Introduction to Musculoskeletal Ultrasound and Injections

Francis O’Connor, MD
Fred Brennan, DO, FAAFP
Anthony Beutler, MD, FAAFP
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Faculty

Francis G. O'Connor, MD, MPH, FACSM, RMSK
Associate Director, Sports Medicine Fellowship
Professor and Chair, Military and Emergency Medicine
Uniformed Services University of the Health Sciences
Bethesda, MD

Fred H. Brennan, Jr., DO, FAOASM, FAAFP, FACSM
Assistant Sports Medicine Fellowship Director
University of South Florida, Morton Plant Mease Family Medicine Residency Program

Anthony Beutler, MD, FACSM
Director, Sports Medicine Fellowship Program
Department of Family Medicine
Uniformed Services University of the Health Sciences
Bethesda, MD
Francis O’Connor, MD, MPH

Professor and Chair, Military and Emergency Medicine; Associate Director, Consortium on Health and Military Performance, Uniformed Services University.

Francis G. O’Connor, MD, MPH, has been a leader in sports medicine education and research for the military for more than 25 years. Dr. O’Connor is the author of more than 90 peer-reviewed scientific journal articles and numerous book chapters/technical reports/health promotion resources for the military. In addition, Dr. O’Connor is the editor of eight texts on sports medicine including, the Textbook of Running Medicine, Musculoskeletal and Sports Medicine for the Primary Care Practitioner 4th Edition, and ACSM's Sports Medicine: A Comprehensive Review. He has been a board member of several leading sports medicine organizations, including the American College of Sports Medicine and the American Medical Athletic Association, and is a past President of the American Medical Society of Sports Medicine. Dr. O’Connor is a recently retired colonel, United States Army, and is a graduate of the United States Military Academy at West Point. Prior to his recent posting at Uniformed Services University in the Department of Military Medicine, he served one year as a Command Surgeon with Special Operations in the Middle East.
Anthony Beutler, MD, FAAFP

Lt Col, USAF, MC

Associate Professor of Family Medicine, Uniformed Services University of the Health Sciences, Department of Family Medicine; Program Director, NCC Sports Medicine Fellowship; Chief, Injury Prevention Research Laboratory; Physician

Dr. Beutler practices family medicine and comprehensive primary care sports medicine for the U.S. Air Force, caring for active-duty service members, retirees, and their families in the Washington, D.C., area. An award-winning educator and teacher, Dr. Beutler recently assisted in developing and implementing a new musculoskeletal curriculum for USU School of Medicine. One of his favorite activities is helping family physicians make their musculoskeletal practices more rewarding and profitable. Dr. Beutler is an AAFP Fellow.
Fred Brennan, DO, FAAFP

Physician, and Assistant Sports Medicine Fellowship Director, University of South Florida, Morton Plant Mease Family Medicine Residency Program, BayCare Health Care System.

Dr. Brennan is a graduate of the University of New England College of Osteopathic Medicine. He completed his family medicine residency at Albany Medical Center, New York, and his sports medicine fellowship at the University of Toledo’s Northwest Ohio Center for Sports Medicine. He specializes in the medical aspects of athletic care, the full scope of nonsurgical musculoskeletal medicine, post-concussion medical care, and ultrasound-guided injections. Dr. Brennan was a decorated active duty Army officer. He has published multiple book chapters and peer-reviewed journal articles, and he is a two-time Boston Marathon finisher, as well as an Ironman World Championship finisher. He is a senior consultant physician to the Ironman World Championship and serves as a medical volunteer at the Marine Corps Marathon and the Boston Marathon.
Learning Objectives

1. Discuss the basic principles of ultrasound imaging, equipment, functionality, aseptic technique and injectate selection for ultrasound-guided pain procedures.
2. Develop scanning techniques to optimize musculoskeletal windows for ultrasound guided injections.
3. Practice joint injection techniques using models.
4. Establish appropriate billing and coding protocols for performing billable injections.
Schedule of Events

- 20 min - Introduction to US
- 10 min - US of the Knee
- 30 min - Scan: Knee
- 15 min - US of Shoulder
- 15 min - Break

- 30 min - Scan: Shoulder
- 15 min - Introduction to US Guided Injections
- 30 min - Injection Workshop
- 15 min - Billing and Coding
Objectives

• Ultrasound versus MRI
• Basic Physics
• Common Terminology
• Knobology
• Normal Anatomy Signals in Musculoskeletal Ultrasound
Ultrasound versus Magnetic Resonance Imaging
Musculoskeletal MRI

• Advantages
  – All tissues of the extremity in multiple planes
  – Detailed evaluation of soft tissues, bones and joints in a single study
  – Standard pre-operative imaging in United States

• Disadvantages
  – Requires correct pulse sequence
  – Expensive
  – Longer examination time
  – Claustrophobia
  – Obese patients
  – Implanted hardware
Musculoskeletal Ultrasound

• Advantages
  – Higher resolution imaging of superficial structures
  – Dynamic assessment for instability or injury severity
  – Portable and relatively inexpensive
  – Comparison views readily available

• Disadvantages
  – Limited field of view
  – Lack of good assessment of deep structures or bones
  – Limited evaluation of intra-articular structures
  – High learning curve
  – Not commonly accepted….yet!
Basic Physics
The Basics

Basic Ultrasound Physics

Diagnostic Ultrasound.

