Subacromial steroid injections are a common procedure for treating shoulder pain. Several studies have reported on the difficulty of performing an accurate injection into the subacromial bursa, as well as the injected material infiltrated into other regional structures even when an accurate injection was done into the subacromial space. These misplacements, and especially in the rotator cuff, creates high signal intensity on T2WI that can mimic a rotator cuff tear. Bergman and Fredericson found that the bursal and extrabursal fluid is resolved or decreased 3 days after the injection, so they recommended a 3-day delay after the shoulder injection before performing MRI to prevent misinterpretation of the signal changes. We report here on a case of a false full-thickness tear of the supraspinatus tendon on MRI one month after subacromial injection, and the supraspinatus tendon turned out to be intact on the follow up ultrasonography and arthroscopic examination.

Index words: Subacromial injection
Rotator Cuff tear
Magnetic Resonance Imaging
Ultrasonography
Case Report

A 53-years-old woman with a history of shoulder pain came to our hospital. She’d had shoulder pain for several years and she had received several subacromial steroid injections without imaging guidance at another hospital when the pain was aggravated. The last subacromial steroid injection was done 1 month ago. After the last injection, she had not undergone any other invasive procedure on her shoulder. She came to our hospital because she wanted to know the cause of her shoulder pain. She then underwent magnetic resonance imaging (1.5 T, Symphony, Siemens Medical Systems, Erlangen, Germany).

On the oblique coronal fat-saturated T2-weighted image (TR/TE = 3640/88), there was a hyperintense gap in the supraspinatus tendon, suggesting the full thickness tear.

Fig. 1. A. The oblique coronal fat-saturated T2-weighted image shows fluid signal intensity (white arrow), suggesting a tendon tear in the supraspinatus tendon.
B. The axial fat-saturated T2-weighted image shows fluid signal intensity (white arrow), suggesting a tendon tear in the supraspinatus tendon.
C. The supraspinatus tendon is intact on arthroscopy.
(SST: Supraspinatus tendon, IST: Infraspinatus tendon, GT: Greater tuberosity)
D. The short-axis 15 MHz US image shows an intact supraspinatus tendon without a definite focal fluid collection.
(Deltoid: Deltoid muscle, SupraS: Supraspinatus tendon, HH: Humeral head)
tendinopathy (Figs. 1A, B). But thinning of the rotator cuff, muscular atrophy or retraction of the myotendinous junction was not noted. Therefore, we thought that it was an acute stage of supraspinatus tear.

She underwent an arthroscopic examination for repair, but the supraspinatus tendon was intact (Fig. 1C). After the arthroscopic exam, she underwent an ultrasound exam and there was no evidence of a supraspinatus tendon tear (Fig. 1D).

**Discussion**

Subacromial injection of steroid to treat shoulder pain is one of the most common procedures for orthopedists, rheumatologists and general practitioners. Because most of these procedures are done without imaging guidance and the subacromial bursa has a very thin cavity, there are questions about the accuracy of this procedure.

Partington et al. (2) reported an accuracy rate of 83% in 24 shoulders in a cadaveric study and they found that the injected material had infiltrated into the other regional structures in 15 of the 24 shoulders, with 7 having injected material in the rotator cuff. Using postinjection fluoroscopy in 53 patients with impingement signs, Yamakado (3) found that only 70% of the lateral injections reached the subacromial space, 21% were into the deltoid, 4% were in the glenohumeral joint and 5% were subcutaneous. Almost half of the successful injections into the subacromial space also reached other structures. Henkus et al. (4) randomized 33 patients with impingement syndrome to the posterior or anteromedial subacromial injection groups and they assessed the accuracy of the injection by performing immediate postinjection MRI. When the posterior approach was used, 13 of 17 injections (76%) reached the subacromial space, of which only 4 were isolated to that space. The accuracy decreased with the anteromedial approach; only 10 of 16 injections (62.5%) infiltrated into the subacromial space, of which 5 were isolated to this space. Multiple surrounding structures were infiltrated, including the rotator cuff, the deltoid muscle, the acromioclavicular joint, the coracoclavicular ligament and the glenohumeral joint.

Therefore, in the post subacromial injected shoulder it is easy to imagine a fluid collection existing in the rotator cuff. Bergmen and Fredericson (1) performed serial MRI scans in 6 patients immediately before and after lateral subacromial injections and then again at 3 days and 2 and 4 weeks after injection. By 3 days after the injection, there was complete subacromial resolution in 2 patients, an interval decline in 2 patients and no change in 1 patient. The extravascular fluid collections resolved by 3 days in 3 of 4 patients. These authors recommended a 3-day delay for MRI after shoulder injections to prevent misinterpretation of the signal changes. Kieft et al. (5) reported on 2 cases of focal high signal intensity at the supraspinatus tendon insertion on the T2-weighted image after injection of a local anesthetic and steroid, and this mimicked a rotator cuff tear. In our case, there was a focal fluid signal intensity area in the supraspinatus tendon, which mimicked a full-thickness tear until about the 1 month later.

The MRI findings associated with full-thickness rotator cuff tears were described by Farley et al. (6). These findings include fluid in the subacromial/subdeltoid bursa, discontinuity of the tendon, focal fluid signal intensity in the tendon, thinning of the rotator cuff, muscular atrophy and retraction of the myotendinous junction. In their study, the most specific finding for the rotator cuff was supraspinatus muscle atrophy (97% specificity), the most sensitive finding was fluid in the subacromial/subdeltoid bursa (93% sensitivity), and the most accurate predictor of a full-thickness tear was a gap in the tendon (89% accuracy). The sonographic findings for a full-thickness rotator cuff tear include nonvisualization or absence of cuff tissue, a full thickness hypoechoic defect, focal thinning, loss of the convexity of the outer cuff contour, the ability to compress the deltoid muscle within a defect or against the humeral head, visualization of the underlying hyaline cartilage (naked cartilage sign), a heterogeneously hypoechoic cuff with bursal fluid and severe distortion of the cuff’s architecture (7). In our case, focal fluid signal intensity in the tendon was noted on conventional MRI without thinning of the rotator cuff, muscular atrophy or retraction of the myotendinous junction, and the sonographic examination showed no definite abnormal lesion. It is believed that the misplaced, unresorbed injected material causes fluid signal intensity that mimicked a tendon tear on MRI.

In conclusion, subacromial injections have a risk that the injected material has a chance to infiltrate into the other regional structures, including the rotator cuff, even after an accurate injection procedure. This infiltrated material can mimic a partial-thickness or full-thickness rotator cuff tear on conventional MRI. It has been reported that the injected material is resolved or decreased by 3 days and so delaying MRI for 3 days after the injection was recommended, but this mimicry can
last for one month, such as in our case. Therefore, it is thought that the combined evaluation by both MRI and USG or an MR arthrogram for detecting rotator cuff pathology in a previously subacromial injected shoulder is required to exclude a false-rotator cuff tear.

References