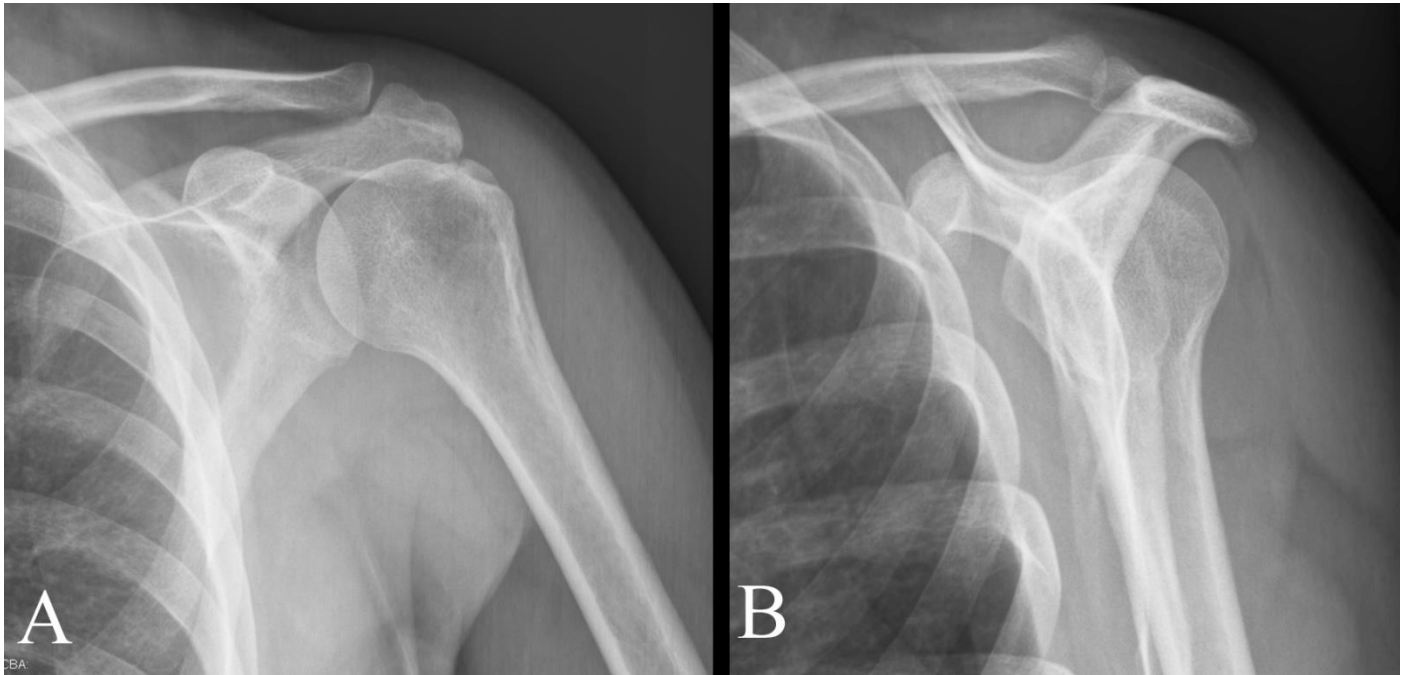


## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 47 year old young woman presents to clinic with chronic shoulder pain. She works as a farmhand on a dairy farm. The patient's pain is along the superior and lateral shoulder and does not radiate past the elbow. She states that her left shoulder feels weak. She has no numbness or tingling in the upper extremity. Neck movement does not exacerbate the shoulder pain. She denies prior fracture, dislocation, or other abnormalities and has no cardiopulmonary complaints. On physical examination, her vital signs are normal. Her Spurling's test is negative. She has no supraclavicular or acromioclavicular joint tenderness. She has full grip strength and normal range of motion and strength at the elbow. Her crossover and impingement tests are positive for pain and she lacks 20 degrees of internal rotation. A plain film of the shoulder was obtained (the study included Grashey and axillary views in addition to the AP and trans-scapular "Y" views shown here):



Which of the following imaging studies is the next examination of choice for evaluation of chronic shoulder pain?

