

5th Annual Radiology Update for Family Physicians

Musculoskeletal Ultrasound: Indications and Alternatives

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Disclosure

I am a Partner at Medical Imaging Consultants (MIC)

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Discussion Points



- Joint specific approach to indications for musculoskeletal ultrasound and role of alternative imaging
- Role of musculoskeletal ultrasound in interventions

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Disclaimers

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Following indications and alternative imaging suggestions are the opinions of the musculoskeletal division of Medical Imaging Consultants

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Decisions are evidence based from the available literature

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Applies to the pediatric (not infant) and adult populations

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Golden Rule of MSK Radiology

Always start with a plain film



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SHOULDER



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Ultrasound Indications

Rotator cuff pathology	• tendons, muscle bellies (except subscapularis)
Subacromial subdeltoid bursa	• bursitis and impingement
Proximal long head of the bicep tendon	• tear and tenosynovitis
Acromioclavicular joint	• <u>specific</u> → effusion and synovitis
Sternoclavicular joint	• <u>specific</u> → effusion and synovitis
Glenohumeral joint	• <u>specific</u> → effusion and synovitis


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Alternative Imaging

Glenohumeral, ACJ and sternoclavicular joint joint → radiograph, MRI	Bones → initially radiograph	Labrum → MRI-arthrogram
Adhesive capsulitis → clinical diagnosis	Cartilage → MRI	Pectoralis major Humeral head can be seen at ultrasound; however global assessment is better suited for MRI

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ELBOW



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Ultrasound Indications

Elbow joint	• <u>specific</u> → effusion and synovitis
Tendon assessment	• triceps, distal bicep, CFO and CEO
Ulnar neuropathy work-up	• dynamic assessment (subluxation of the nerve), cubital tunnel
Olecranon and bicipitoradial bursa	• bursitis

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Alternative Imaging

Elbow joint/ bones
 → radiograph to assess the joint space, loose bodies
 → MRI

Ligaments → MRI	Cartilage → MRI
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FOREARM/WRIST



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Ultrasound Indications

Wrist joint	• <u>specific</u> → effusion and synovitis
Intersection syndrome	• extensor tendons (proximal [ext 1 over 2] and distal [ext 3 over 2])
Median neuropathy	• carpal tunnel and median nerve
Ulnar neuropathy	• course of the ulnar nerve to Guyon canal
Lump	• ganglion cyst, solid mass (may need MRI)

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Alternative Imaging

Triangular fibrocartilage (TFCC) → MRI	Ligaments (ie. Scapholunate ligament) → MRI
Wrist joint/bones → radiograph	Cartilage → MRI

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HAND/FINGER



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Ultrasound Indications

Joint	• <u>specific</u> → effusion, synovitis, capsular ligaments (UCL/RCL)
Extensor and flexor tendons	• tear, tenosynovitis, dynamic assessment
Lump	• ganglion, palmar fibromatosis, solid mass (may need MRI)

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Alternative Imaging

Joint spaces/bones → radiograph	Flexor Pulleys → better assessed by MRI but can be initially attempted by ultrasound
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PELVIS/HIP



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Ultrasound Indications

Hip joint/ pubic symphysis	• <u>specific</u> → effusion and synovitis
Tendons (gluteal, hamstring, iliopsoas, adductor)	• tendinosis, tear
IT band	• IT friction syndrome
Bursa (iliopsoas, trochanteric, ischial)	• bursitis

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Alternative Imaging

Joint spaces/ Bones → radiograph	Hip labrum → MRI	Athletic Pubalgia → MRI more sensitive
Cartilage → MRI	Arthroplasty → MRI (ultrasound can assess for fluid collections)	

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KNEE



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Ultrasound Indications

Knee joint	• <u>specific</u> → effusion and synovitis
Tendons (quadricep, patellar, bicep femoris, pes anserine [not popliteus])	• tendinosis, tear
MCL, LCL, IT	• sprain, tear
Other	• Prepatellar soft tissues, baker cyst and Pes anserine bursa

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Alternative Imaging

Joint space/ bones → radiograph	Arthroplasty → MRI	ACL/ PCL → MRI
Meniscus → MRI	Cartilage → MRI	Posteromedial and posterolateral corner structures → MRI