The image is based on reflected sound or ultrasound waves.

A transducer generates ultrasound waves and detects the reflected ultrasound waves.

Attenuation is the name for all interactions that decrease the intensity of the ultrasound beam except reflection.
Bottom Line

- **Low Frequency Probes** (1.5 to 5 MHz) are better for visualizing deeper structures (> 6 cm)
  - Hips
  - Spine
  - Abdomen

- **High Frequency Probes** (8 – 18 MHz) are better for visualizing more superficial structures
  - Rotator Cuff
  - Knee
  - Hand
Common Terminology
Terminology

• **Transducer**
  – A device that transforms one form of energy into another form of energy.

• **Linear**
  – Generally utilized for more superficial structures.

• **Curved**
  – Generally utilized for deeper structures
Terminology

• **Anisotropy**
  – Ultrasound variation with fibrillar structures; hyperechoic to hypoechoic when beam angle is varied.
Artifacts are any structure in a image that does not correlate directly with actual tissue.

Two different categories of artifacts - perceived objects in the image that are not actually present - or - the most difficult artifact to recognize, the missing structure.

Through transmission enhancement - cysts and other liquid filled structures attenuate less sound compared to surrounding soft tissue thus the region below the liquid filled structure produces brighter echoes than the adjacent tissue not directly below the liquid filled structure.

Shadowing - solid masses are generally more attenuated thus the region below the solid mass appears to be reduced in brightness compared to adjacent tissue.
Knobology
B-Mode

- B stands for brightness
- B mode creates pictures based on the brightness of the dots in the image
- This is “normal” ultrasound
M-Mode

- M stands for Motion
- It is often used for echocardiography or in OB for fetal heart rates
- It looks at motion in a single plain
- Not valuable for MSK applications
Color Doppler

- Indicates directional flow with the colors blue or red
  - Red is moving towards the probe
  - Blue is moving away from the probe (if the probe is oriented correctly)
- TILT THE PROBE SLIGHTLY – for a more distinct image
- This is a useful mode to help identify blood vessels, hyperemia and neovascularization
Frequency

• **High Frequencies** give better resolution (image quality) to shallow structures, but rapidly attenuates and cannot penetrate deeper structures.

• **Lower Frequency** has less attenuation as it passes into deeper tissue and can “see” deeper structures, but the image quality and detail will not be as good as the higher frequencies can provide.
Gain

- **Gain = amplification (like volume)**
  - It does not change the depth you look or the detail you can potentially see, but will give the picture a contrast you find useful
  - Generally if you are working in a well lit room, you need to turn the gain up a bit
  - Near gain will change the image near the skin
  - Far gain will change the deeper part of the image
- Near and Far gain are usually not a big deal in the generally shallow fields used in MSK ultrasound.
Normal Anatomy Signals in Musculoskeletal Ultrasound
Terminology

- **Hyperechoic**
  - Strong reflection, bright echo image
- **Hypoechoic**
  - Weak or low echo signal
- **Anechoic**
  - Absent echo signal
Normal Muscle

• Muscle
  – Hypoechoic with multiple hyperechoic lines which represent fibro adipose septa or perimysium
  – Transverse –”starry night appearance.”
  – Longitudinal –Multi-Pennate appearance
Normal Tendon

- **Tendon**
  - Hyperechoic with anisotropy
  - bright lines longitudinally or bright dots at right angles fibrillary pattern
Normal Ligament

- **Ligaments**
  - Hyperechoic striated appearance which are more compact than tendons.
  - Trilaminar appearance – central hypoechoic layer.
  - Connect two osseous structures.
Normal Nerve

• Nerve
  – Fascicular pattern with hypoechoic fascicles and hyperechoic connective tissue.
  – Transversely nerves are “honeycomb” or “speckled” in appearance.
Normal Bone and Cartilage

• Bone
  – Hyperechoic calcification of cortical bone
  – Hyaline cartilage is hypoechoic or anechoic
Abnormal Anatomy Signals in Musculoskeletal Ultrasound
Joint Effusion

