AMSER Case of the Month

60-year-old female presents with right shoulder pain

Malaak Saadah, MS3
Case Western Reserve University School of Medicine

Navid Faraji, MD
University Hospitals Cleveland Medical Center
Department of Radiology

Patient Presentation

HPI: A 60-year-old female presents to urgent care after falling in her bathroom two days ago, landing on her right shoulder. She reports significant shoulder pain, especially with abduction, and some initial swelling in her hand, which has improved. She denies loss of consciousness, pain or swelling in her wrist or elbow, and additional injuries. The shoulder pain has only slightly improved since the injury.

Medical History: Rheumatoid arthritis

Surgical History: None

Physical Exam: Circulation and sensation intact in the arm. Mild edema in the hand, with some arthritis noted in the fingers. Hand, wrist, and elbow demonstrate normal range of motion. The **upper shoulder is tender, with maximum active abduction limited to 30 degrees**. The scapula and clavicle appear normal.

Pertinent Labs

- None

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 1: **Adult. Acute shoulder pain. Any etiology. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography shoulder	Usually Appropriate	☢
US shoulder	Usually Not Appropriate	O
MR arthrography shoulder	Usually Not Appropriate	O
MRI shoulder without and with IV contrast	Usually Not Appropriate	O
MRI shoulder without IV contrast	Usually Not Appropriate	O
Bone scan shoulder	Usually Not Appropriate	☢☢☢
CT shoulder with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without and with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without IV contrast	Usually Not Appropriate	☢☢☢
CT arthrography shoulder	Usually Not Appropriate	☢☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Ordered by attending physician at urgent care

