Interventional Musculoskeletal Ultrasound: Common Applications

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

Disclosures:
- Consultant: Bioclinica
- Advisory Board: Philips
- Book Royalties: Elsevier
- Not relevant to this talk

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

Outline:
- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

Joint Aspiration and Injection
- Aspiration:
  - Infection, crystal disease
- Injection:
  - Anesthetic: Lidocaine, Ropivacaine
  - Steroids
  - Therapeutic or diagnostic

Joint Aspiration and Injection
- Know which joint recesses become distended and which are accessible
- For joint access:
  - Aim for joint fluid seen at ultrasound
  - Aim for specific joint recess
  - If no recess, aim for joint space

Glenohumeral Joint
- Posterior joint recess
  - In plane
  - Transducer: axial
  - Lateral to medial
  - Most reliable site*

*H G IST
Eur Radiol 2011; 21:1858
Acromioclavicular Joint
- In plane
- Transducer: coronal
- Lateral to medial

Elbow Joint
- Olecranon recess
- Elbow flexed
- In plane
- Lateral to medial

Invest Radiol 1998;33:117

Wrist Joints
- Dorsal recesses
- In plane
- Transducer: axial
- Medial or lateral

MCP Joints
- Dorsal recesses
- In plane
- Parasagittal or transverse
- Sterile gel stand off

Joint injection
- Anterior recess
- In plane
- Transducer:
  - Parallel to femoral neck
  - Consider curvilinear
- Needle: distal to proximal
- 97% accuracy¹

¹Smith J. J Ultrasound Med 2009; 28:329

Knee Joint
- Suprapatellar recess or medial/lateral recesses
- In plane
- Transducer: axial
- Needle: lateral to medial
Ankle Joint
- Anterior joint recess
- In plane
- Transducer: sagittal
- Needle: inferior to superior

Posterior Subtalar Joint
- Lateral joint recess
- Out of plane
- Transducer: coronal
- Place roll: varus
- Avoid: peroneal tendons

MTP Joints
- Dorsal recesses
- In plane
- Parasagittal or transverse
- Sterile gel stand off

Outline:
- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

Tendon Sheath
- Aspiration:
  - Infection, crystal disease
- Injection:
  - Anesthetic: Lidocaine, Ropivacaine
  - Steroids
  - Therapeutic or diagnostic
**Biceps Tendon Sheath Injection**

- Injection should surround tendon
- Confirm post-injection in short and long axis

**De Quervain’s Tenosynovitis**

- Inject short axis: dorsal
- Between EPB & radius
- Possible septation
- Inject around abnormal tendons
- Avoid superficial branch of radial nerve

**A1 Pulley Injection**

- Out of plane
- 10 mg triamcinolone, 2% lidocaine
- 90% success rate: 1 year

**Tendon Sheath: injection**

- Short axis to tendon
- Anterior or posterior
- Deep to tendon:
  - Decreased risk of depigmentation, fat atrophy
- 100% accurate

**Outline:**

- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

**Bursa**

- Aspiration:
  - Infection, crystal disease
- Injection:
  - Steroids
  - Therapeutic
**Subacromial-subdeltoid Bursa**
- In plane
- Posterior to anterior or lateral to medial
- Patient supine
- Test inject
- Avoid rotator cuff

**Olecranon Bursa**
- Arm extended
- Axial plane
- Lateral to medial
- Avoid cubital tunnel

**Iliopsoas Bursa**
- Oblique-axial plane:
  - Superior to femoral head
  - Lateral to medial
  - Inject between tendon, ilium¹
- Pain relief = successful iliopsoas surgical release²

²Blankenbaker DG. Skeletal Radiol 2006; 35: 565

**Greater Trochanter**
- Subgluteus Medius
- Trochanteric Bursa
- Subgluteus Minimus

**Trochanteric Region Bursae**
- Trochanteric: deep to gluteus maximus
- Subgluteus medius
- Subgluteus minimus
- Axial or coronal plane
**Baker Cyst**
- Aspiration
  - Inferior to superior
  - Medial to lateral
- Aspirate joint effusion first if present
- Steroid injection
  - Baker cyst injection works better than intra-articular injection