[Images showing ultrasound scans with the label "ABNORMAL"]
Rotator Cuff Tendinopathy with Bursitis
Rotator Cuff Tear

Acromion
AHD
Supraspinatus
Humeral head

ABNORMAL
Contact Information

Francis G. O’Connor, MD, MPH, FACSM, RMSK
Associate Director, Sports Medicine Fellowship
Professor and Chair, Military and Emergency Medicine
Uniformed Services University of the Health Sciences
Bethesda, MD

Francis.oconnor@usuhs.edu
AAFP Musculoskeletal Ultrasound Imaging 2017: Knee

- Francis G. O’Connor, MD, MPH, FACSM, RMSK
Objectives

- Review Applied Shoulder Anatomy
- Review 16 Image Standard Knee Scanning Protocol
Clinical Anatomy
Bones

- **Femur**
  - Medial and lateral condyles
  - Lateral epicondyle
- **Tibia**
  - Plateau
  - Spines
  - Tubercle
- **Fibula**
- **Patella**
  - Facets
Protocol for a Dynamic Examination of the Knee
1- Suprapatellar Long

- Long axis linear slide (LALS) from the patella to the quadriceps myotendinous junction

![Diagram showing patella, quadriceps tendon, suprapatellar bursa, prefemoral fat, and femur]
2 - Suprapatellar Transverse

- Short Axis linear slide (SALS) from quadriceps tendon and medial vastus myotendinous junction to the patella
4 - Infrapatellar Long

- LALS from the patellar apex to the patellar tendon insertion on the tibial tuberosity
5- Infrapatellar Trans

- SALS with cephalad tilt towards the femoral condyles below the patella, LALS from the medial to lateral condyle.
6 - Medial Collateral Long

- LALS to locate joint line, then SALS posteriorly to be parallel with MCL then LALS cephalad and caudal to MCL insertion sites.
8 - Pes Anserine Long

- LALS with rotation over proximal pes anserine insertion
9 - Lateral Collateral Long

- LALS to locate the popliteus notch in the femur
11- Iliotibial Band Long

- LALS with rotation over the It band insertion on to Gerde’s tubercle then LALS cephalad to iliotibial band overlying lateral femur proximal to the epicondyle
Questions?
AAFP Musculoskeletal Ultrasound Imaging 2017: Shoulder

• Francis G. O’Connor, MD, MPH, FACSM, RMSK
Objectives

• Review Applied Shoulder Anatomy
• Review 13 Image Standard Shoulder Scanning Protocol
• Describe ultrasound imaging identified with Rotator Cuff Pathology
Clinical Anatomy
Bony Anatomy

- Humerus
  - Head
  - Greater tuberosity
  - Bicipital groove
  - Lesser tuberosity
  - Proximal shaft
Bony Anatomy

- **Scapula**
  - Spine
  - Acromion
  - Coracoid
  - Glenoid
  - Scapular Notch
- Overlies ribs 2-7
- Angled 30-45° anterior to coronal plane
Applied Clinical Anatomy

- Static and Dynamic Stabilizers
  - labrum
  - glenohumeral ligaments
  - rotator cuff
Dynamic Stabilizers

- Rotator Cuff
  - Smaller than more superficial muscles
  - “Steering” mechanism for humeral head
  - Depresses humeral head into glenoid
Dynamic Stabilizers

- Long head of biceps brachii
  - Humeral head depressor
  - Reduces anterior translation
  - Origin at superior labrum
  - Associated with “SLAP” lesion
Shoulder Diagnostic Ultrasound

• This guide provides basic instructions to achieve 13 standard images for a shoulder diagnostic ultrasound study. These are by no means the only 13 images of the shoulder, but they would constitute a complete study.

• To bill for a diagnostic ultrasound study of an extremity joint, the accepted standard is 12 views which need to be labeled correctly and securely stored, either as hard copy images or “permanently stored” media. In addition, a final written report must be kept on file.
1. Biceps Short Axis

- This is a key view for orientation to the shoulder. Patient position: sitting up with elbow flexed to 90 degrees and palm up and hand resting on thigh.
- Assess for effusion, which may be associated with rotator cuff tear. This space (proximal bicipital groove) communicates with the gleno-humeral joint.
2. Biceps Long Axis

- Follow from the glenohumeral joint to the musculotendinous junction.
- Probe surface must follow the tendon surface (not skin surface) to observe tendon fibers.
4. Subscapularis Long Axis

• At the level of the coracoid, assess the muscle from its insertion on the lesser tuberosity towards its origin by externally rotating the arm while scanning.

