A 28-year-old male with persistent shoulder pain and limited range of motion presents for magnetic resonance (MR) imaging. T1-weighted coronal oblique (Figure 1) and fast spin echo T2-weighted sagittal oblique (Figure 2) images are provided. What are the findings? What is your diagnosis?

Failure of fusion of an anterior acromial ossification center is demonstrated on both images.

The os acromiale, an un-united acromial ossification center in adults, is one of the most frequently missed abnormalities by physicians who interpret MR. The reason is twofold. For one, the os acromiale, when viewed in the coronal or sagittal planes, bears a strong resemblance to a normal acromioclavicular (AC) joint (Figures 3 and 4). Second, the os acromiale is fairly common, being seen in approximately 8% of shoulder examinations. This combination of a not-uncommon yet challenging finding leads to the high frequency of missed diagnoses of the os acromiale.

It is essential in routine MR imaging of the shoulder to obtain axials that extend superior to a point above the level of the acromion. The key to the simple and reliable diagnosis of the os acromiale lies in these upper axial images. On such images, the acromion is completely visualized, and the diagnosis of an os acromiale becomes much simpler. Only in the axial plane is one able to reliably visualize both the AC joint and the os acromiale on a single slice (Figure 5).
One to 3 ossification centers of the acromion appear by age 15 to 18 years, and they normally fuse no later than 25 years of age. Failure of any of these ossification centers to fuse results in an os acromiale. The 3 potential ossification centers are the preacromion, mesoacromion, and meta-acromion, from anterior to posterior (Figure 6). The adjacent ossification center for the lateral scapular spine is known as the basi-acromion. Failure of fusion can occur at the junction of any of these ossification centers, in a single junction or in combination. As a result, 7 types of os acromiale may arise (Figure 7).
The mesoacromion (A) is the most common type of os acromiale, followed distantly by the preacromion variant (B).

Osteophytes may arise at the synchondrosis of an os acromiale (Figure 8), and the os acromiale is thought to increase the incidence of osteoarthritis at the AC joint, both cases of which may predispose the patient to impingement. In addition, when an os acromiale is unstable, the downward pull of the deltoid muscle reduces the subacromial space, causing mass effect upon the rotator cuff (Figure 9).

In addition to the role that an os acromiale plays in increasing the risk for impingement syndrome, it is important to realize that recognition of an os acromiale is necessary because the os itself may be a primary source of patient symptoms. Such patients typically have point tenderness over the os acromiale and pain.
Figure 9. A T1-weighted coronal image in a patient with an os acromiale (arrow at synchondrosis) demonstrates the lateral deltoid attachment to the os (arrowhead). With deltoid contraction, the downward pull upon an unstable os acromiale narrows the subacromial space (red area), increasing the patient’s risk for impingement syndrome. With forward elevation of the shoulder. On MR images, edema and/or fluid may be noted along the synchondrosis of the os acromiale (Figures 10 and 11); as is true with other body regions, edema on MR is a reliable indicator of a site of patient pain.

TREATMENT

The clinical importance of an os acromiale in the development of shoulder pain has not been fully established. The os acromiale can be found in asymptomatic patients, but as described above, it has been implicated both as a risk factor for impingement syndrome and as a primary cause of patient pain. In patients with os acromiale and symptoms of impingement syndrome without rotator cuff tear, treatment is generally conservative, using rest, ice, and nonsteroidal anti-inflammatory drugs to reduce inflammation. Steroid injections may also be of benefit.

If conservative measures fail over a period of 6 weeks to 6 months, operative therapy may be warranted. Preoperative recognition of an os acromiale is important in patients with impingement syndrome or rotator cuff tear because an unstable os acromiale may render a typical anterior acromioplasty impossible. It is generally accepted that in patients with both an os acromiale and a tear of the rotator cuff, the surgeon should correct both abnormalities. Small os acromiales, such as the preacromion or small mesoacromion variants, are usually resected, and it is now possible to accomplish this procedure arthroscopically. Neer reported that large os acromiales should be stabilized rather than resected at the time of rotator cuff repair, given that resection of large fragments may lead to unacceptable weakness. Though not without controversy, such an approach remains popular with many orthopaedic surgeons.

CONCLUSION

The os acromiale is a not-uncommon abnormality that is frequently missed on routine MR examinations of the shoulder. Proper MR scanning technique and the careful evaluation of axial images through the acromion make the correct diagnosis relatively simple. In patients with impingement syndrome, recognition of an os acromiale is important because the lesion may be an important...
source of patient symptoms and an awareness of its presence can significantly alter the planned operative approach.

REFERENCES
1. Boehm TD, Matzer M, Brazda D, Gohlike FE. Os acromiale associated with tear of the rotator cuff treated operatively: review of 33 patients. J Bone Joint Surg Br. 2003;85:545-549.
2. Davlin CD, Fluker C. Bilateral os acromiale in a Division I basketball player. J Sports Sci Med. 2003;2:375-379.
3. Grass A. The incidence and role of the os acromiale in the acromiohumeral impingement syndrome. Radiol Med. 1992;84:567-570.
4. Liberson F. Os acromiale: a contested anomaly. J Bone Joint Surg Am. 1937;19:683-389.
5. Neer C. Anterior acromioplasty for the chronic impingement syndrome in the shoulder. J Bone Joint Surg Am. 1972;54:41-50.
6. Park GP, Lee JK, Phelps CT. Os acromiale associated with rotator cuff impingement: MR imaging of the shoulder. Radiology. 1994;193:255-257.
7. Sammarco VJ. Os acromiale: frequency, anatomy, and clinical implications. J Bone Joint Surg Am. 2000;82:594-600.
8. Swain R, Wilson F, Harsha D. The os acromiale: another cause of impingement. Med Sci Sports Exerc. 1996;28:1459-1462.
9. Warner JJP, Beim GM, Higgins L. The treatment of symptomatic os acromiale. J Bone Joint Surg. 1998;80:1520-1526.

For reprints and permissions queries, please visit SAGE’s Web site at http://www.sagepub.com/journalsPermissions.nav.