

EMERGENCY MEDICINE
ULTRASOUND WORKSHOP

Joint and MSK Ultrasound

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Disclosure

- I do not have any relevant financial conflicts with commercial interest companies to disclose.

About Me

I am an emergency medicine physician practicing in Des Moines, with UnityPoint Health. I am a Des Moines native and returned to the area in 2019. I completed my emergency medicine residency at the University of Iowa, medical school at KCOM in Kirksville, Missouri.



I assisted in development of new ultrasound curriculum at the University of Iowa EM program, and nursing US IV access at UIHC. Completed US based research in fluid resuscitation and sepsis.

Shoulder Ultrasound

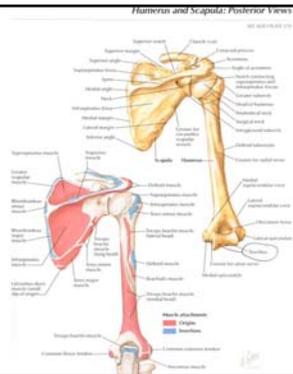
Diagnosis and Joint Injections

Shoulder Dislocations

- Ultrasound can be used to visualize the glenohumeral joint and AC joint
- Curvilinear or Linear probe can be used
- Exam is best performed on the posterior aspect, place your screen in front of the patient if possible
- Limitations include that you are not identifying possible Hill-Sachs or Bankart deformities

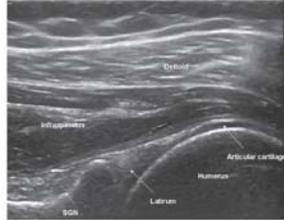
Shoulder Anatomy

- The Humeral head rests within the glenoid fossa, which is the area that we will focus on with POCUS



Shoulder Anatomy

- Normal US visualization of the shoulder



<https://radiologykey.com/shoulder-7/>

Shoulder Anatomy

- Anterior Glenohumeral dislocation



<http://brownemblog.com/blog-1/2016/11/30/pocus-shoulder-dislocation>

Shoulder Anatomy

- Posterior glenohumeral dislocation



<http://brownemblog.com/blog-1/2016/11/30/pocus-shoulder-dislocation>

Shoulder Dislocations

- Often procedural sedation is employed for reduction of glenohumeral dislocations
- Alternatively, intraarticular lidocaine can be administered with improved pain control
- This reduces many of the time and labor intensive aspects of procedural sedation

Intra-Articular Lidocaine

Position yourself in the same manner that you would to visualize the joint

Ensure that you have a long needle, 22G is preferred (you may need a spinal needle)

As always, prepare your injection site

Patient's may feel a sharp pain as you enter the joint space

Anesthetic should freely flow when you are in the joint space without resistance



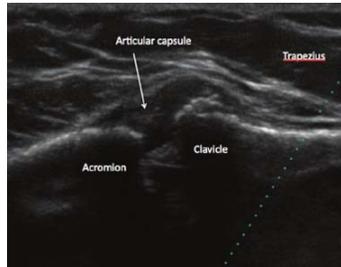


AC Separation

- The acromioclavicular joint is easily identified with the linear probe as it is relatively superficial in most patients
- As with the shoulder you can also administer anesthetic into this joint for pain control in these patients

AC Separation

Note that there is a surrounding hematoma



<https://www.researchgate.net/figure/Sonographic-image-of-a-right-acromioclavicular-joint-The-acromion-can-be-seen-on-the>

Knee Ultrasound

Diagnostics and arthrocentesis

Knee Trauma

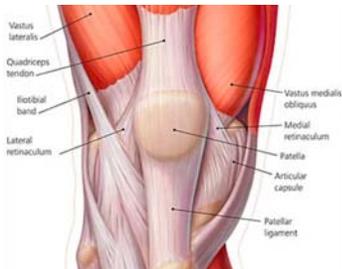
- Knee trauma can result in multiple different pathologies
- Ultrasound can help give real time visualization of anatomy that is not identified on plain films
- POCUS can also aid in identifying occult fractures such as tibial plateau fractures

Knee Anatomy

Quadriceps are divided into four muscles which join together to insert onto the patella