• Most tears of the subscapularis occur within 1 cm of its insertion onto the lesser tuberosity.
6. Acromioclavicular Joint Long Axis

- Span the AC joint in long axis.
- Consider dynamic assessment by observing the joint space while the patient is horizontally adducting.
Joint Capsule
Distal Clavical
Acromion

Acromio-clavicular Joint Long Axis
7. Subacromial Space With Arm in Neutral Position

- From the AC joint, long axis slide laterally over the acromion.
- Freeze the image and use ultrasound calipers to measure the distance from the caudal portion of the acromion to the humeral head.
- Note the subacromial-subdeltoid (SA-SD) bursa.
Where does One find the Rotator Cuff Tears?
AAFP Procedures 2017: Introduction to Ultrasound and Ultrasound Guided Injections

- Francis G. O’Connor, MD, MPH, FACSM, RMSK
Goals

• Address the Issue of “Why Ultrasound Guided”
• Discuss the Technical Considerations of Ultrasound Guided (USG) Injections
• Review common upper extremity USG Injections
• Review common lower extremity USG Injections
Why Ultrasound and Ultrasound Guidance?
Ultrasound Guided Injections: Accuracy

- The medical literature shows that ultrasound guided injections are more accurate than clinically guided injections, even amongst experienced physicians.
- Eustace et al showed that only 29% of clinically guided injections for subacromial bursitis actually reached the intended bursa.
- For procedures, the main advantages of ultrasound lies in its real-time capabilities and ability to directly visualize the neurovascular and soft tissue structures.

Does US Needle Guidance Affect Outcomes?

- **Background and Objective**: This randomized controlled study addressed whether sonographic needle guidance affected clinical outcomes of intraarticular (IA) joint injections.

- **Methods**: 148 painful joints were randomized to IA corticosteroid injection by conventional palpation-guided or sonographic image-guided injection. Baseline pain, procedural pain, pain at outcome (2 weeks), and changes in pain scores were measured with a VAS scale.

- **Results**: Relative to conventional palpation guided methods, sonographic guidance resulted in 43% reduction in procedural pain ($p>0.001$), 58% reduction in absolute pain scores at the 2 week outcome ($p>0.001$), 62% reduction in non-responder rate. Sonography also increased detection of effusion by 200% and volume of aspirated fluid by 337%.

- **Conclusions**: Sonographic guidance significantly improved clinical outcomes.

A Must Read!

- **Findings:**
  - Strong evidence that USGIs are more accurate;
  - Moderate evidence that USGIs are more efficacious;
  - Preliminary evidence USGIs are more cost effective.

Ultrasound Guided Injections: Technical Considerations

“So easy, a caveman could do it”
Basic Competency

Before you consider doing ultrasound guided injections:

- You must know what you are looking at on the ultrasound before you stick a needle in it.
- You must be sure you will not hit anything you should not on the way to your target tissue.
- You need to know how to use sterile technique with your equipment.
- You need to have reasonable skill in handling the transducer.
- You must have reasonable needle driving skill.
Basic Competency

- Key ultrasound anatomy for your target area.
  - Study the view before you attempt to inject
    - Learn the anatomic relationships in the cut you are looking at.
  - There is a significant learning curve here
Basic Competency: Avoiding Key Anatomy

- **Use clinical landmarks**
  - Feel for a pulse and mark significant vessels
  - Standard anatomy
- **Use ultrasound landmarks**
  - Using color Doppler to clear your needle path of significant vessels is very useful.
  - Use ultrasound anatomy of target area to avoid key structures.
    - Nerves / peritoneum / lungs / solid organs / etc.
Basic Competency: Sterile Technique

• **Wide skin prep**
  – chlorohexidine gluconate x 1
  – betadine x 3 (until dry)
  – Widely prep where ever the probe, gel or needle may go

• **Disinfect probe and cable with appropriate disinfectant**
  – (see manufacturer recommendation)
  – Cavicide, T Spray II, etc.

• **Probe condoms? Tegaderm?**

• **Sterile packets of ultrasound transmission gel**
  – 20 gram packets usually sufficient

• **Foot pedal control for US machine**
  – To take US images and video clips while your hands are occupied
Basic Competency: Skill in Handling the Transducer

• KEEP 2 -3 FINGERS OF YOUR PROBE HAND IN CONTACT WITH THE PATIENTS SKIN to control probe.
• Short axis slides to keep needle in view
  – Subtle pitch, roll and yaw
• Always stay aware of how anisotropy is working for or against you
• Move needle or probe…not both at the same time!
Basic Competency: Needle Acquisition

- **STAR Technique:**
  - See
  - Tilt
  - Align
  - Rotate

Needle Selection

• For other than superficial structures, CONSIDER a 3.5” spinal needle.
  – 18 gauge for aspirations
  – 20 gauge
    • Glenohumeral
    • Hip
    • Spine
  – 22 gauge
    • Intra-articular knee
    • Greater trochanter bursa
  – May need longer needle for thicker individuals
Needle Driving

