

CLINICAL QUIZ



Shoulder Pain and Weakness

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An otherwise healthy 47-year-old man reported a history of right shoulder pain subsequent to an injury he sustained several months earlier while boating. The patient recalled trying to lift a heavy object out of the water when his right arm was forcibly externally rotated. The patient related that his arm was sore for several days after the injury, but his pain receded and became manageable. He did not seek medical care acutely. Months later, when he did seek care, he said that he had lost overall power in his shoulder and had generalized shoulder pain with activity. Furthermore, he could not tuck his shirt into his pants with his right arm.

Examination revealed no point tenderness but did reveal weakness with internal rotation. Active and passive motion were essentially normal, with the exception of increased passive external rotation on the affected side. A belly press test was positive, but the apprehension sign and instability signs were negative. Examination of the neck and the neurologic exam were both unremarkable. Magnetic resonance images (MRIs) were obtained (figure 1).

Figures: Courtesy of John D. Kelly IV, MD

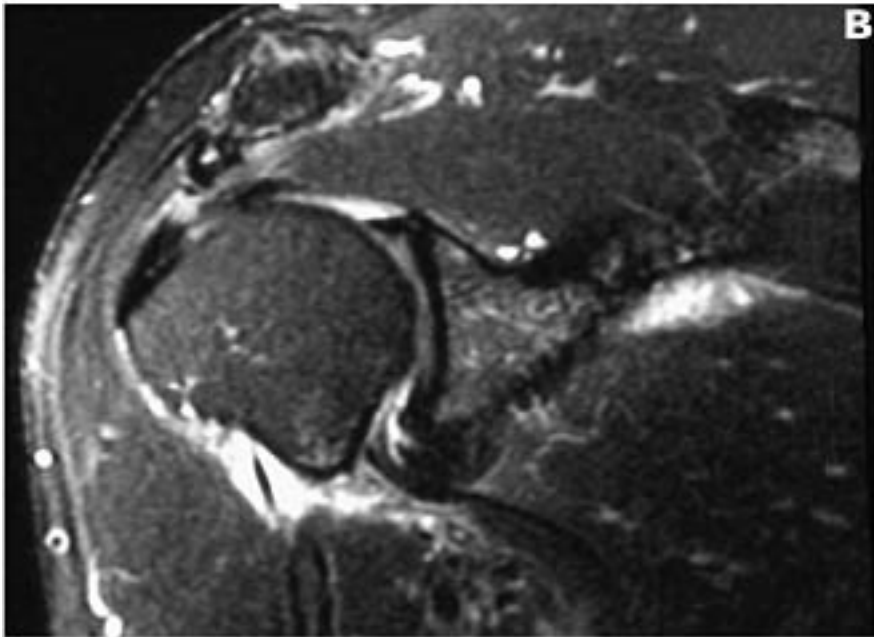
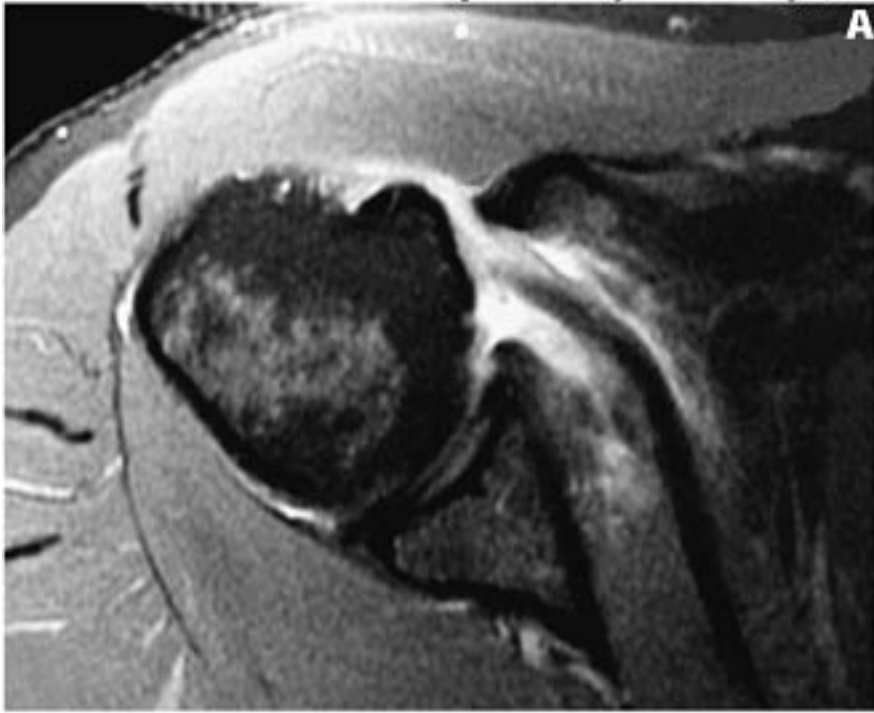


