Objectives

- To demonstrate musculoskeletal pathologies requiring:
  - Joint movement or positioning
  - Muscle contraction

Shoulder:

- Biceps brachii tendon dislocation
- Impingement
- Adhesive capsulitis
- Acromioclavicular joint subluxation

Biceps Brachii Tendon:

- Subluxation:
  - Partially perched on lesser tuberosity

- Dislocation:
  - Empty bicipital groove
  - Simulates biceps tendon tear
  - Associated subscapularis tears, pulley injury

Farin et al. Radiology 1995; 195:845
**Biceps Tendon Dislocation**

**Impingement: bursal fluid**
- Abnormal pooling of subacromial-subdeltoid bursal fluid
- Lateral acromion¹:
  - Coronal plane, active arm elevation
  - Not visible in neutral position, no cuff tear
- At coracoid²:
  - Axial plane, active elevation internal rotation

¹Farin et al. Radiology 1990; 176:845
²Stallenberg et al. AJR 2006; 187:804

**Subacromial-subdeltoid Bursa (blue)**

**Impingement Test**

**Impingement: supraspinatus**

**Subacromial Impingement**
- Thickened tendon or bursa
  - Possible snapping of thickened bursa
  - “Gathering” of bursa: may be asymptomatic¹
- Superior movement of humeral head
  - Possible contact between humerus and acromion²

¹Daghir A et al. Skeletal Radiol 2012; 41:1047
²Bureau N et al. AJR 2006; 187:216
Impingement: supraspinatus

Subacromial Impingement: anterior

Impingement: osseous

Adhesive Capsulitis:
- Frozen shoulder
- Gradual limitation in motion
- Incidence 2 – 5%
- Diabetic (insulin dependent): 30%
- Associations: female, trauma, >40 years old, diabetes, immobilization, thyroid disease, stroke, MI, autoimmune disease

Griesser, et al, JBJS 2011; 93:1727

Adhesive Capsulitis:
- Sensitivity 91%, specificity 100%, accuracy 92%

**Acromioclavicular Joint:**

- **Dynamic evaluation:**
  - Clinical sign “cross-arm”
  - Ipsilateral hand to opposite shoulder: pain
- **Normal:**
  - Maneuver: ACJ narrows <1 mm, no pain
  - Rest: widens back to normal (up to 5 mm)

**Elbow:**

- Ulnar nerve dislocation
- Snapping triceps syndrome
- Ulnar collateral ligament tear

**Ulnar Nerve Dislocation**

- Occurs in elbow flexion
- Reduces in extension
- Nerve irritation, predisposes to injury
- Found in 20% asymptomatic volunteers

*Okamoto, J Hand Surg 2000; 25B:85*
Snapping Triceps Syndrome

- Ulnar nerve and medial triceps dislocate over apex of medial epicondyle
- Ulnar nerve and medial triceps remain in contact with each other
- Palpable snap felt through transducer

Radiology 2001; 220:601

Snapping Triceps Syndrome: dynamic imaging

Ulnar Collateral Ligament: partial tear

Ulnar Collateral Ligament: valgus stress

- >1 mm asymmetric gapping = 87% accuracy in diagnosis of UCL tear
  - MR arthrography accuracy = 88%
  - US + MR arthrography: accuracy = 98%
- Asymmetric joint space widening with stress:
  - Normal: 1.3 mm or less
  - Partial tear: 1.2 – 3.0 mm
  - Full thickness tear: 2.8 – 4.8 mm

Roedl JB et al. Radiology 2016

Ulnar Collateral Ligament: laxity

With valgus stress
**Ulnar Collateral Ligament: complete tear**

**Wrist and Hand:**
- Tendon abnormalities:
  - ECU dislocation
  - Boxer knuckle
  - Pulley tear
  - Trigger finger

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**Extensor Carpi Ulnaris:**
- 6th extensor wrist compartment
- Asymptomatic subluxation
  - Supination
  - Up to 50% out of groove
  - No tear or tenosynovitis

Lee KS et al. AJR 2009; 193:651

**Dislocation: extensor carpi ulnaris**

**Boxer Knuckle:**
- Damage to the sagittal bands of extensor hood
  - Transverse orientation
- Extensor tendon subluxation or dislocation with finger flexion

Lopez-Ben et al. Radiology 2003; 228:642
Pulley Tear

- A2 and A4 pulleys: most important
- Sagittal image
  - Bowstringing
  - Hypoechoic edema / hemorrhage
- Dynamic evaluation*

*Radiology 2002; 222:755

A2 – 4 Pulley Injury

<table>
<thead>
<tr>
<th>Pulley</th>
<th>Proximal Phalanx</th>
<th>Middle Phalanx</th>
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<tbody>
<tr>
<td>Normal</td>
<td>Normal</td>
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A4 Pulley Injury: bowstringing

<table>
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Normal: < 1 mm; incomplete rupture: 1 – 3 mm; complete: 3 mm

Trigger Finger:

- Stenosing tenosynovitis: A1 pulley
- Thick and hypoechoic pulley
- Hyperemia: 91%
- Tendinosis: 48%
- Tenosynovitis: 55%


Dynamic Imaging: summary

- Shoulder:
  - Biceps
  - Impingement and frozen shoulder
  - AC joint
- Elbow:
  - Ulnar nerve and snapping triceps
  - UCL
- Hand:
  - ECU
  - Boxer knuckle
  - Pulley
  - Trigger


Trigger Finger: thumb

Case #1

Case #2
Syllabus on line and other educational material:
www.jacobsonmksus.com
Twitter handle: @jacobsn