- 22 gauge spinal needles take practice to re-direct
  - Good visualization of needle to redirect.
  - “Bent needle” technique
    - Indirectly curve needle to re-direct needle: Bend syringe down to direct needle down.
  - **Use bevel to deflect needle**
    - Bevel up, needle goes down
    - Bevel down, needle goes up
  - Not necessarily intuitive

- Practice technique in tissue model (pork shoulder)
- Always see the Needle!
Long Axis Injections

Able to track needle into Target Tissue
Short Axis Injections

Can not see needle tracking into target
Needle appears as a hyperechoic “dot” once in target
Common Lower Extremity Ultrasound Guided Injections
US Guided Knee Injection

• Common injection for visco-supplementation
• Long axis injection
• Targets the suprapatellar pouch
• Avoids repeated insults to remaining hyaline cartilage which occurs with other needle approaches to the knee joint.
• An excellent model for learning US guided technique to apply to other joints as your skill grows
US Guided Knee Injection

- Document informed consent
- Enter patient data into the ultrasound, pre-label the image
  - “L suprapatellar pch trans inj”
- Confirm indicator on probe to see where your needle will enter the screen
- Disinfect probe and cable
  - Linear array high frequency probe
- Be prepared to save image of needle on target!
US Guided Knee Injection

• Position patient
  – Sitting up on exam table with back supported and leg extended

• Prep skin widely for transverse view (ventral to lateral)
  – Chloroprep x 1
  – Betadine x 3 (+ time)
US Guided Knee Injection

• Prepare Equipment
  – If doing an aspiration first, use an 18 gauge 3.5” spinal needle on a 60 cc Luer-Lok™ syringe
  – If injection only, use a 22 gauge 3.5” spinal needle on a 10cc normal saline flush syringe.
  – Injectate (visco-supplementation or corticosteroid-lidocaine mix in appropriate syringe)
US Guided Knee Injection

- Prepare equipment
  - Sterile ultrasound gel packet
  - Kelly Forceps or equivalent to facilitate syringe change
  - Probe condom
  - 4x4 gauze
  - Band-aid
  - Sterile gloves if probe hand will be on prepped skin
- Position ultrasound machine across from you so you can easily see it.
- Position equipment in easy reach
US Guided Knee Injection

• Place sterile gel onto prepped skin over suprapatellar pouch
• Sterile glove at least on hand holding the ultrasound probe
• Place probe on skin above the suprapatellar pouch in transverse view and locate target
  – Resist the urge to look in long axis view
    • It will not help you with the injection
  – KEEP 2 -3 FINGERS OF YOUR PROBE HAND IN CONTACT WITH THE PATIENTS SKIN to control probe.
    • Think pool-cue
US Guided Knee Injection

• Locate suprapatellar pouch, it may be hard to pick out definitively.
  – Use very light pressure on the probe
  – Look for the tissue plane between the quadriceps tendon and the pre-femoral fat
  – This is usually a potential space
  – It is readily seen if an effusion is present
  – Look for small pockets of fluid
US Guided Knee Injection

• Tips for finding the suprapatellar pouch
  – Use light pressure on probe
  – Subtle movements of the probe
    • short-axis slides and tilts; “pitch, roll and yaw”
    • Stay on prepped skin
  – Try milking fluid up by having assistant compress the caudal aspect of knee joint
  – Try having patient flex quadriceps
  – Push on vastus medialis
• If in doubt, aim for the tissue plane between the pre-femoral fat and the quadriceps tendon
US Guided Knee Injection

• Once you have located the suprapatellar pouch, inject the anesthesia
  – Inject the skin weal at the needle entry point
    • Deeper than you may initially think
  – Inject deeper along the estimated needle track to anesthetize the nerve rich lateral retinaculum
  – Give the anesthesia at least 45 seconds to take effect
US Guided Knee Injection

- If the pouch is readily visible and you can reach it with the anesthesia needle, use the anesthesia needle to deliver the injectate.
US Guided Knee Injection

• Initial needle entry
  – **DO NOT LOOK AT THE SCREEN**
  – Look at the probe and perfectly line up your spinal needle
  – Enter the anesthetized skin into pouch with ONE SURE CONFIDENT STROKE to a point under the ultrasound probe
    • Usually you will be very close to your target if your heart is pure and you are using your powers for good.
US Guided Knee Injection

