Elbow Ultrasound: Anatomy and Scanning Techniques

Jon A. Jacobson, M.D.
Professor of Radiology
Director, Division of Musculoskeletal Radiology
University of Michigan

Disclosures:
• Consultant: Bioclinica
• Advisory Board: GE, Philips
• Book Royalties: Elsevier
• Not relevant to this talk

Note: all images from the textbook Fundamentals of Musculoskeletal Ultrasound are copyrighted by Elsevier Inc.

Anatomy: anterior

Anatomy: posterior

From: Netter's Atlas of Human Anatomy

Sonographic Technique:
• Standardized sequence
  – Anterior
  – Medial
  – Lateral
  – Posterior
• Focused examination
• Transducers: 10 - 17 MHz linear

Technique: anterior

elbow extended
• Biceps brachii
• Brachialis
• Coronoid and radial recesses
Anterior Elbow: transverse

Biceps Brachii: transverse

Biceps, Brachialis, and Anterior Recess

Biceps Brachii Tendon: distal

Biceps Brachii: Terminal Bifurcation

Biceps Brachii:
- Insertion: radial tuberosity
  - Short head: superficial, distal
  - Long head: deep, proximal
- No synovial sheath
- Bicipitoradial bursa


Note: endotenon septum (asterisk and arrows)
Biceps Brachii: terminal bifurcation

Note: toggling the transducer, which creates anisotropy allows visualization of two tendon heads

Courtesy of M. Chiavaras, Hamilton, Ontario

Biceps Brachii Tendon: distal

1 = long head
2 = short head


Biceps Brachii: long (1), short (2) heads

Note: long head (1) courses lateral to medial, deep to short head (2)


Biceps Tendon

- Medial approach
- “Pronator window”
- Transducer:
  - Distal aspect over medial epicondyle
  - Parallel to humerus
  - Slide transducer anterior


Biceps Brachii Tendon: technique

Medial Approach + Dynamic Imaging

Biceps Brachii Tendon: lateral approach

Long Axis: dynamic imaging
Kalume Brigido M. Eur Radiol 2009; 19:1817
Biceps Tendon
- Flexion, pronation view
- Transverse: between radius and ulna
- Radial tuberosity rotated into view
- Limited diagnostic value
- Ideal biceps tendon injection

Median Nerve

Ulnar Collateral Ligament
Anterior, Posterior, and Transverse Bundles

Technique: medial
- Elbow partially flexed
- Ulnar collateral ligament
  - Anterior bundle
- Common flexor tendon
- Cubital tunnel
  - Ulnar nerve

UCL and Common Flexor Tendon

Technique: cubital tunnel
Technique: cubital tunnel

Humerus

Longitudinal

Technique: ulnar nerve subluxation

Transverse

Technique: lateral

elbow partially flexed

• Common extensor tendon
• Radial collateral ligament
• Radial head & annular recess
• Capitellum

Lateral Collateral Ligament Complex


Lateral Ulnar Collateral Ligament (LUCL)


Common Extensor Tendon Removed

*LUCL attaches at crista supinator of ulna
Radial Head and Annular Recess

- Sagittal
- Capitellum
- Radial Head
- Elbow extended
- Elbow flexed

Radial Nerve

- Sagittal
- Tr. humerus
- Tr. brachialis
- Sup. bifurcation
- Longitudinal

Radial Nerve: deep branch

- As it enters into supinator under Arcade of Frohse
- Normally flattens in AP dimension: 50%
- Cross-sectional area does not change

Technique: posterior

- elbow flexed
- Olecranon recess
- Triceps brachii
- Olecranon bursa

Olecranon Recess and Triceps

- Sagittal
- Triceps
- Olec
- Humerus

Anatomy of the Distal Triceps Brachii

- Superficial (blue arrow): long + lateral heads
- Deep (black arrow): medial head
  - Primarily muscular insertion

*From Resnick, Skeletal Radiol 2009; 38:171

**Take-home Points:**

- Follow a scanning protocol
- Do not focus exam too much
- Use bone landmarks:
  - Orientation
  - Where tendon abnormalities occur
- Biceps scanning technique

Syllabus on line and other educational material:  
www.jacobsonmskus.com

Twitter handle: @jjacobsn