- (a) computed tomography (CT) of the shoulder
- (b) magnetic resonance (MR) imaging of the shoulder
- (c) nuclear medicine bone scan of the shoulder
- (d) ultrasound (US) examination of the shoulder

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
---

Which of the following imaging studies is the next examination of choice for evaluation of chronic shoulder pain?

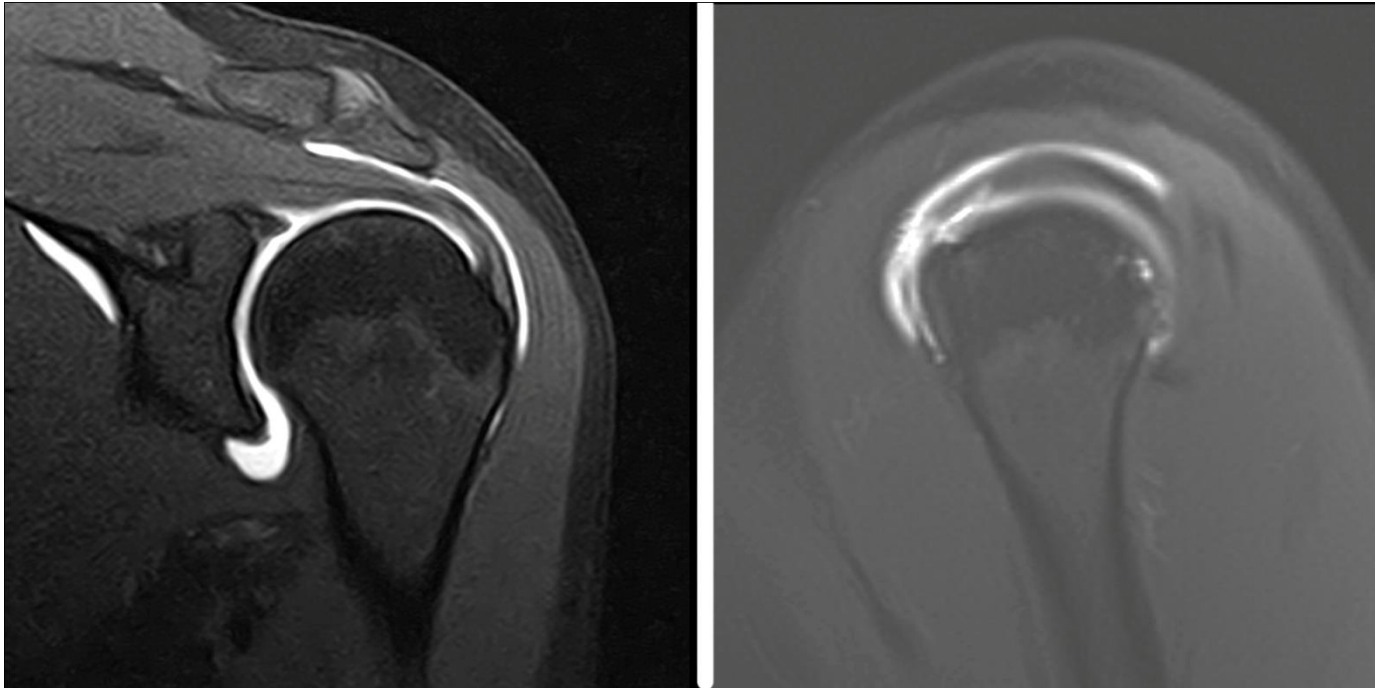
- (a) computed tomography (CT) of the shoulder
- (b) magnetic resonance (MR) imaging of the shoulder
- (c) nuclear medicine bone scan of the shoulder
- (d) ultrasound (US) examination of the shoulder

The initial imaging study in almost all patients with chronic shoulder pain is a plain film examination of the shoulder, which was obtained. This was normal (see image on Page 1). Given the patient's symptoms, possible diagnoses include rotator cuff tear, bursitis, and (rarely) radiographically occult stress fracture, avascular necrosis, or tumor. The next imaging study of choice depends somewhat on local ordering patterns and the preference of the ordering physician and patient. Generally, MR imaging of the shoulder (b) is the next imaging study performed. MR imaging may be performed either without, or following, introduction of intra-articular contrast material. In some locations (for examples, in many European countries), US of the shoulder (d) is used in patients with suspected rotator cuff tears. Therefore, both (b) and (d) may be considered correct answers in this case.