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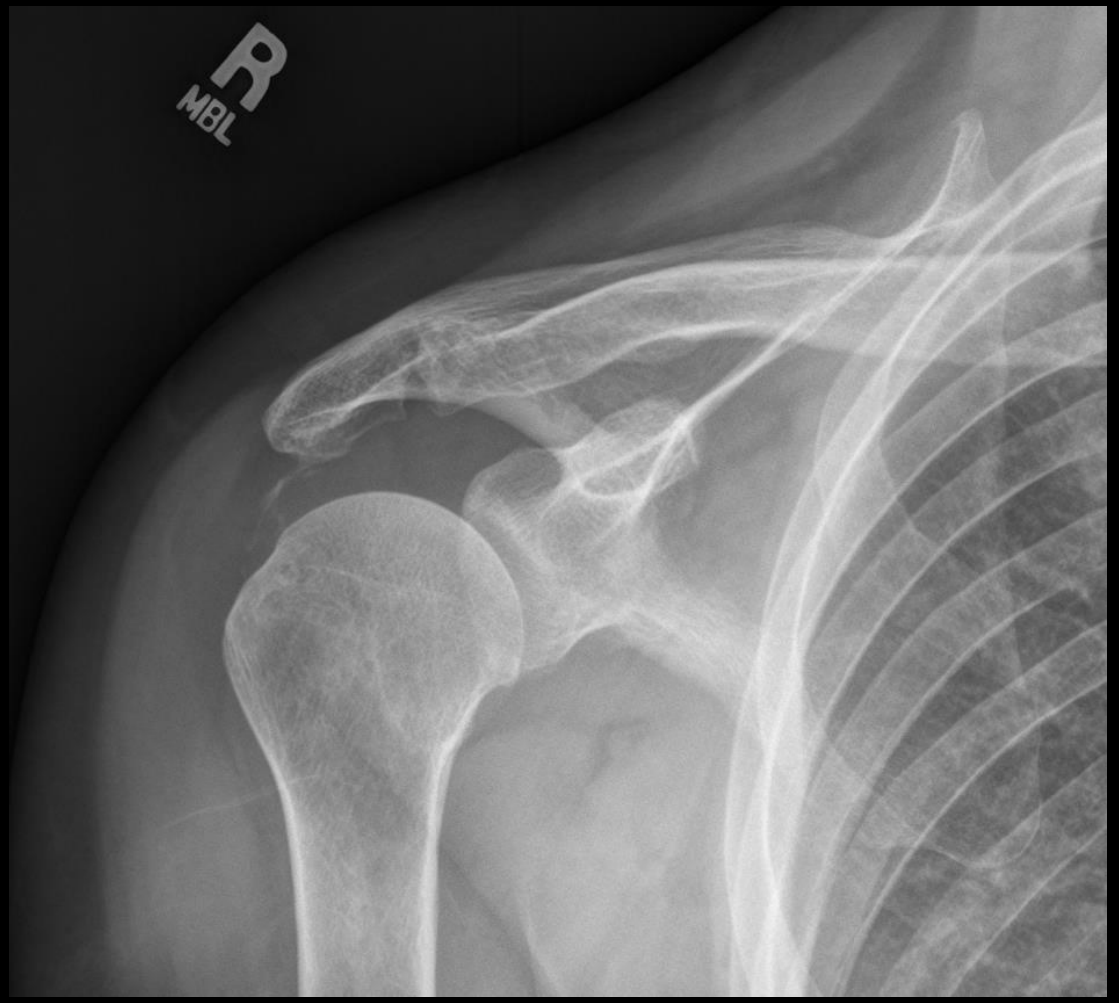
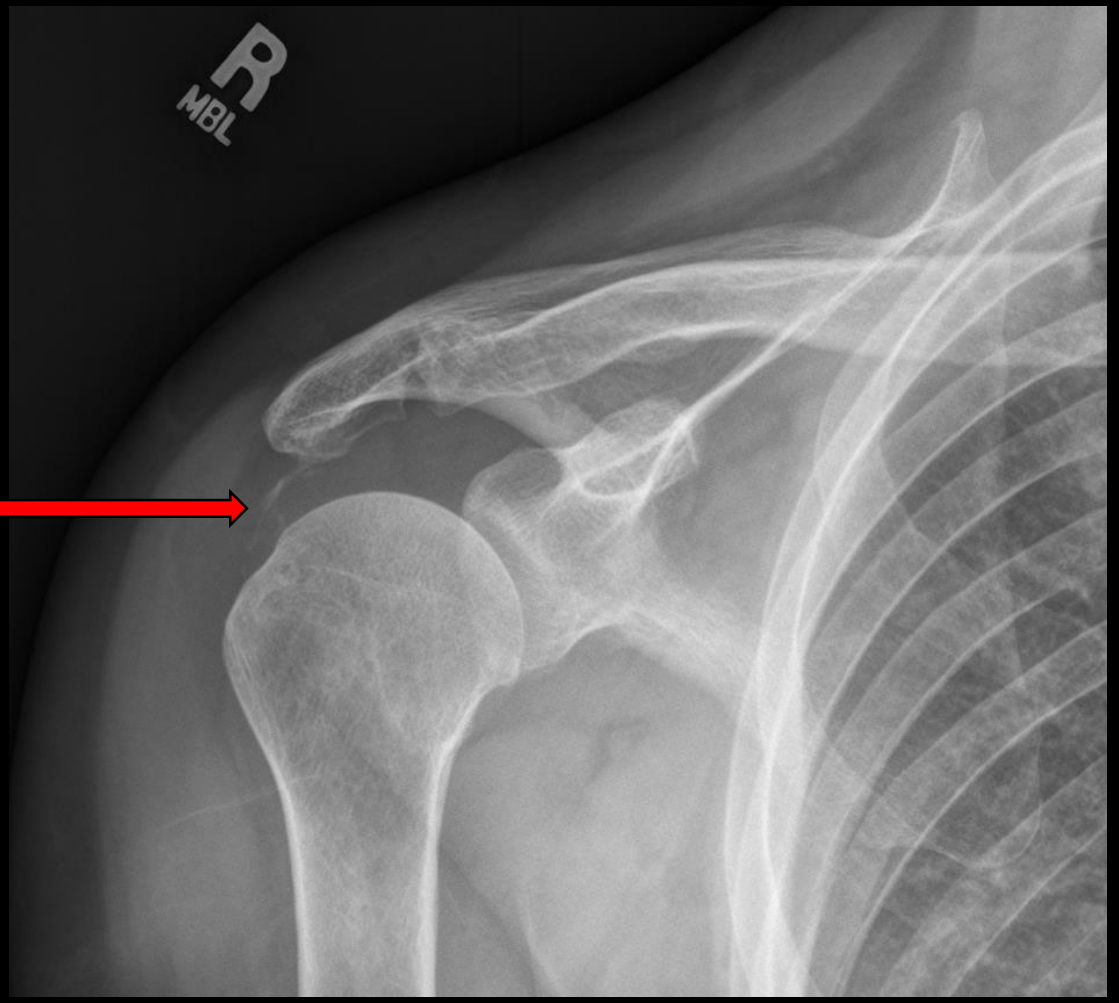
Findings (unlabeled)



Findings: (labeled)

AP external rotation radiograph with a normal glenohumeral joint and calcification in the superior rotator cuff (arrow), consistent with calcific tendonitis



Plan: Prednisone for pain with rest, ice, heat, NSAIDs, diclofenac, and manual massage for management. Follow up with orthopedic surgery in two weeks.