**Pes Anserinus**
- Pes anserinus: “goose foot”
  - Sartorius
  - Gracilis
  - Semitendinosus
- Bursa:
  - Deep to tendons
  - Adjacent to proximal tibia

**Retrocalcaneal Bursa**
- Injection
- Medial to lateral
- Short axis to Achilles
- Needle perpendicular to ultrasound beam

**Outline:**
- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

**Cyst Aspiration**
- Ganglion cyst:
  - Large bore needle
  - Wrist, knee: lobular, anechoic or hypoechoic
- Other cysts:
  - Paralabral cysts: shoulder and hip labrum
  - Parameniscal cysts
Ganglion Cyst (elbow): aspiration

Medial Meniscus: tear and parameniscal cyst

Outline:
- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

Calcific Tendinosis
- Hydroxyapatite deposition: metaplasia
  - Usually do not have cuff tear
- Appearance:
  - 79% hyperechoic & shadowing
  - No shadow: 7%
- Two phases:
  - Formative
  - Resorptive: painful

Farin et al. Skeletal Radiol 1996; 25:551

Tendon Calcification:
- Degenerative: thin, linear deposit
- Calcific tendinosis:
  - Formative: well-defined, dense shadow
  - Resorptive:
    - Globular, amorphous
    - Variable shadow
    - Best success with aspiration


Degenerative Calcification
Calcific Tendinosis

- Formative: Defined, shadow
- Resorptive: Amorphous, little shadow

Calcific Tendinosis: aspiration

- Percutaneous lavage and aspiration
  - Best: rounded amorphous calcification
  - Correlate with radiography
- 3-10 cc syringes: Lidocaine
- 20 – 22 gauge needle
- Position patient: syringe is dependent

Calcific Tendinosis: aspiration

- Inject Lidocaine, then aspirate
  - Dilute calcification
  - Syringe dependent
  - Calcification will flow into needle
  - Repeat until calcification decreases
- Inject steroids into adjacent bursa

Calcific Tendinosis: lavage/aspiration

- Patient #1
- Patient #2

Calcific Tendinosis

- 3 weeks after lavage and aspiration
Calcific Tendinosis: results

- Calcium decrease correlates with symptom improvement
- Improvement: 91% at 1 year*  
  - Calcium gone in 89%
  - Transitory recurrence at 15 weeks: 44%
  - Improved symptoms at 1 year
- No difference at 5, 10 years**

*del Cura, AJR 2007; 189:W128  
**Serafini S, Radiology 2009; 252:157

Calcific Tendinosis

- Ultrasound-guided lavage and aspiration
- 20 gauge spinal needle

Outline:

- Joint
- Tendon sheath
- Bursa
- Cyst
- Calcific tendinitis
- Miscellaneous

Morton Neuroma

- Steroid injection1  
  - 3 month: pain relief
- Alcohol injection2  
  - Symptoms return at 5 yrs
- Radiofrequency ablation3  
  - 85% effective at 6 months

1Thomson CE JBJS 2014; 96A:334  
2Gurdezi S Foot Ank Int 2013; 34:1064  
3Chuter GSJ Skeletal Radiol 2013; 42:107

Carpal Tunnel Injection

- Axial plane: ulnar to radial
- Sterile gel stand-off
- Begin over ulnar nerve and stay superficial
- Inject adjacent to median nerve
- Cross-sectional area may decrease within 1 week after steroid injection1


Meralgia Paresthetica

- Sensory: anterolateral thigh
- Hypoechoic enlargement
- Ultrasound-guided steroid injection
Take Home Points:

- Joint:
  - Aim for recess
- Bursa:
  - Know anatomic locations
- Cyst:
  - Large bore needle
- Calcific tendinitis:
  - One puncture, lavage and aspiration

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

Twitter handle: @jacobsn