OBJECTIVE. The aim of this study was to evaluate the use of MR imaging in the characterization of the Perthes lesion by correlating MR findings with findings at arthroscopy.

CONCLUSION. The use of a combination of axial and abduction–external rotation position sequences on MR images can be helpful in the diagnosis of a Perthes lesion. A fluid-filled joint with capsular distension, caused by either a large amount of effusion or MR arthrogram, was found to be helpful in outlining Perthes lesions. Adding the abduction–external rotation position to the protocol in patients in whom Perthes lesion is suspected will increase diagnostic accuracy and may reveal a Perthes lesion not visible on axial images, as was the case in 50% of the patients in our series.

A variation of the Bankart lesion, the Perthes lesion occurs when the scapular periosteum remains intact but is stripped medially [1, 2], and the anterior labrum is avulsed from the glenoid but remains partially attached to the scapula by the intact periosteum. (Fig. 1) The labrum may assume a normal position, but in these cases, the stabilizing function may be lost and thus the shoulder may remain unstable [2]. Because the anterior labrum remains in its correct anatomic position, our surgeons have found Perthes lesions difficult to see at arthroscopy without prior knowledge of the presence of the condition.

We undertook this study to describe the appearance of the Perthes lesion on MR imaging and to correlate our findings with those at arthroscopy.

Materials and Methods

In a combined retrospective and prospective study, we reviewed the clinical and MR imaging findings in 10 patients originating from a single practice who had arthroscopically confirmed Perthes lesions. The subjects were seven men and three women, ranging in age from 18–49 years (mean age, 32 years) and representing seven cases of right and three cases of left shoulder disorders. The interval between MR imaging and arthroscopy was between 7 and 62 days (mean interval, 30 days). Arthroscopic criteria for inclusion in this study were visualization of a stripped but intact scapular periosteum and either a minimally displaced tear or none at all at the base of the anterior labrum. The patients’ history, findings at physical examination, and findings at the time of arthroscopy (performed with patients under anesthesia) were recorded. Three patients had conventional MR imaging, and seven patients underwent MR arthrography.

MR images of the affected shoulder were obtained on a 1.5-T MR unit (Signa; General Electric Medical Systems, Milwaukee, WI). Patients were placed in the supine position with the affected arm at their side. A commercially available transmit–receive shoulder coil was used in all examinations except when the patients were in the abduction–external rotation position. For conventional MR
imaging, images were obtained in the oblique coronal, oblique sagittal, and axial planes. For the abduction–external rotation position, the patient was supine with the affected arm in an abducted and externally rotated position using a 7-inch shoulder-loop coil behind the shoulder and a 5-inch shoulder-loop coil on the axilla [3, 4].

A 14- to 16-cm field of view was used for all the following pulse sequences: axial multiplanar gradient-echo T2-weighted sequence (TR range/TE range, 350–533/15–20; flip angle, 15–20°; number of signals averaged, 3 or 4; section thickness, 4 mm; intersection gap, 0; and matrix, 256 × 192); axial fast spin-echo fat-suppressed T2-weighted sequence (TR/TE, 3200/64; echo train length, 8; number of signals, 2; section thickness, 4 mm; intersection gap, 0; and matrix, 256 × 192); and oblique coronal and sagittal fast spin-echo fat-suppressed proton density–weighted and T2-weighted sequences (1800/25; 80° flip angle, echo-train length, 8; number of signals, 2; section thickness, 4–5 mm; intersection gap, 1 mm; and matrix, 256 × 160) was used.

In seven patients, MR arthrography was performed. After the intraarticular injection of contrast material, the patient’s shoulder was put through a full range of motion. All sequences were obtained with frequency-selective fat saturation. T1-weighted sequences (400/14; section thickness, 4 mm; intersection gap, 1 mm; number of signal averages, 2; matrix, 256 × 192; and field of view, 14 cm) were obtained in the axial, oblique coronal, and oblique sagittal planes as well as in the oblique axial plane with the patient’s arm in the abduction–external rotation position [3, 4]. Fast spin-echo T2-weighted oblique coronal images (3200/64; echo-train length, 10; section thickness, 4 mm; intersection gap, 1 mm; number of signals averaged, 4; matrix, 256 × 224; and field of view, 14 cm) were also obtained.

All images were prospectively evaluated by two musculoskeletal radiologists who were aware that the patients had anterior instability. Consensus interpretations were performed at the time of the MR study (before arthroscopy), and the reports generated formed the basis for the conventional and MR arthrographic findings used in this study. A Perthes lesion was defined as a torn anterior labrum that on at least one imaging plane on MR images appeared to be partially attached to the glenoid, with or without visualization of an intact scapular periosteum. A diagnosis of Perthes lesion was made in patients who presented with anterior instability and whose labrum on standard images appeared to be normal but became displaced—though still partially attached to the glenoid—on images obtained in the abduction–external rotation position.

After arthroscopic correlation was obtained, both radiologists retrospectively reviewed all images to further identify MR imaging criteria of Perthes lesions. Labral tears seen on axial images were reviewed, and those findings were correlated to the appearance of the tear on images obtained in the abduction–external rotation position.

Results

A review of the patients’ clinical histories revealed the history of trauma with anterior shoulder dislocation in all patients. The time from injury to MR imaging ranged from 14 days to 20 years, with a mean of 145 days. At arthroscopy (performed with the patients under anesthesia) all patients were found to have anterior instability. In all 10 patients, arthroscopy showed a tear of the attachment of the anterior labrum at the glenoid insertion. In six, the anterior labrum remained in its original position and was still attached by varying degrees to the scapular neck, but a tear could be identified as fraying at the base of the labrum on initial inspection and then as displacement after probing by the arthroscopist (Figs. 2C and 3C). In four patients, initial inspection revealed a normal-appearing anterior inferior labrum. Probing of the attachment of the anterior labrum at its glenoid insertion revealed that the labrum was torn, displaceable, and only minimally attached to the bony glenoid. Fibrous healing with granulation tissue deposition was noted surrounding the area of the labral tear, mimicking the appearance of an intact labrum (Fig 4C). An intact but stripped scapular periosteum was identified in all patients, and the tear of the anterior labrum was surgically repaired with suture anchors in all.