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Follow-Ups

2-weeks post urgent care visit at orthopedic surgery

Patient reports unresolved, constant, aching pain in right shoulder with pain in the right wrist as well despite taking medication and following prescribed management. Pain is worse with activity.

Plan: Steroid injection performed

6-week orthopedic surgery follow-up

No improvement in right shoulder pain

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 3: **Chronic shoulder pain. Radiographs demonstrate calcific tendinopathy or calcific bursitis. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually Appropriate	Varies
US shoulder	May Be Appropriate	O
MR arthrography shoulder	May Be Appropriate	O
MRI shoulder without IV contrast	May Be Appropriate	O
Radiography shoulder additional views	Usually Not Appropriate	☢
MRI shoulder without and with IV contrast	Usually Not Appropriate	O
Bone scan shoulder	Usually Not Appropriate	☢☢☢
CT shoulder with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without and with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without IV contrast	Usually Not Appropriate	☢☢☢
CT arthrography shoulder	Usually Not Appropriate	☢☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Ordered by orthopedic surgeon

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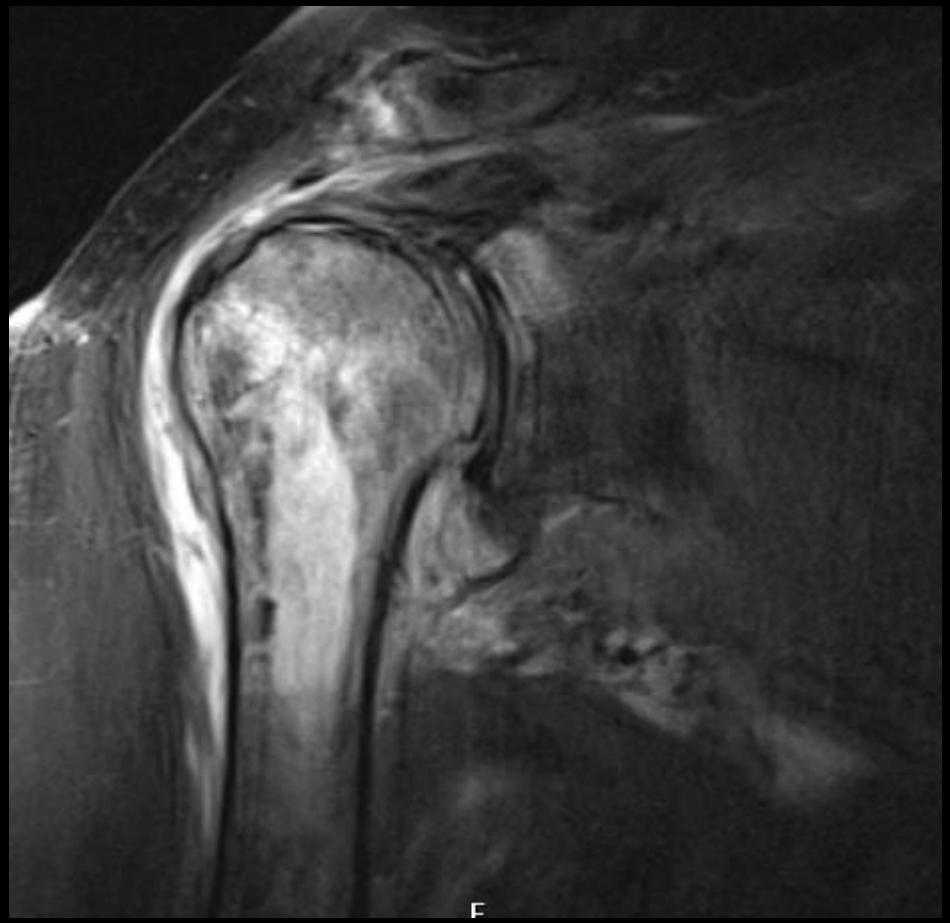
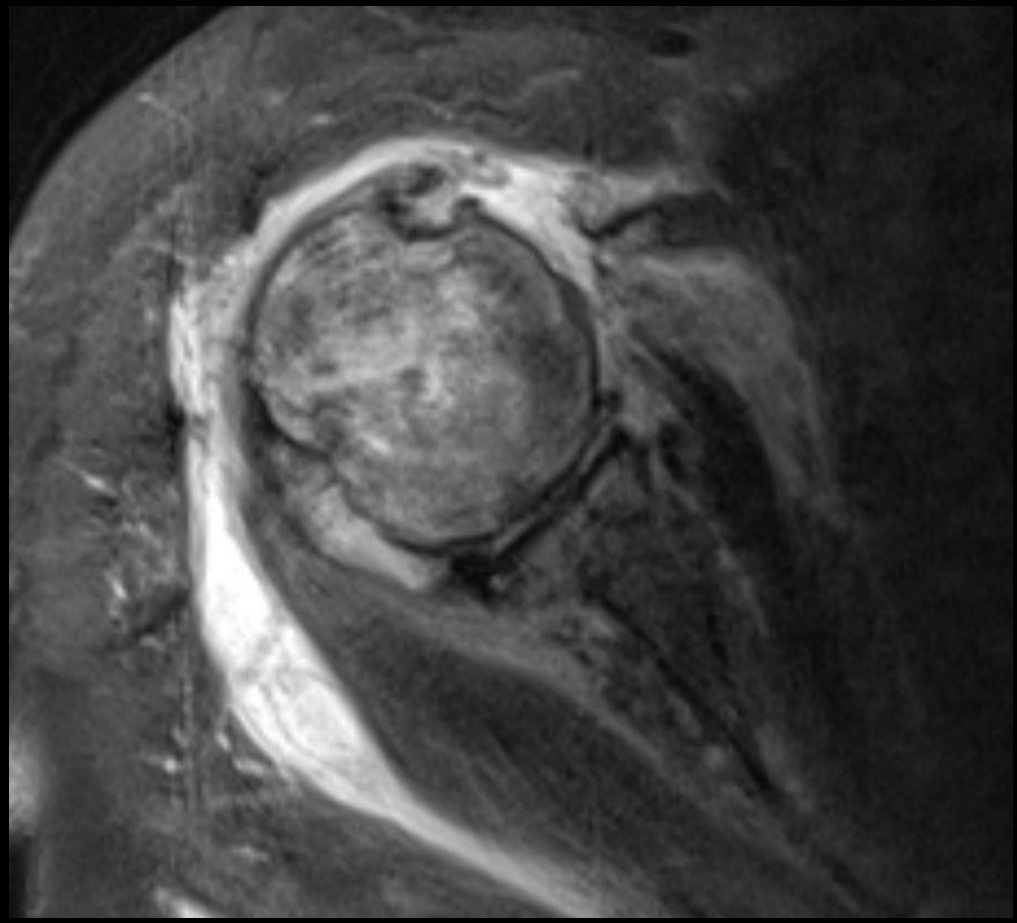
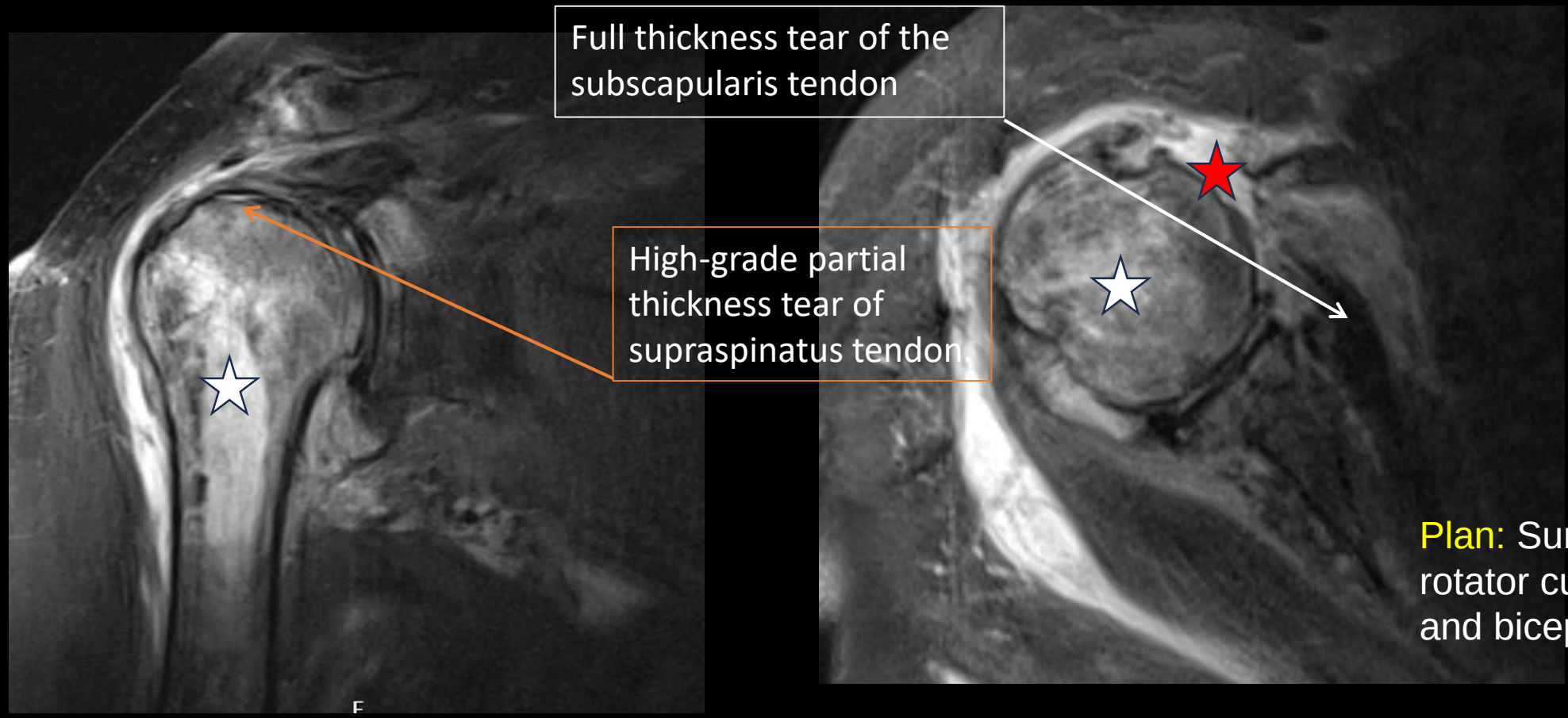
Findings (unlabeled)