• Look up and find your needle on the screen
  – Use subtle movements of the probe (short axis slides, tilts)
  – Advance into pouch if not in already using the ultrasound to guide your movements as you advance into the bursa
  – Start with needle bevel facing the probe to increase ultrasound wave reflection
  – Take “multi-beam” function off, this may help you see the reverberation shadow from the needle
US Guided Knee Injection

- Confirm needle placement in bursa
  - Aspirating a significant effusion it is like hitting the side of a barn
  - Take image of needle in the effusion before and after aspiration, or take a video clip
  - If no effusion, once the needle tip in in what you think is the suprapatellar pouch, inject some normal saline
    - You should see the bursa modestly inflate (hypoechoic) then immediately deflate as it flows away with very little plunger pressure. It may not inflate visibly because it is flowing away.
    - It should not “sausage out” away from the needle tip, you are in a tissue plane and not the bursa.
    - If you see a “ball of speckles” around the needle tip, you are not in a bursa or a tissue plane.
"Ball of speckles" at needle tip with injection
R Knee Suprapatellar pouch
Hyalgan injection #3
US Guided Knee Injection

• Pull needle out swiftly
• Wipe off gel with 4x4 sponge
• Wipe off skin prep with alcohol
• Bandage
• Flex knee several times
• Always give and document precautions to patient
  – Signs of infection, drug reaction, bleeding, etc.
Common Upper Extremity Ultrasound Guided Injections
Subacromial Bursal Injection

- **Probe**
  - 6-13 MHz (high frequency) linear probe
  - Long axis injection
  - Probe long axis perpendicular to edge of acromion

- **Patient position**
  - Sitting up

- **Needle**
  - 2” long 25 gauge needle

- **Anesthesia**
  - 2cc buffered lidocaine skin weal and along needle track or none
Subacromial Bursal Injection

Injection
- Find the bursa between the supraspinatus and deltoid (hypoechoic line)
- More lateral than you think, you do not have to go under the acromion
- Start with needle bevel up (facing probe) then once in bursa turn bevel 180 to facilitate infiltration
- Watch fluid track up and under the acromion
Subacromial Bursal Injection
Conclusion

• Be conservative and safe as you gradually expand your repertoire
• Seek out continuing education from physicians skilled in ultrasound guided procedures
• Document your training
• Keep a record of your procedures
• This is a skill worth learning and will have synergy with your practice of musculoskeletal medicine
Questions?
Musculoskeletal Ultrasound: Billing, Coding, and Documentation

Fred H. Brennan, Jr., DO, FAOASM, FAAFP, FACSM
Assume that a radiologist, or someone who believes that radiologists are the "gold standard", will eventually examine your records.
General Comments

- Create a separate report for diagnostic ultrasound documentation

- Document the number of different views obtained in the study

- Include measurements of all pathologic lesions identified

- US guided procedures: include rationale for why guidance is necessary
General Comments

• Your documentation must be complete and clear: you are the expert

• Insurance companies, referring physicians, and anyone reviewing your records should get the impression that MSK US is something useful and valid.
Storage of E-images

• Back up hard drive from ultrasound frequently (external hard drive best)

• EMR: if able, store images and report in patient’s E-chart
Case #1

• 56 year-old male with shoulder pain and weakness. Possible rotator cuff tear by exam. Has pacemaker....

• You perform a complete US eval of the shoulder
  – All cuff muscles/tendons
  – AC joint and biceps tendon/groove
  – GH joint
  – Dynamic evaluation for impingement
Coding Case #1

- **76881 =** US, extremity, non-vascular, real time with image documentation; complete
  - 10-12+ captured still and/or dynamic images of various muscles/tendons/joint/other soft tissue
  - Final written separate report describing elements of the exam with measurements as appropriate; note abnormalities
Documentation Case #1

Name: John Doe  
DOB: 01/01/1955  
MR#: 12345  
Date: 09/09/09

STUDY: Right shoulder, 13 distinct views obtained, Sonosite M-Turbo with linear probe

FINDINGS: There was mild hyperechogenicity of the long head biceps tendon, without any surrounding fluid. The subscapularis had a normal appearance. The coracoacromial ligament showed mild anterior bulging with shoulder ER. The AC joint demonstrated a small effusion, a small spur on the clavicular side of the joint, and mild instability with crossover maneuver. The subacromial space measured 0.81 cm with the patient’s arm at her side, and with 70 degrees of abduction, 0.5 cm. Scaption showed no signs of impingement. With the patient’s arm behind her back, an intrasubstance tear of the supraspinatus was seen, towards the articular aspect of the tendon. The tear measured 1.72 cm longitudinally, with thickness 0.42 cm. There was also a 0.5 cm hyperechogenic area on the articular surface of the supraspinatus, just distal to its myotendinous junction. The supraspinatus showed no neovascularization. The posterior aspect of the supraspinatus tendon, adjacent to the infraspinatus, showed a 2.2 cm long hypoechogenic area. The infraspinatus showed a 0.73 cm intrasubstance tear. With the patient’s hand on her hip, the rotator interval view showed an intrasubstance tear of the supraspinatus, 1.36 cm anterior to posterior, with its anterior edge 0.51 cm from the interval. Therefore, this tear extends into the infraspinatus. Scanning from distal to proximal along the cuff in the rotator interval view, it became apparent that the intrasubstance tear may communicate with the glenohumeral joint, or it may be separated from the joint by a thin, 1 mm layer of tendon. At the posterior cuff, shoulder ER demonstrated blunting of the posterior labrum, and a mild posterior humeral head cortical lesion, but no abnormality of the infraspinatus.