Quadriceps tendon tears usually occur just above the insertion

Less common than a patellar tendon tear



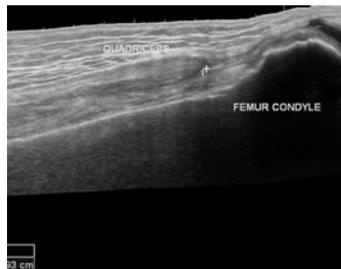
<https://coreem.net/core/quadriceps-tendon-rupture/>

Normal US Views

Suprapatellar view of the knee

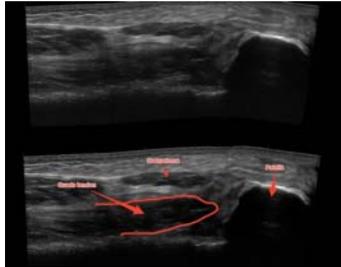
Note quadriceps tendon and underlying adipose tissue

- Superficial layer: rectus femoris
- Middle layer: vastus medialis, vastus lateralis
- Deep layer: vastus intermedius



Quadriceps Tendon Rupture

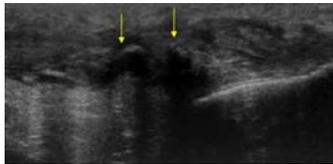
Ultrasound can provide direct visualization of a tendon rupture, and sometime an associated hematoma



<https://coreem.net/core/quadriceps-tendon-rupture/>

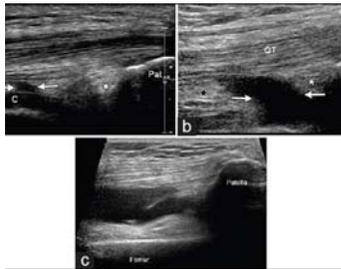
Patellar Tendon Rupture

Patellar tendon ruptures also frequently occur near the attachment of the inferior pole of the patella



<https://coreem.net/core/patella-tendon-rupture/>

Knee Joint Effusion



http://www.indianrheumatol.com/viewimage.asp?img=IndianRheumatol_2018_13_5_36_238200_f2.jpg

Knee arthrocentesis

Lateral access to the knee joint can be easily obtained with palpating the patella and joint recess

Suprapatellar access can also be easily obtained using a linear transducer

Needle entrance through the potential space lateral to the quadriceps tendon



http://www.indianjrheumatol.com/viewimage.asp?img=IndianJRheumatol_2018_13_5_36_238200_f6.jpg

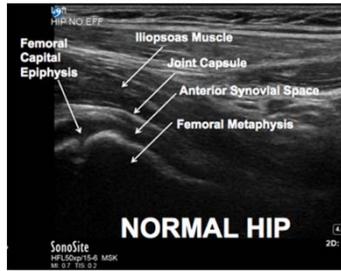
Hip Ultrasound

Common Hip Pathologies

- POCUS is particularly useful in pediatric patients
- Can be used to evaluate for effusions, and to a lesser degree, bony abnormalities
- Transient synovitis and septic arthritis

Normal Hip POCUS

Place the patient supine
Use the linear or curvilinear probe
Place the probe in the sagittal plane and move superiorly until you identify the femoral head



<https://www.acep.org/how-we-serve/sections/emergency-ultrasound/news/april-2018/tips--tricks-ultrasound-in-the-diagnosis-of>

Joint Effusion on POCUS

There is a physiologic amount of fluid in the joint space, typically less than 5mm

For pediatric joint effusion: Fluid collection greater than 5mm or greater than 2mm when compared to the contralateral hip

Measured between the posterior surface of the iliopsoas and anterior surface of the femoral neck



Ankle Ultrasound

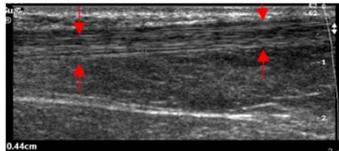
Ankle Ultrasound Utilization

- Identify Achilles' tendon rupture
- Identify joint effusions

Achilles Tendon

Normal anatomy

Begin your scan at the calcaneus and move proximally
As you are assessing the tendon, plantarflex the ankle to assess for tears, some parts may move and others will not
We are looking for contour change or shadowing