FIGURE 1. Axial (A) and coronal (B) T2-weighted MRIs of the shoulder of a 47-year-old man who reported arm weakness and pain several months after a boating injury.

What is your diagnosis? What conditions should be included in the differential diagnosis?

Diagnosis

MRIs show the avulsion of the subscapularis tendon from the lesser tuberosity of the humerus. This is best seen on the axial image (figure 2A). Also, edema is noted distal to the supraspinatus muscle belly (figure 2B). Medial subluxation of the biceps tendon commonly accompanies full-thickness tears of the subscapularis tendon, but, in this case, the tendon

appears centrally located in the bicipital groove.

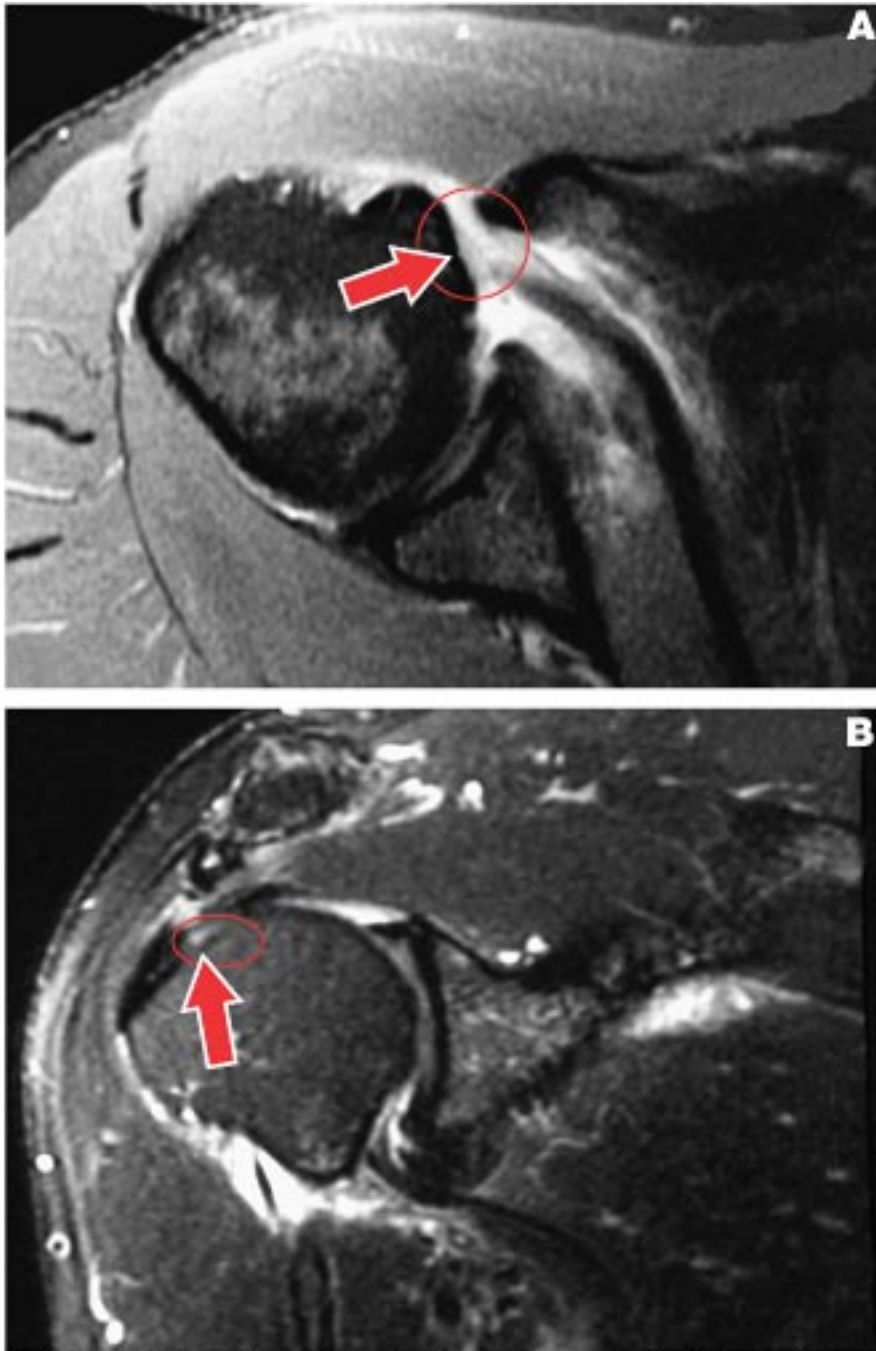


FIGURE 2. Repeat of figure 1 with arrows indicating the avulsion of the subscapularis tendon from the lesser tuberosity (A) and edema distal to the supraspinatus muscle belly (B).

Athroscopic surgical repair of the subscapularis tendon was performed approximately 1 year after the injury occurred. The proximal half of the tendon was avulsed from the lesser tuberosity and retracted medially. The tendon was mobilized and successfully reattached using suture anchors. The supraspinatus tendon was slightly frayed but essentially intact.

The patient wore a sling for 6 weeks postoperatively, and he was instructed to avoid active use of the arm for that time. Passive external rotation of the upper arm to neutral rotation was encouraged during sling immobilization. Following this, the patient underwent physical therapy

focused on improving range of motion, followed by strength training of the rotator cuff, deltoid, and scapular rotator muscles. At approximately 5 months postoperatively, the patient stated that the pain and weakness had largely resolved. His internal rotation strength was significantly improved, and results of his belly press test (see figure 6 for description) were less pronounced.