Findings (labeled)



Plan: Surgery for rotator cuff repair and bicep tendonitis

Coronal *(left)* and axial *(right)* T2 fat suppressed images that demonstrate extensive bone marrow edema *(white stars)* and subacromial subdeltoid bursal inflammation *(red stars)*

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Follow-Up

7-week surgery follow-up with orthopedics

Patient reports increasing shoulder pain

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

Variant 8: **Chronic shoulder pain. History of prior rotator cuff repair. Suspect rotator cuff disorders or subacromial subdeltoid bursitis. Initial radiographs normal or inconclusive. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
US shoulder	Usually Appropriate	O
MR arthrography shoulder	Usually Appropriate	O
MRI shoulder without IV contrast	Usually Appropriate	O
CT arthrography shoulder	Usually Appropriate	☢☢☢☢
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	May Be Appropriate	Varies
Radiography shoulder additional views	Usually Not Appropriate	☢
MRI shoulder without and with IV contrast	Usually Not Appropriate	O
Bone scan shoulder	Usually Not Appropriate	☢☢☢
CT shoulder with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without and with IV contrast	Usually Not Appropriate	☢☢☢
CT shoulder without IV contrast	Usually Not Appropriate	☢☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢

Ordered by orthopedic surgeon

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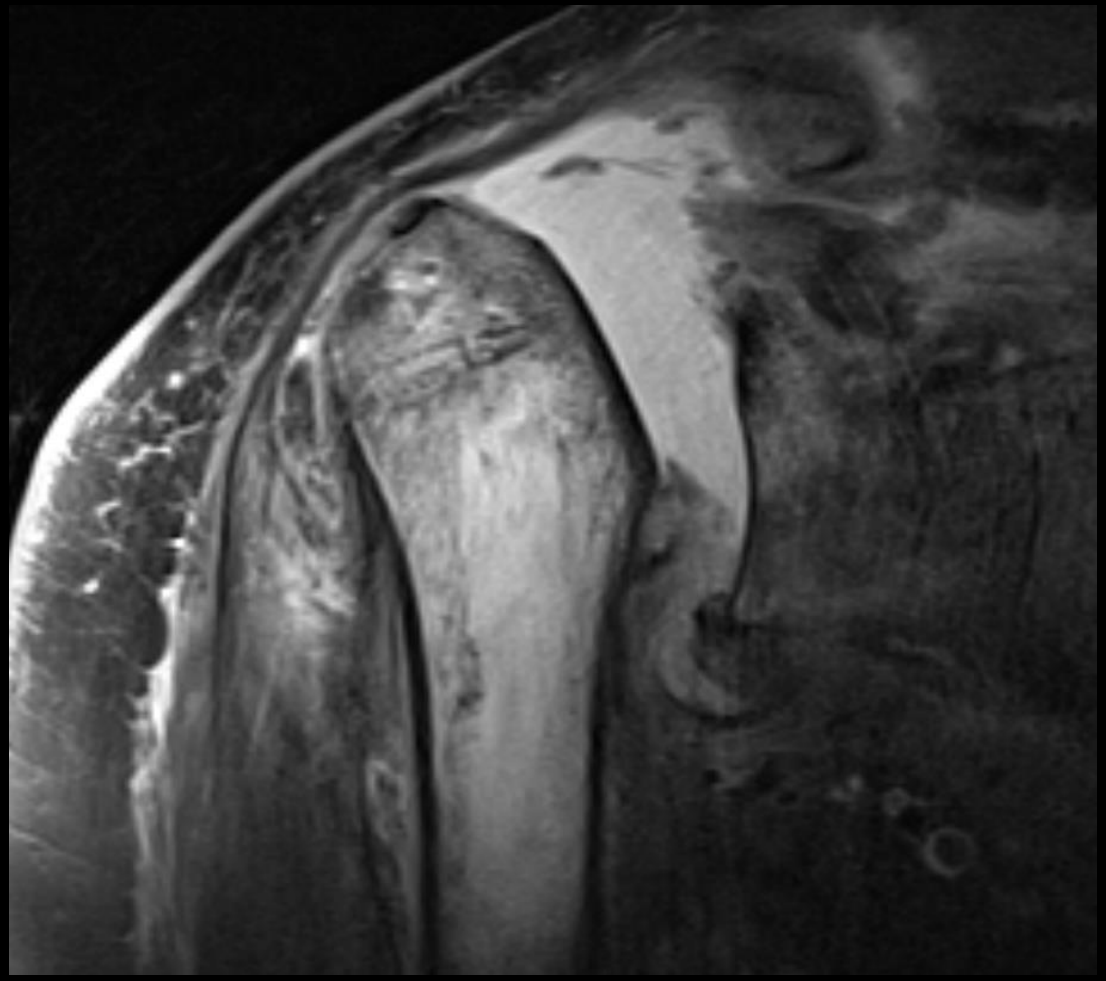

