**Ultrasound of the Elbow**

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**Educational Objectives**

- Following the presentation, participant should be able to:
  - Outline approach to scan the major structures at the elbow
  - Identify important bone landmarks, tendons, nerves, and muscles at the elbow
  - Identify common abnormalities at the elbow (joint effusion, tendinosis)

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**Musculoskeletal Ultrasound Technique**

- High frequency linear transducers
- 7MHz or higher
- Hockey stick (15-17 MHz) useful for imaging smaller tendons, joints, ligaments
- Thick gel

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**MSK Ultrasound scanning technique**

- In transverse view  
  - Head of the probe is directed towards the examiner, along the short axis of the structure  

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**MSK US Scanning Technique**

- the patient is examined with you standing at the patient’s right side
- in Sagittal view  
  - notch of the probe to the “North” (directed proximally) along long axis of the structure

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**Disclosures**

None
Appearance of Normal Tendons
• echogenic
• fibrillar, striated pattern in long axis
• no internal vascular flow
• Anisotropy – artifact, tendon appears hypoechoic (when beam not perpendicular to structure)

Normal Ligaments
• hyperechoic
• striated texture, similar to tendons
• identified by osseous attachment sites

Peripheral Nerves

Normal Nerve
• hypoechoic nerve fascicles (honeycomb in transverse)
• less anisotropy compared with tendons

Scanning of the Elbow
• Anterior – biceps tendon, joint effusion, radial nerve, posterior interosseous nerve (PIN)
• Lateral - common extensor tendon, ligaments, PIN
• Medial - common flexor tendon, ligaments, ulnar nerve
• Posterior – triceps tendon, joint effusion, olecranon bursitis

Anterior Elbow – Distal Biceps Tendon
• patient with elbow extended
• biceps - lateral to brachial artery
• If examined in long axis, press distal end of probe into patient to decrease anisotropy
Medial approach to scanning distal biceps tendon

- elbow flexed, forearm supinated
- transducer parallel to humerus and moved distally
- brachial artery serve as “window”
- can ask patient to supinate/pronate


Anterior Elbow - Joint recess

Anterior/Lateral Elbow – Radial nerve and Posterior Interosseous Nerve (PIN)

Anterior/Lateral Elbow – Posterior Interosseous Nerve (PIN) Entrapment

- may have pain and tenderness mimicking lateral epicondylitis
- weakness in extensors of wrist/fingers
- caused by compression by fibrous band, mass, etc. in prox. forearm
- US: nerve enlarged ± abnormally hypoechoic proximal to point of entrapment

PIN Entrapment

Normal PIN
**Lateral Elbow- Common Extensor Tendon (CET) Origin**

- can scan with patient elbow in flexion, internal rotation (below)
- start with probe in long axis of common extensor tendon
- cranial edge of probe over the lateral epicondyle of the humerus

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**Normal Common Extensor Tendon Origin**

- echogenic
- fibrillar appearance
- no vascular flow

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**Lateral Epicondylitis “Tennis Elbow”**

- Tendinosis of common extensor tendon origin
  - Thickening
  - Heterogeneity, hypoechoic
  - Increased color Doppler flow
  - Calcifications
  - Partial tears (anechoic defects)

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**Tendinosis of Common Extensor Tendon (“tennis elbow”)**

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**Tendon Tears**

- anechoic/hypoechoic defects
- loss of tendon volume
- partial thickness or full thickness
- tendon retraction (usually in full thickness tears)

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**Partial Tear of Common Extensor Tendon**

- partial thickness
- anechoic/hypoechoic defect
**Lateral Elbow - Ligaments (deep to common extensor tendon)**

- Radial Collateral Ligament
- Ample Ligament: Accessory Ectate
- Lateral Ulnar Collateral Ligament

**Normal Radial Collateral Ligament**

- Echogenic radial collateral ligament blends with overlying common extensor tendon
- Humerus (lateral epicondyle)

**Radial Collateral Ligament Tear**

- Ultrasound findings

**Medial Elbow - Common Flexor Tendon Origin**

- Forearm in external rotation
- Cranial aspect of probe over the medial epicondyle of the humerus
- Start with probe in long axis of tendon

**Medial Elbow - Medial Epicondylitis “Golfer’s Elbow”**

- Tendinosis of common flexor tendon origin
- US findings: tendinosis - same as lateral epicondylitis
Medial Elbow Ligaments – ulnar collateral ligament (UCL)

- deep to the common flexor tendon
- apply valgus stress - demonstrate joint space widening in cases of ligament laxity/tear

Normal Ulnar Collateral Ligament (UCL)

humerus (medial epicondyle)
common flexor tendon
UCL
humerus (trochlea)
ulna

Medial elbow- Ulnar Collateral Ligament (UCL)

- anterior band of UCL most important stabilizer against valgus stress
- injury common in throwing athletes
  – Baseball pitchers

Ulnar Collateral Ligament Tear

- anechoic/hypoechoic defect
- most important diagnostic criterion is response to valgus stress
- normal ulnohumeral joint space increases up to 2 mm with stress
- > 2 mm increase implies UCL insufficiency/laxity
- laxity - must be > 1 mm difference compared with normal side

The Pitching Motion

Valgus Stress on Elbow
Acute Pain in a Javelin Thrower
UCL Tear (valgus stress)

UCL tear with laxity

Full Thickness UCL Tear
(proximal attachment)

Medial Elbow – Ulnar Nerve
examine first in short axis:
- distal arm
- at the elbow between the medial epicondyle and olecranon
- in cubital tunnel between the heads of the FCU muscle

Medial Elbow – Ulnar Nerve
Abnormalities
- patient may have medial elbow pain and/or symptoms in the ring and small finger
- compression syndromes
  - Cubital tunnel (elbow)
- subluxation/dislocation of the nerve
- tumors

Medial Elbow - Ulnar Nerve
Cross Sectional Area
Cubital Tunnel Syndrome

Ulnar Nerve Subluxation
- seen on elbow flexion
- occurs in 15% of normals

Ulnar Nerve Dislocation
- elbow flexed, hand on table
- triceps tendon
- deep to the triceps is the posterior recess of the elbow joint (should be echogenic fat pad)
- olecranon bursa over the triceps insertion (use light pressure)

Posterior Elbow - Joint Effusion

Posterior Elbow Intra-articular Body
Triceps Tendon Rupture

Olecranon Bursitis

US Guided Elbow Procedures
- diagnostic joint aspirations, intra-articular corticosteroid injection
- percutaneous needle tenotomy for tendinosis, PRP injection

Conclusions
- Ultrasound is an excellent problem solving tool in the elbow
- Excellent in evaluation of tendons, ligaments, nerves
- Important complementary test to MRI
- Main advantages
  - spatial resolution
  - dynamic studies
  - image guided interventions

Thank you!