Discussion

Partial or complete tears of the subscapularis tendon are often not recognized by clinicians for a variety of reasons. First, treating physicians are generally less aware of subscapularis pathology than of other lesions of the rotator cuff, principally because subscapularis lesions are less common than tears of the supraspinatus tendon. Second, patients with subscapularis injury—especially partial tears—initially appear less disabled and in less pain than those who have supraspinatus or infraspinatus tears. However, partial subscapularis tears can indeed propagate, and even partial tendon disruption may produce weakness and pain in active patients.

The subscapularis tendon may tear following anterior shoulder dislocation in older patients.¹ Tendon failure can also occur after traumatic events involving external rotation of the arm at the side^{2,3} or extension of the humerus.³ Patients who have isolated subscapularis tendon tears usually report a *traumatic* shoulder injury. In contrast, tears of the supraspinatus tendon usually develop from "wear and tear" and often in the absence of trauma. Patients who have subscapularis tears are generally younger than those who experience degenerative tears of the supraspinatus or infraspinatus.⁴

Common symptoms of subscapularis dysfunction include anterior shoulder pain, night pain, and weakness when the arm is used below or above shoulder level.^{3,5} Patients who have supraspinatus tears chiefly report weakness only with overhead activity. Difficulty reaching for a wallet in a back pocket or problems with tucking in one's shirt are common symptoms of subscapularis weakness.