CT of the shoulder (a) is usually done to delineate the configuration of a known fracture or fracture/dislocation, or following arthrography to depict the rotator cuff and glenohumeral joint (including the articular cartilage and glenoid labrum) if MR cannot be performed (because of, for example, a pacer or aneurysm clip). However, CT is not the best next step in this patient, and (a) is incorrect. A nuclear medicine bone scan (c) may be helpful in excluding areas of increased radiotracer indicating increased bone turnover such as might be seen in metastatic deposit or stress fracture. However, nuclear medicine is typically performed only *after* magnetic resonance imaging of the shoulder, and (b) is incorrect.

## IMAGING STUDY AND QUESTIONS

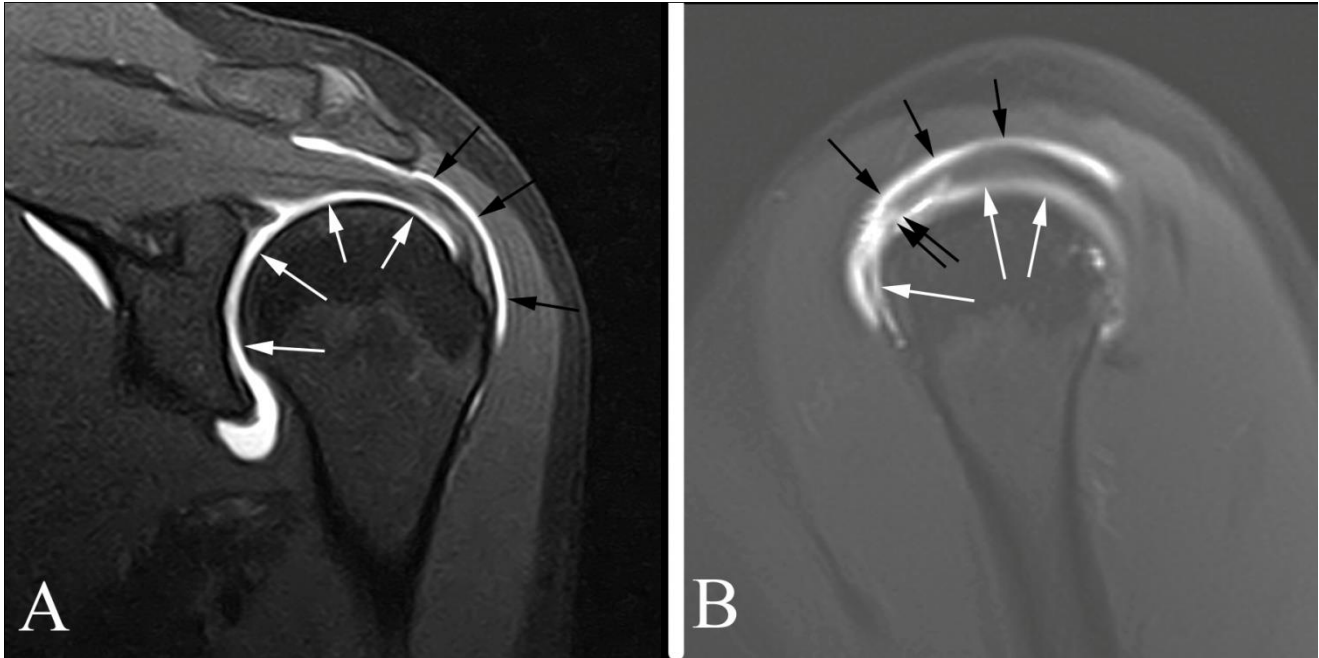
An imaging study was performed:



Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

## IMAGING STUDY QUESTIONS AND ANSWER



### Imaging questions:

- 1) What type of study is shown? A shoulder MR-arthrogram. A is a “coronal oblique” (coronal to the glenohumeral joint, oblique to the body) fat-saturated, T1 weighted MR arthrogram which shows contrast in the glenohumeral joint (white arrows), the expected location following an arthrogram, as well as contrast in the subacromial-subdeltoid bursa (black arrows). B is a “sagittal oblique” (sagittal to the glenohumeral joint, oblique to the body), which again shows contrast in the glenohumeral joint (white arrows), the subacromial-subdeltoid bursa (black arrows) and extending through a defect in the rotator cuff (double black arrow).
- 2) Are there any abnormalities? Yes. Contrast material reaching the subacromial-subdeltoid bursa from a glenohumeral injection indicates a full-thickness rotator cuff tear, which is directly visualized in B at the location of the double black arrow
- 3) What is the most likely diagnosis? Small full thickness rotator cuff tear.
- 4) What is the next step in management? Referral to orthopedic surgery. Trial of conservative therapy including physical therapy, rotator cuff exercises, and possible injection, followed by consideration for surgical repair of the rotator cuff tear.

## PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

The patient underwent a trial of conservative therapy including physical therapy, rotator cuff strengthening exercises, and a therapeutic injection. The patient had excellent but transient (1 day) relief of pain from the injection. The patient elected to go forward with rotator cuff tear repair with accompanying subacromial decompression. This was performed, and followed by rehabilitation. The patient had an excellent result from surgery, with rapid recovery and return to work.

## SUMMARY

**Presenting symptoms:** The patient presented chronic shoulder pain. Considerations in patients with chronic shoulder pain include referred pain from outside the shoulder (for example, myocardial ischemia, gallbladder disease, gastritis, and aortic dissection), cervical spine degenerative disc disease, stress fracture, rotator cuff tear, tendinitis (including calcific tendinitis), glenohumeral joint or acromioclavicular joint osteoarthritis, glenohumeral instability, and impingement syndrome.

**Imaging work-up:** The initial imaging study of choice for chronic shoulder pain is a plain film examination of the shoulder. This study is useful to exclude chondrocalcinosis and calcific tendinitis, to demonstrate degenerative changes, and to exclude large destructive tumors. However, such studies are often normal or nonspecific and further imaging may be required. In most cases, the next imaging study of choice is MR imaging, although (as discussed on Page 2) US of the shoulder may be preferred in some locations. MR may be performed either without, or following, intra-articular injection of contrast material. Intra-articular contrast material allows better demonstration and more confident diagnosis of rotator cuff tears, glenoid labral tears, biceps tendon tears, and articular cartilage abnormality. The MR arthrogram of the shoulder in this patient demonstrated a small, full-thickness rotator cuff tear.

**Establishing the diagnosis:** Rotator cuff tears may be diagnosed by standard arthrography, MR (either without or with intra-articular injection of contrast), CT arthrography, and US. The result at open repair or arthroscopy is generally taken to be the reference standard for diagnosis of a full-thickness rotator cuff tear.

**Take-home message:** The initial study of choice for virtually all patients with chronic shoulder pain is a plain film evaluation of the shoulder. In patients who require additional imaging, MR is generally the next imaging study of choice.

### FURTHER READING

Martin SD, Martin TL. Management of rotator cuff tears. UpToDate, accessed 4/6/12.

Modarresi S, Jude CM. Radiologic evaluation of the painful shoulder. UpToDate, accessed 11/6/09.

Renfrew DL. Single joint pain. Chapter 14 in *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).

Simons SM, Dixon JB, Kruse D. Presentation and diagnosis of rotator cuff tears. UpToDate, accessed 4/6/12.

Weissman BN. Diagnostic imaging of joint pain. UpToDate, accessed 11/16/09.