IMPRESSION:
1. Complex tear of right supraspinatus, extending into the anterior infraspinatus. The tear may be separated from the articular side by a very thin layer of tendon.
2. Small intrasubstance tear of right infraspinatus.
3. Early right AC joint arthropathy.
4. Evidence for slight anterior instability, and there is also evidence of internal impingement.
Reimbursement Case #1

• 76881
  – Private insurance: $145-$252
  – Medicare: $125
Case #2

• 35 year-old basketball player running down the court and feels a sharp “ripping sensation” in his Achilles

• Next day he is in your office with lots of posterior ankle swelling. You suspect he has a partial tear of Achilles

• A limited US is done focusing on the Achilles tendon
Coding Case #2

• **76882** = US, extremity, non-vascular, real time image documentation; **limited**, anatomic specific
  – 4-8 + still and/or dynamic images in short and long axis views focusing on anatomic site or abnormalities
  – Final written separate report describing elements of the exam with measurements as appropriate; note abnormalities
Documentation Case #2

- Name: Steven Doe
- DOB: 01/01/1976
- MR#: 246811
- Date: 6/30/10

**STUDY:** Left Achilles tendon, 8 distinct views obtained, Sonosite M-Turbo with linear probe

**FINDINGS:** Long axis views of the Achilles tendon identified a near full thickness tear 6 cm proximal to the calcaneal attachment. Greater the 80% of the thickness of the tendon showed hypoechoic changes consistent with a tear. The tear measured 3 cm in length but did now increase with dynamic contraction of the calf. Short axis views of the tendon demonstrated once again a partial tear (hypoechoic fluid) involving approximately 80% of the tendon thickness. Hyperechoic changes were also seen within the substance of the tendon suggestive of chronic calcific tendinosis.

**IMPRESSION:**
1. Partial, but near full thickness tear of the left Achilles tendon, approximately 6 cm from the calcaneal insertion.
2. Dynamic testing of the gastroc-soleus-Achilles complex demonstrated some intact fibers
3. Intratendinous hyperechoic signal within the Achilles tendon suggestive of calcific tendinosis.
Reimbursement Case #2

- **76882**
  - Private insurance: $45-$75
  - Medicare: $37
Case #3

- 40 year-old female runner presents with posterior knee pain and fullness. Tweaked her knee a month ago
- You perform a limited diagnostic US and find a large Baker’s cyst.
- You have time and the patient wants the cyst aspirated, if possible
- An US guided cyst aspiration is done successfully
Coding Case #3

- With proper imaging captured and US report, code **76882** (US, limited)
- **10160** = Aspiration of Baker’s cyst
  - Rationale for why US guidance necessary
  - Image of site to be localized
  - Image(s) of needle at or approaching target site
  - Before and after images helpful
Documentation Case #3

- Name: Susan Doe
- DOB: 02/06/1971
- MR#: 246910
- Date: 10/10/10

**PROCEDURE:** Left knee Baker’s cyst aspiration, 8 distinct views obtained, Sonosite M-Turbo with linear probe. Patient confirmed no allergies and identified the targeted joint. Sonosite M-Turbo with a linear probe.

**FINDINGS:** The popliteal fossa of the left knee revealed a 5 cm x 6 cm hypoechoic encapsulated, non-pulsatile mass, in a long axis view c/w a Baker’s cyst. The skin over the cyst was marked with a retracted ball point pen and the skin was cleaned thoroughly with betadine and alcohol. Under sterile technique the skin and subcutaneous tissues were anesthetized with 3 ml of 1% lidocaine without epinephrine. Once adequate anesthesia was confirmed, an 18 gauge needle with syringe was slowly introduced and ultrasonically guided into the cyst with the needle visualized in the long axis. 30 ml of an amber colored thin fluid was aspirated without complications. Video clips were captured demonstrating dynamic removal of the cyst contents and the final empty cyst sac. The needle was removed with immediate hemostasis. A Band Aid was applied and the patient was discharge to home in stable condition with post injection written instructions.
Reimbursement Case #3