On MR images, all patients showed a nondisplaced tear of the antero inferior labrum that was attached by an intact linear structure with decreased signal intensity believed to represent an intact scapular periosteum. The inferior glenohumeral ligament was still attached to the labrum.

The Perthes lesion was best seen on images obtained in the abduction–external rotation position, which allowed visualization of the labral tear in all patients. On the images obtained for five out of 10 patients (for three of the five, these were MR arthrogams), the tear could be seen only in abduction–external rotation position views; axial views revealed an inconspicuous labrum (n = 3) or a thickened anterior labrum (n = 2) (Fig. 4). A separation of the anterior labrum from the glenoid rim with a fluid-filled cleft of high signal intensity between the labrum and the bony glenoid was seen on T1- and T2-weighted fast spin-echo sequences with fat saturation. The anterior labrum was seen as remaining loosely attached to the glenoid rim. On the images of the remaining five patients, a nondisplaced tear of the anteroinferior labrum could be seen on axial as well as on abduction–external rotation position sequences. In these patients, axial gradient-echo and spin-echo sequences with fat saturation showed an area of subtly increased signal intensity at the base of the anterior labrum.

The three patients who underwent conventional MR imaging had experienced recent trauma to their shoulders, and a large amount...
of joint fluid was present at MR imaging, which created a moderate distension of the joint capsule similar to the appearance seen at MR arthrography.

Using arthroscopy as the gold standard, we correctly diagnosed a Perthes lesion prospectively in seven of the 10 patients. A Bankart lesion was suggested as the most likely diagnosis in the other three patients (two of them with conventional MR studies); however, we also included the differential diagnosis of a Perthes lesion in the report. In retrospect, MR imaging and MR arthrographic findings for those three patients that initially were not identified as showing a Perthes lesion were similar to findings for those that were correctly diagnosed.

Discussion

Imaging evaluation of labral tears and of instability of the glenohumeral joint is crucial for subsequent surgical planning and the selection of the appropriate treatment [5, 6]. It remains, however, a difficult diagnostic challenge [7, 8]. The anterior labrum has many normal variants in size and shape [9]. During the last few years, several variations of the Bankart lesion have been described, including the anterior periosteal sleeve avulsion lesion in which the anterior labrum is torn and inferomedially displaced along the glenoid neck [10, 11]. In the Perthes lesion, first de-
scribed by the German surgeon Perthes in 1905 [12], the scapular periosteum remains intact but is stripped medially, resulting in an incomplete avulsion of the labrum from the glenoid margin (Fig. 1). The torn anterior labrum is displaced only minimally or not at all and may remain in the correct anatomic position; therefore, it can be overlooked at arthroscopy and on MR imaging.

The lesion may heal partially and synovial membrane may be reestablished, but the instability of the shoulder joint will remain because of a mechanically impaired anterior labrum.

On conventional MR images, Perthes lesions can look remarkably normal and may not be able to be differentiated from a normal labrum. In our series, the presence of a large amount of joint effusion or joint distension attributable to MR arthrography in the axial slices allowed the visualization of the stripped but intact periosteum ballooning out medially. In other patients, axial slices of MR arthrograms revealed contrast medium extending under the “pseudoattachment” of the labrum on the glenoid rim, similar to a labral recess, indicating a loose labrum and the loss of the stabilizing function.

Oblique axial slices obtained with the patient’s arm in the abduction–external rotation position were very helpful in differentiating between a normal labrum and a Perthes lesion. In the abduction–external rotation position, the anterior band of the inferior glenohumeral ligament becomes taut and induces stress on the attachment of the ligament at the glenoid insertion, allowing the visualization of a loose and only partially healed labrum [3, 4]. Occult labral tears may be seen as separations of the base of the anterior labrum from the glenoid.

At arthroscopy, Perthes lesions may appear indistinguishable from a normal labrum. However, probing of the labrum will show the lax attachment of the labrum to the glenoid rim. Therefore, the treating surgeon should be aware of the MR findings that indicate the possibility of a Perthes lesion because it may alter treatment planning.

In 50% of our patient population, we could not identify a tear of the anterior labrum from the appearance on axial MR images alone (Fig. 5). Combining the images with those obtained in the abduction–external rotation position, we were able to correctly diagnose seven of the 10 arthroscopically confirmed Perthes lesions. In the other three patients, we included the possibility of a Perthes lesion in the list of possible differential diagnoses that was based on the appearance of the anterior labrum on the images obtained in the abduction–external rotation position.

Our study has several limitations. Because of the small number of patients, statistical
analysis is not meaningful, and we cannot prove the true diagnostic accuracy of MR imaging for cases of Perthes lesions. The lack of a control group might introduce potential bias.

However, we believe that in patients with history of anterior shoulder dislocation and clinical signs of shoulder instability, the possibility of a Perthes lesion should be considered in the absence of a Bankart lesion that is visible on axial images. On conventional MR images and MR arthrograms, subtle high signal intensity under the labral attachment to the glenoid rim may indicate an occult labral tear. Adding the abduction–external rotation position to the protocol in patients with a suspected Perthes lesion will increase the diagnostic accuracy and may reveal the Perthes lesion, as we found in 50% of the patients in our series.

References

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