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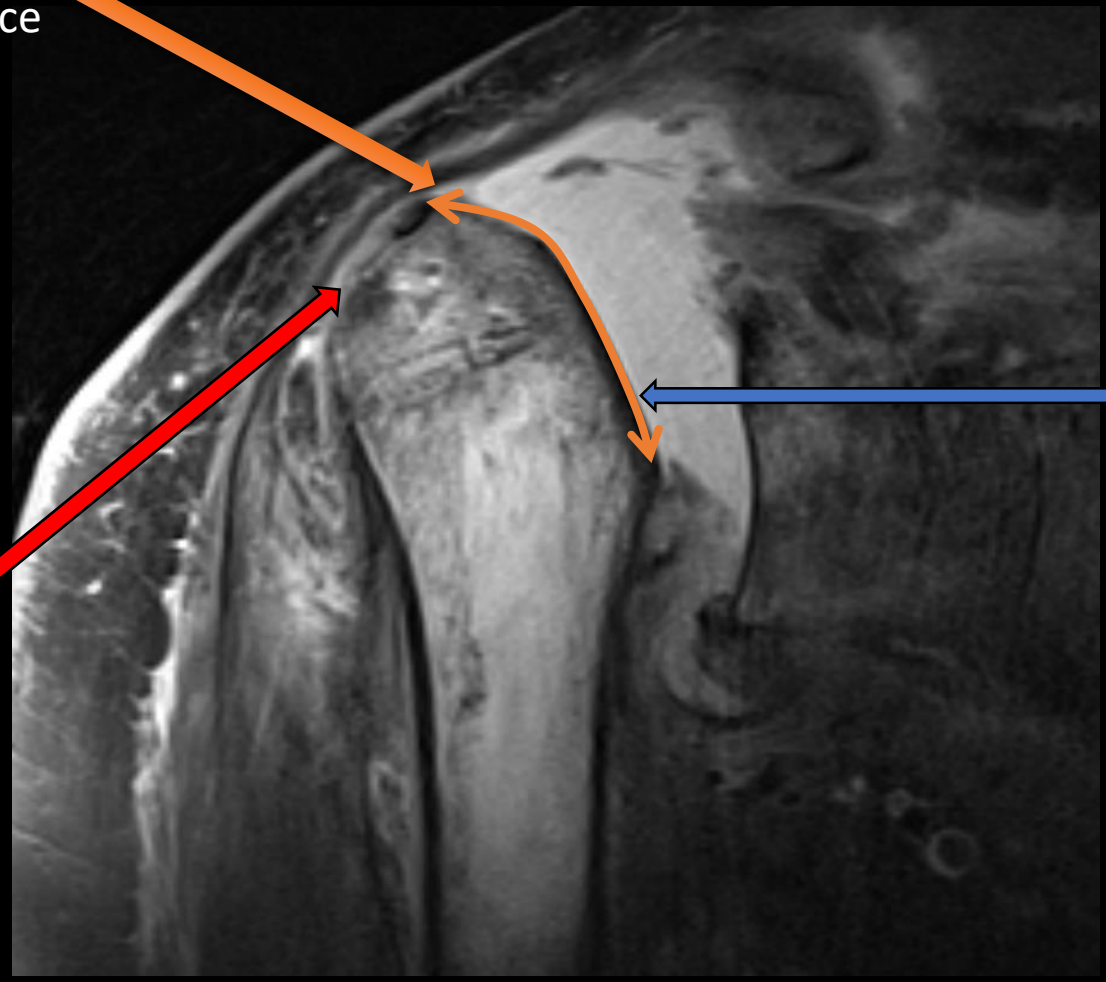

Coronal T2 fat suppressed MRI of right shoulder

Final Dx:

Milwaukee Shoulder Syndrome

Case Discussion

History: The name “Milwaukee Shoulder” comes from a group of Milwaukee-based researchers who encountered four cases of this pathology. However, the first case of this condition was noted by an Irish surgeon in 1857.

Epidemiology: Affected individuals are primarily elderly women, especially those with a prior history of trauma to the region

Clinical Presentation: Onset of this condition is typically rapid with join pain, inflammation, and tenderness. Patients may also experience limited range of motion.

Case Discussion

Diagnostic: X-ray and MRI findings are severe and striking. Imaging may be characterized by the following

- Severe articular surface destruction
- Large joint effusion
- Partial or complete rotator cuff tear
- Subchondral sclerosis

Alizarin red staining may help confirm presence of calcium hydroxyapatite crystals.

Case Discussion

Pathophysiology: Hydroxyapatite crystal deposition within the joint space results in widespread articular cartilage and capsular tissue degeneration. This results in partial or complete tears of the rotator cuff and joint instability.

Treatment: Focus is on supportive therapy and symptomatic relief including physiotherapy, NSAIDs, intra-articular steroids, etc.

Differential Diagnoses: Severe osteoarthritis, Charcot joint, vanishing bone disease, or other crystal deposition arthropathies

References:

1. Santiago T, Coutinho M, Malcata A, et al. Milwaukee shoulder (and knee) syndrome. *BMJ Case Rep*. 2014;2014:bcr2013202183. doi:10.1136/bcr-2013-202183.
2. Llauger J, Palmer J, Rosón N, et al. Nonseptic monoarthritis: imaging features with clinical and histopathologic correlation. *Radiographics*. 2000;20(Spec No):S263-S278. doi:10.1148/radiographics.20.suppl_1.s263.
3. McCarty DJ, Halverson PB, Carrera GF, et al. "Milwaukee shoulder"—association of microspheroids containing hydroxyapatite crystals, active collagenase, and neutral protease with rotator cuff defects. I. Clinical aspects. *Arthritis Rheum*. 1981;24(3):464-472. doi:10.1002/art.1780240303.