• **10160**
  - Private insurance: $141-$257
  - Medicare: $136
Other Case #3

- **76942** = US guidance for needle placement (biopsy, aspiration, injection, localization device), imaging supervision and interpretation
  - Aspiration of other cystic structure (not Baker’s)
  - Peri-tendinous injection
  - Diagnostic injection for pain relief
  - Venous or central access with US guidance
Other Reimbursement Case #3

- **76942**
  - Private insurance: $90-$419
  - Medicare: $63 ($205)

"I don’t reimburse. I validate. I listen and acknowledge how difficult it was for you to find a place to park.”
Case #4

- 50 year-old paralegal with 8 months of elbow pain. Limited US done at last visit confirmed common extensor tendinopathy. Has failed multiple treatments
- Discuss “dry needling/fenestration” as an option, and approved by insurance
- Next visit, you perform dry needling of tendon origin with US guidance
Coding Case #4

- **24357** = Tenotomy, elbow, (medial or lateral), percutaneous

- **20999** = Unlisted procedure, MS system, general
  - Be careful with this one. Will raise questions
  - Prior approval recommended
PROCEDURE: Dry needling/fenestration of right elbow common extensor tendinosis. Sonosite M-Turbo with a linear probe. Patient confirmed no allergies, and identified the correct target.

FINDINGS: The elbow common extensor tendon was visualized in the long axis view using the linear probe. Hypoechoic and hyperechoic segments of the tendon were identified, suggestive of tendinosis. The skin was marked with a retracted ball point pen and the skin was cleaned thoroughly with betadine and alcohol. Using sterile technique the overlying skin, subcutaneous tissues, and common extensor tendon were anesthetized with 4 cc of 1% lidocaine without epinephrine. Once proper anesthesia was confirmed; in the long axis view, a 22 gauge needle was introduced and ultrasonically guided to the areas of identified tendinosis. The needle was maintained in the long axis view. Approximately 35-45 fenestrations of the tendinopathic tissue were made under US guidance. Several of these still pictures and dynamic video clips were captured on the US hard drive for medical documentation. The patient tolerated the procedure well without complications. She was discharged to home in stable conditions with a written post injection instruction sheet.
Reimbursement Case #4

- 24357
  - Private insurance: $769 - $935
  - Medicare: $451
Case #5

- 48 year old female presents with left shoulder pain and stiffness for 3 months. Unable to reach behind and fasten her bra. You diagnose adhesive capsulitis and offer her physical therapy and an US guided glenohumeral joint injection.

- Glenohumeral joint injection with 6 cc lidocaine and 80 mg kenalog under US guidance today
Coding Case #5

• 20611 = Arthrocentesis, aspiration or injection of major joint or bursa, with US guidance, and permanent recording and reporting
  – Large joint injection (knee, shoulder, hip) with US guidance or large bursa (troch, pre-patellar)
  – And, J-code for 2 units of kenalog (40 mg/ml)
Documentation Case #5

- Name: Alyson Noname
- DOB: 02/06/1961
- MR#: 003456
- Date: 10/12/10

**Procedure:** US guided left glenohumeral joint injection using Sonosite M-turbo with a linear probe. 4 images captured with video or static images of the joint before and during the needle placement. Verbal and/or written consent was obtained prior to the injection. Proper side was confirmed.

**Findings:** A posterior view of the glenohumeral joint was obtained and a still image was captured. The skin was marked with a retracted ball point pen, the area was cleaned in a sterile fashion with betadine then alcohol. The glenohumeral joint was clearly visualized and thinning of the articular cartilage was noted. A 22 gauge spinal needle was introduced and the needle was visualized showing both the joint and the needle in a long axis view. The needle was slowly guided into the glenohumeral joint under US guidance Video clips and 2 still images were captured. A syringe containing 6 cc of lidocaine and 80 mg of kenalog was attached and this was injected smoothly into the joint without resistance or complications. Patient was given a written post injection instruction sheet and told to call if any problems, questions or complications post injection.
Case #5

- 20611
- Private insurance: $183-$208
- Medicare: $96
Minimize Claim Denials

- Include your US reading with the medical records
- Narrative of US needle guidance should be clear in the procedure note
- Have not heard of denials because “you are not a radiologist”
- Necessity of US needle guidance is the most likely issue to arise (Why did you need US?)
Final Tips

• Be meticulous in your narrative

• Do not code for using Doppler

• 76970 = US study, follow up
  – Must be used by itself on day of visit
  – Private insurance: $110 - $191
  – Medicare (if allowed): $99

• *Reimbursement is regionally and insurer variable