<http://www.emdocs.net/ultrasound-for-achilles-tendon-rupture/>

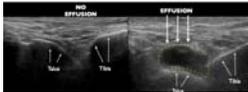
Achilles Tendon

Achilles' tendon rupture



Ankle Arthrocentesis

Place the foot in slight plantarflexion
 Slide the probe distally along the tibia in sagittal orientation, identify the tibialis anterior tendon
 Visualize the tibial-talar joint space
 Use a medial to lateral approach with your needle (you may use in-plane if possible)



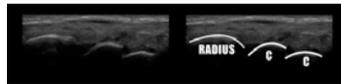
<http://highlandultrasound.com/ankle-arthrocentesis>

Wrist Arthrocentesis

BONUS!

Wrists can be difficult to obtain synovial fluid from, and can frequently have a dry tap.

Place the patient with their palm down
 Probe will be sagittal over the distal radius
 Identify the joint space between the radius and scaphoid/lunate
 Advance your needle in plane



<https://www.acep.org/how-we-serve/sections/emergency-ultrasound/news/dece/more-tips-and-tricks-ultrasound-guidance-for->



<https://www.acep.org/how-we-serve/sections/emergency-ultrasound/news/dece/more-tips-and-tricks-ultrasound-guidance-for->

Foreign Body Retrieval

Foreign Body Retrieval

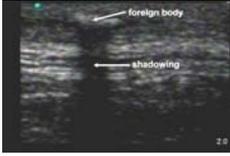
- FBs are a common ED complaint that can result in a relatively simple and efficient disposition
- POCUS can aid in identifying these FBs and removing them
- Not all FBs are radio-opaque, but may be visualized with US
- Real time investigation of soft tissues

Foreign Body Retrieval

- Wood splinters are one example of objects which may not appear on plain films
- US can investigate the area while physical exam is being performed and can aid in real time visualization of retrieval
- Less trauma as we are not searching blindly

Foreign Body Retrieval

- Water bath is the preferred method for visualization
- You may also use ultrasound gel if the area is not able to be submerged



<https://www.acep.org/sonoguide/FB-Figure1.html>



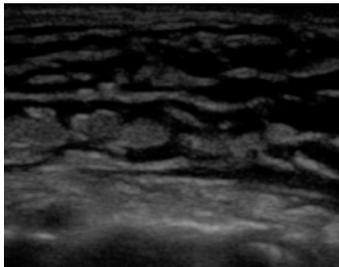
<https://www.acep.org/sonoguide/FB-Figure2.html>

Soft Tissue Infections

Cellulitis, abscess, necrotizing infections

Cellulitis

- Fan through the area of concern
- Note cobblestoning of the subcutaneous tissues
- Absence of drainable fluid collection



<https://radiopaedia.org/cases/cellulitis-sonographic-cobblestone-appearance>

Abscess

Hypoechoic fluid collection
You may note a "star like" appearance which may be gas within the wound
Often will see cobblestoning of surrounding tissues
When identifying an area of maximum fluid collection, use a skin marker to identify a site for incision in two planes



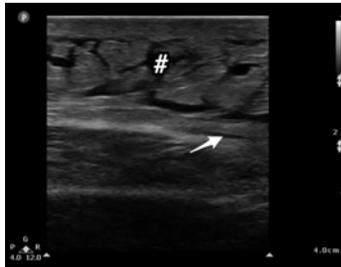
[https://radiopaedia.org/cases/39586/studies/41903?lang=us&referrer=%2Farticles%2Fsubcutaneous-abscess%3Flang%](https://radiopaedia.org/cases/39586/studies/41903?lang=us&referrer=%2Farticles%2Fsubcutaneous-abscess%3Flang%3F)

Necrotizing Soft Tissue Infections

Findings will show cobblestoning of subcutaneous tissues
Additionally, you will see fluid layers in deeper fascial planes
Typically > 4mm along the deep fascial layer

US has been shown to be 88.2% sensitive and 93.3% specific

Yen Z, Wang H, Ma H, Chen S, Chen W. Ultrasonographic screening of clinically-suspected necrotizing fasciitis. Acad Emerg Med. 2002;9(12):1448-1451.



<https://www.aliem.com/ultrasound-win-erythematous-abdomen/>

Questions?