The differential diagnosis should include shoulder instability, glenohumeral arthritis, and cervical radiculopathy. However, our patient demonstrated no overt signs of shoulder instability (no apprehension or pain with the shoulder positioned in abduction and external rotation), and the fact that he had full range of shoulder motion argues against glenohumeral arthritis. Patients with significant glenohumeral arthritis uniformly lack motion, particularly external rotation with the arm adducted and internal rotation. Symptom provocation with neck positioning (Spurling's test) and diminished cervical range of motion indicate cervical radiculopathy.

Physical examination findings of subscapularis tears include increased passive external rotation of the humerus with the arm at the side (figure 3) and decreased strength to internal rotation. The normal subscapularis tendon is a powerful internal rotator of the humerus. The modified lift-off test and the belly press test are used to assess motor strength of this musculotendinous unit.^{3, 4, 6}



FIGURE 3. Increased external rotation of the humerus can be seen when the subscapularis tendon is torn.

To perform the modified lift-off test, the arm is positioned behind the patient's back and the examiner passively lifts the hand away from the back. The patient is asked to hold this position (figure 4), and an inability to maintain the space between the hand and the back denotes subscapularis insufficiency.³



FIGURE 4. The patient is asked to maintain the space between the hand and the back during the lift-off test. Inability to hold this position indicates a torn subscapularis tendon.

For patients who have limited internal rotation because of pain or stiffness, the belly press test or "Napoleon position" is preferred. The patient is asked to press on his or her belly while keeping the elbow in the coronal plane and avoiding wrist flexion (figure 5). Inability to maintain the elbow forward in the coronal plane and/or wrist flexion during performance of this maneuver indicates a positive test. The belly press test may be generally more useful than the lift-off test, because it more readily activates the upper subscapularis,⁶ where most tears originate.⁷



FIGURE 5. During the belly press test, the patient is asked to maintain the elbow in the coronal plane without flexing the wrist. The test is positive if the elbow moves posteriorly after the clinician removes his or her hand or the patient bends the wrist to maintain contact with his or her belly.

The "bear hug" test (figure 6) has been recently described as an even more sensitive barometer of upper subscapularis integrity (Steven Burkhart, MD, conversation, April 2004). To perform this test, the patient is asked to position the palm of the affected arm on the contralateral shoulder and resist efforts by the examiner to displace the palm anteriorly. Note that all diagnostic maneuvers to assess subscapularis function simply test humeral internal rotation.



FIGURE 6. In the bear hug test, the patient places the palm of the affected arm on the contralateral shoulder. The examiner tries to displace the patient's palm anteriorly. The inability to hold the palm on the shoulder, or a significant difference in power compared with the other arm, constitutes a positive test.

MRI is the imaging study of choice to confirm the diagnosis, with tendon disruption best seen on T2-weighted images in the axial and oblique sagittal planes.⁸ Many patients also exhibit subluxation of the biceps tendon. When subscapularis tendon tears are recognized, the long head of the biceps tendon should also be examined for injury or malposition medially.⁸

Complete tears of the subscapularis tendon generally require surgical treatment in all but the most debilitated patients. Partial tears may be treated initially with rehabilitation if internal rotation strength (determined with the belly press test and the bear hug test) is adequate. Failure to repair larger tears in time leads to atrophy and fibrofatty degeneration of cuff tissue and may ultimately render the tear irreparable.⁹ Repairs can be performed either in open fashion or, as in this patient's case, arthroscopically. Because the subscapularis tendon lies deep to the subscapularis muscle, arthroscopic evaluation much more readily defines tendon violation than do open approaches to the shoulder. Patients can generally return to full activity approximately 5 to 7 months after successful repair.

Shoulder Pearl

Subscapularis tendon tears are easily missed on presentation, but a history of shoulder or arm trauma and inability to tuck in a shirttail or reach into a back pocket are telltale indications of significant injury. These injuries generally require surgical treatment, so primary care physicians are advised to refer these patients to an experienced orthopedist.

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