loading
 - ▶ Anaerobic sprints

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INJURY TREATMENT PYRAMID



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CONTROL ABUSE

- ▶ Control force loads to the previously injured tissue
 - ▶ Improving the athlete's sport technique
 - ▶ Bracing and/or taping
 - ▶ Controlling the intensity and the duration
 - ▶ Appropriately modifying equipment

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INJURY TREATMENT PYRAMID



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RETURN TO SPORT

- ▶ Criteria to return to play
 - ▶ Full and pain free range of motion
 - ▶ Injured extremity demonstrates 80-90% of the strength of the uninjured extremity
 - ▶ Athlete successfully demonstrates sport-specific function
 - ▶ The athlete is psychologically ready

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CONCLUSION



Overuse injuries to the upper extremity are common



Overuse injuries occur at multiple areas in the upper extremity



Repetitive microtrauma causes overuse injuries



Successful treatment is based on area of injury and usually conservative management

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SHOULDER

Subacromial Space

- ▶ Enter at or medial to corner of acromion
- ▶ Direct needle parallel to acromion (some say “hit” it)
- ▶ Depth 3 cm
- ▶ 1-2 cc steroid
- ▶ 4 - 9 cc Lidocaine +/- Sensorcaine
- ▶ 22-23 gauge 1.5" needle



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SHOULDER

Glenohumeral Joint

- ▶ Same point of entry BUT now aim needle for the coracoid process
- ▶ Depth 2 -3 cm
- ▶ ~1 cc steroid
- ▶ 3 - 8 cc Lidocaine
- ▶ 22-23 gauge 1.5" needle

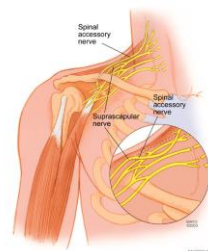


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SHOULDER

Glenohumeral Joint

- ▶ Why posterior?
 - ▶ brachial plexus
 - ▶ axillary artery



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SHOULDER

Acromioclavicular Joint

- ▶ Identify groove with finger and mark
- ▶ Direct needle straight down into joint, ~1 cm depth
- ▶ 0.5cc – 1cc steroid
- ▶ 1 -2 cc Lidocaine
- ▶ 25 gauge .5 - 1" needle



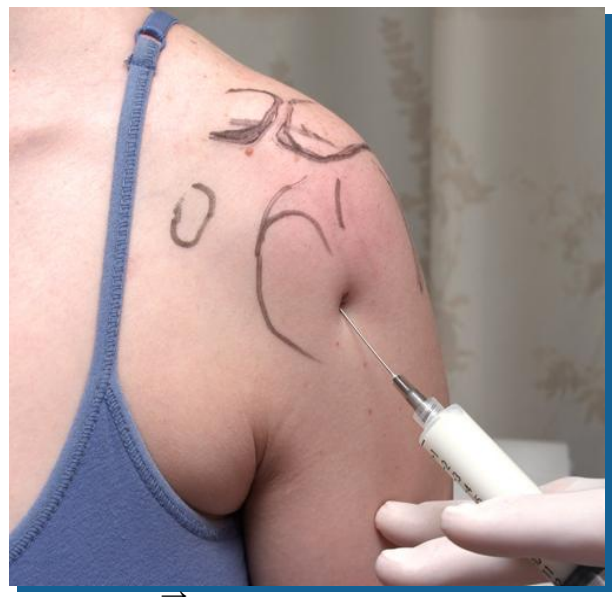
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SHOULDER

Bicep Tendon

(Warning: Most Commonly Ruptured Muscle/Tendon)

- ▶ Identify bicipital groove (intertubercular sulcus) by internally and externally rotating arm, mark
- ▶ Direct needle upward at shallow angle, parallel to tendon
- ▶ The needle tip is at the tendon when resistance increases. Withdraw slightly while applying gentle pressure to inject
- ▶ 0.5cc – 1cc steroid
- ▶ 1 -2 cc Lidocaine
- ▶ 25 gauge .5 - 1" needle

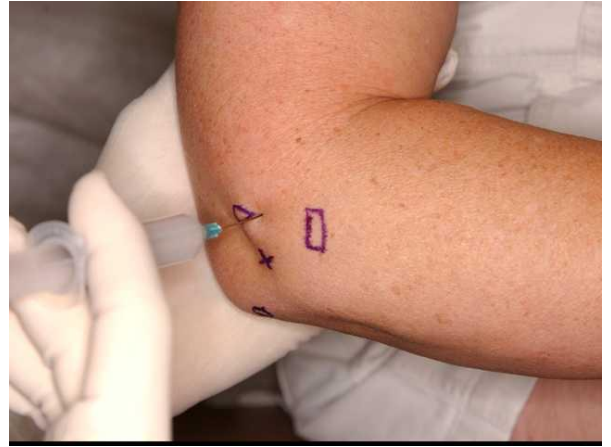


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ELBOW

Epicondylitis

- ▶ Frequency: Lateral >> Medial
- ▶ Inject the MTP (peri-tendon), not the epicondyle
- ▶ May inject medication in fan-like distribution in area of pain. Tent skin?
- ▶ 0.5cc – 1cc steroid
- ▶ 1cc - 2cc Lidocaine
- ▶ 25 gauge .5 - 1" needle



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ELBOW

Olecranon Bursa

- ▶ Cause: Infection vs Trauma vs Gout?
- ▶ Aspiration: 18 - 20 gauge, 1.5" needle, 1-3 cm depth
- ▶ If fluid is cloudy or history suspicious, then send culture
- ▶ If non-infectious, consider injection:
 - ▶ 0.5 - 1cc steroid
 - ▶ 1 - 2cc Lidocaine