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LOWER LEG/ ANKLE



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Ultrasound Indications

Achilles tendon	• tendinosis, tear
Tennis leg	• medial head of the gastrocnemius myofascial tear
Ankle joint	• <u>specific</u> → effusion and synovitis
Ankle tendons (medial, anterior and lateral)	• tendinosis, tear, tenosynovitis
Ankle ligaments	• ultrasound does NOT provide an all encompassed assessment of the ligaments • ATFL, CFL, AITFL, ?Deep deltoid
Dynamic assessment	• peroneal subluxation, lateral instability (ATFL)

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Alternative Imaging

Joint spaces/ Bones → radiograph	Syndesmotic injuries → MRI	Wider scope of ligament assessment → MRI (ie. PTFL, spring ligament)
Cartilage → MRI	Tarsal tunnel and sinus tarsi → MRI	

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FOOT/TOES



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Ultrasound Indications

Joint	• <u>specific</u> → effusion and synovitis
Extensor and flexor tendons	• tear, tenosynovitis, dynamic assessment
Intermetatarsal pain	• Morton neuroma/ intermetatarsal bursitis
Plantar fascia	• tear, fasciitis, fibroma
Lump	• ganglion cyst, solid mass (may need MRI)

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Alternative Imaging

Joint spaces/ Bones → radiograph	Plantar plate injuries → MRI	Lisfranc joint/ligament → MRI weight-bearing views of the foot for joint and MRI for ligament
Cartilage → MRI	Turf toe MRI	

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OTHER: GENERALLY IMPROPER INDICATIONS FOR MSK ULTRASOUND

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Improper indications of MSK US (1 of 2)



- **Spine/back imaging**
 - radiograph, MRI, CT
- **General pain**
 - ultrasound requires a directed question to be answered
- **Soft tissues**
 - general wide-spread → MRI (Ultrasound can be good to address a specific question)
- **Sacroiliac joints**
 - only visualizing the tip of the iceberg

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Improper indications of MSK US (2 of 2)



- **TMJ**
 - studies comparing US with MRI in TMJ arthritis have determined a poor correlation between these modalities, with US potentially missing from 67% up to 75% of TMJ MRI-detected inflammatory changes [3]
- **Trauma**
 - radiograph (fractures) should be the initial modality prior to any further investigations (ie. Ultrasound)

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MSK ultrasound in interventions



Recent evidence, based on large randomised controlled trials and meta-analyses, demonstrates improved accuracy, efficacy, and cost-effectiveness of ultrasound-guided joint and MSK soft tissue injections when compared with landmark-guided injections [1,2]



The use of ultrasound guided interventions compared to landmark guided reduces the likelihood of inadvertent outcomes



We are of the opinion that interventions pertaining to tendons/ tendon sheaths be performed under ultrasound guidance to avoid inadvertently injecting the tendon itself



Ultimately, ultrasound guided interventions provide value to patients as it is targeting the area of concern while minimizing/eliminating the potential adverse outcomes

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Conclusion

We have learned about common MSK ultrasound indications and indications where other imaging is more appropriate

Take home point: MSK Ultrasound is an excellent modality for many pathologies, however; is better suited to answer a DIRECT/ SPECIFIC question

Clinic-dependent: MSK diagnostic ultrasound is interpreted by an on-site Musculoskeletal Fellowship-trained Radiologist

Clinic-dependent: MSK ultrasound-guided interventions are performed by a Musculoskeletal Fellowship-trained Radiologist

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References

- [1] Finnoff D, Hall MM, Adams E et al. American Medical Society for Sports Medicine (AMSSM) position statement: interventional musculoskeletal ultrasound in sports medicine. *Br J Sports Med.* (2015) 49(3): 145–150.
- [2] Huang Z, Du S, Qi Y, et al. Effectiveness of ultrasound guidance on intraarticular and periarticular joint injections: systematic review and meta-analysis of randomized trials. *Am J Phys Med Rehabil.* (2015) 94(10): 775–783.
- [3] Weiss PF, Arabshahi B, Johnson A, Bilaniuk LT, Zarnow D, Cahill AM, et al. High prevalence of temporomandibular joint arthritis at disease onset in children with juvenile idiopathic arthritis, as detected by magnetic resonance imaging but not by ultrasound. *Arthritis Rheum.* (2008) 58:1189–96.

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Thank you!

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