Sports Ultrasound

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Disclosure

- Nothing to disclose
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Introduction

**PROS**
- Noninvasive
- Cost-effective
- Soft tissue, tendon, nerve
- Dynamic imaging technique

**CONS**
- Operator dependent
- Limited field of view
- Limited depth, penetration
- Time
PHYSICS OF ULTRASOUND - Penetration

Higher frequency transducers
- higher resolution images
- more rapidly absorbed by the tissues.
- Better for superficial tissue

Lower frequency transducers
- Lower resolution
- More capable of assessing deeper structures
- Better for deep tissue
Ultrasound Machine
Linear Transducer (Resolution)

- Broad-spectrum linear matrix array transducer
- Width: 50 mm
- Frequency: 4 – 15 MHz
- High resolution
- Superficial area
- R. Cuff, Elbow tendons
Linear Transducer (Hockey stick)

- Broad-spectrum linear transducer
- Width: 25 mm
- Frequency: 4 – 15 MHz
- Very small field and depth
- Small Parts, Vascular
- Hand, foot, ankle or other small anatomy

L8-18i-D
PHYSICS OF ULTRASOUND

Echogenicity

- Fluid
  - Anechoic
  - Black, Dark

- Muscle, Nerve
  - Hypoechoic
  - Gray

- Ligament, Tendon
  - Isoechoic

- Bone
  - Hyperechoic
  - White, Bright
Image interpretation
Muscle

- Perimysium: Cylindrical structures separated by hyperechoic intervening connective tissue
- Longitudinally, a feather or veins on a leaf
- Transversely, a starry night
Tendon

- Long axis: Dense, linear hyperechoic bands in a fibrillar pattern
- Transverse: Multiple hyperechoic foci or dots and display a broom-end echotexture.
Ligaments

- a hyperechoic, linear appearance
- Less compact than tendon
- optimally evaluated when stretched
Nerve

- Usually best viewed transversely,
- **Fascicular pattern** with uninterrupted hypoechoic bands (fascicles) surrounded by linear, interrupted hyperechoic bands (the interfascicular epineurium).
- Transverse view: a **honeycomb** appearance
Vessels

Easy to find. Good for a landmark a hypoechoic or anechoic tubular appearance. Confirmed by doppler Vein: easily compressible. Vessel can be used an indicator of nerves because they often follow a similar course in the body.
Bones

- well-defined, linear, and smooth hyperechoic borders.
Clinical Applications of Ultrasound

1. Distal biceps tendon tear, injection guidance
2. Common extensor tendon, Tennis elbow
3. Radial tunnel syndrome, PIN block
4. Common flexor tendon evaluation
5. Throwing elbow – valgus stress of medial elbow
6. Cubital tunnel, Snapping triceps syndrome
7. Dequervain’s, Intersection syndrome
8. ECU tendinopathy, subluxation
9. SLL
10. Ganglion
11. CTS
12. Post op evaluation
13. Palmar cutaneous branch
14. Pulley, Sagittal band
SHOULDER
Checklist for Shoulder

- A-C joint
- Biceps tendon and muscle
- Subscapularis muscle, tendon and bursa
- Suprasupinatus muscle, tendon
- Rotator cuff interval (Adv.)
- Posterior glenohumeral joint (Adv.)
- Infrasupinatus and teres minor
- Suprascapular notch (Adv.)
- Spinoglenoid notch (Adv.)
A-C joint
Biceps tendon and muscle

Transverse

BT

GT
Supraspinatus muscle, tendon

Long axis
Rotator cuff interval
ELBOW
- Move transducer medially over elbow joint
- Maintain long-axis to humerus
- Ulna, coronoid fossa and trachlea are in view
- Brachialis inserts on coronoid process and ulna tubercle
- Brach: Brachialis
- Troc: Trochlea
- ▲: Coronid fossa
- ▼: Coronoid process
- △: Biceps tendon
Distal Biceps tear
Medial structures

- Medial epicondyle
- Common flexor tendon
- Ulnar collateral ligament
- Dynamic valgus stress of ulnar collateral ligament (as indicated)
Medial elbow joint

- Identify the medial epicondyle, place probe in long-axis to ulna
- Common flexor tendon
- UCL
- Medial epicondylar groove
- Ligament of Osborne (cubital retinaculum)
- Ulnar nerve
Medial collateral ligament

- Ulnar collateral ligament
- Three components
- Anterior bundle
  - Main stabilizer
  - Originate inferior surface of the humeral medial epicondyle to the sublimis tubercle of the ulna
- UCL (▼) can be seen originating from medial epicondyle (ME)
- Anterior bundle of UCL (↓) is deep and inserts on ulna
- Large linear hypoechoic cleft (straight arrows) extending from deep surface through torn attenuated common extensor origin, indicating complete tear
- Tear of LCL (curved arrow) and humerus (asterisk)
- Diffuse thickened hypoechoic tendon (between asterisks)
- Loss of normal fibrillar pattern
Medial Epicondyle
Lateral elbow joint

- Position elbow in 90-degree flexion, forearm supinated
- Probe in long-axis over lateral epicondyle
- Evaluate common extensor tendon, LCL
Common extensor tendon

- Confluence of ECRB, EDC, EDM, and EDU
- Originate on lateral epicondyle
- Deep portion: ECRB
- Superficial portion: EDC, superficial part of ECU and EDM
- Open arrow: Radial collateral ligament
- SM: supinator muscle
• LE: lateral epicondyle
• RH: radial head
• Sup: supinator
• ▲: radiocapitellum joint synovium
• ▼: radial collateral lig
• ▼: common extensor tendon
Posterior elbow

- Evaluate triceps, anconeus
- Place probe in long-axis to humerus
- Cadaver and MRI (T1) distal triceps
  - Orange arrow: common tendon
  - Blue arrow: medial head muscular insertion
- Triceps inserts onto the olecranon
- Olecranon fossa with fat pad
- Two heads of the triceps can be seen
KNEE
Knee US Exam Check list

- Anterior Knee
  - Rectus femoris
  - Vastus
  - Quadriceps tendon
  - Supra-patellar recess
  - Femoral Trochlear
  - Patellar retinaculum, recess
  - Patellar tendon
  - Hoffa’s fat pad
  - Infra-patellar bursa
  - Pes anserinus

- Medial Knee
  - Medial collateral ligament
  - Medial meniscus
  - Superficial portion of medial collateral ligament
  - Meniscofemoral ligament (deep portion)
  - Menisci

- Lateral Knee
  - Iliotibial band
  - Gerdy’s tubercle
  - Lateral femoral condyle
  - LCL

- Posterior Knee
  - Popliteal artery
  - Tendon of the medial head of gastrocnemius,
  - Medial femoral condyle;
  - Semimembranosus tendon
  - Semimembranosus-gastrocnemius bursa
  - Popliteal vein
  - Biceps femoris
  - Common peroneal nerve
  - Fabella
  - Popliteal fossa
  - Popliteal tendon
  - Prox Tib-fib joint
  - Semimembranosus, medial gastroc bursa

ARDMS
Quadriceps Tendon
Patellar tendon

- Fat pad
- Tibia
Patellar Tendon
MCL
Tennis Leg/ Calf tear
ANKLE
ATFL

ATFL

FIBULA

HEEL BONE
Case: ATFL

- A fibrotic appearance of the ATFL after previous trauma.
- Ligament is thickened and inhomogeneous (*)
Planta Fasciitis
Calf/Achilles

lateral supracondylar ridge of the femur
Achilles Tendon
Thank You

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