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ELBOW

Elbow Joint Aspiration

- ▶ Used to aspirate hemarthrosis and to instill lidocaine (to check for mechanical block) after radial head fracture
- ▶ Enter at mid-triangle, just inferior to lateral epicondyle
- ▶ Depth ~1cm
- ▶ Aspiration: 18 - 20 gauge, 1.5" needle
- ▶ 3-5 ml Anesthetic



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WRIST AND HAND

Carpal Tunnel Syndrome

- ▶ Enter at distal crease. Avoid the Palmaris longus tendon (enter ulnar to tendon) and veins!
- ▶ Direct toward middle finger at ~45 degrees; ~1-2 cm depth
- ▶ Withdraw if finger pain or paresthesias
- ▶ 22-25 gauge, 1.5" needle
- ▶ 0.5 - 1 cc steroid
- ▶ ~1 cc Lidocaine

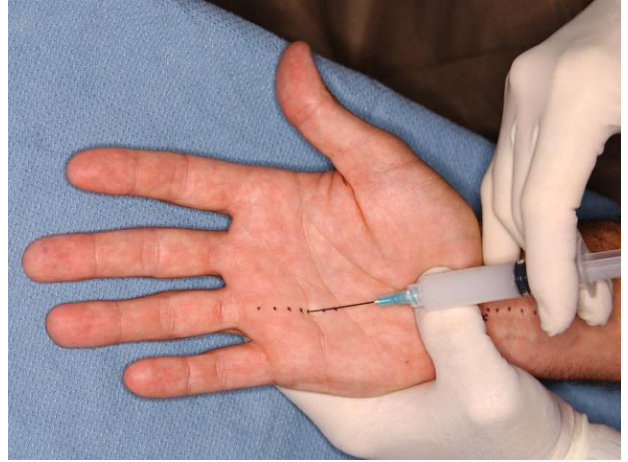


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WRIST AND HAND

Trigger Finger

- ▶ Enter at distal crease with bevel up.
- ▶ Direct at shallow angle, parallel to tendon, and toward fingertip.
- ▶ The needle tip is at the tendon when it moves with finger movement. Withdraw slightly, slightly flex finger, and inject.
- ▶ 25 gauge, 1 -1.5" needle
- ▶ 0.5 cc steroid
- ▶ 0.5 cc Lidocaine



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WRIST AND HAND

DeQuervain's Tenosynovitis

- ▶ MTP is usually the Abductor pollicis longus at the radial styloid. (recall snuffbox)
- ▶ Wrist should have slight ulnar bend
- ▶ May direct toward or away from fingers. Technique is similar to trigger finger
- ▶ 25 gauge, 1- 1.5" needle
- ▶ 0.5 - 1cc steroid
- ▶ 0.5 - 1cc Lidocaine



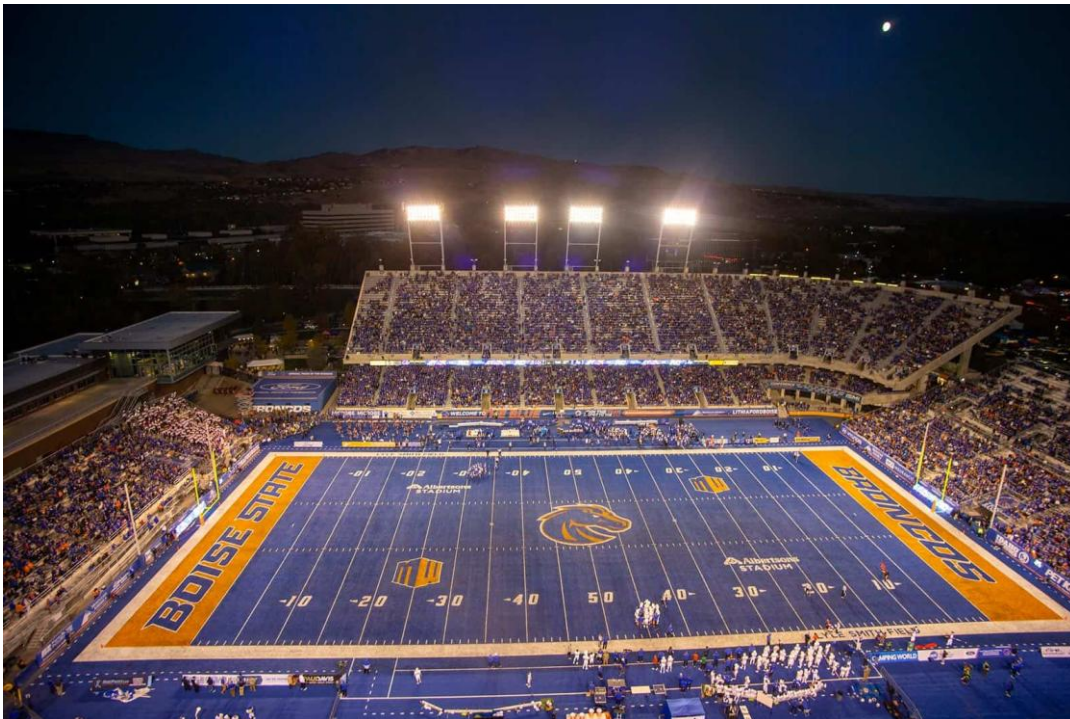
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PRP INJECTIONS

- ▶ Not FDA approved
- ▶ Effective on tendons and soft tissues (Epicondylitis)
- ▶ Extensive use in Sports Medicine
- ▶ Safe
- ▶ Ultrasound guided
- ▶ Most insurances do not cover, Cost \$500-1500



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