Clinical Journal of Sport Medicine, 13:152–156

Hip Joint Pathology: Clinical Presentation and Correlation Between Magnetic Resonance Arthrography, Ultrasound, and Arthroscopic Findings in 25 Consecutive Cases

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Background: The hip joint is becoming increasingly recognized as a source of groin pain and, in the authors' experience, buttock and low back pain.

Objectives: To determine the range of pathologic diagnoses, clinical presentation, and the correlation between magnetic resonance arthrographic, ultrasonographic, and arthroscopic findings in the hip joint.

Methods: We prospectively studied 25 consecutive hip arthroscopies to determine the range of pathologic diagnoses, clinical presentation, and the correlation between magnetic resonance arthrographic, ultrasonographic, and arthroscopic findings.

Results: All of the hips arthroscoped had pathology. Back pain and hip pain were the 2 most common presentations. The only consistently positive clinical test result was a restricted and painful hip quadrant compared with the contralateral hip. Of the 17 patients whose flexion, abduction, external rotation (FABER) test results were reported at the time of examination, 15 (88%) were positive, and 2 (12%) negative. Plain radiographs were normal in all patients. All but 1 patient underwent magnetic resonance arthrography. Although specificity of 100% was achieved in our study, the sensitivity was significantly lower, with a relatively high number of false negatives. Hip arthroscopy proved the definitive diagnostic procedure for intraarticular pathology.

Conclusions: Hip pathology, particularly labral pathology, may be more common than has been previously recognized. In those patients with chronic groin and low back pain, a high index of suspicion should be maintained. Clinical signs of a painful, restricted hip quadrant and a positive FABER test result should suggest magnetic resonance arthrography in the first instance, but a negative magnetic resonance image should not preclude hip arthroscopy if there is high clinical suspicion of hip joint pathology.

Clin J Sport Med 2003;13:152–156.

INTRODUCTION

Pathology of the hip joint is increasingly recognized in sports medicine as a result of increased clinical suspicion and advances in magnetic resonance (MR) imaging[1–6] and hip arthroscopy.[7–12] The differential diagnosis for patients who present with hip joint abnormalities and have normal plain radiographic findings include synovitis, labral tears, loose bodies, degenerative disease, ligament teres tears, and chondral defects.[13]

A number of recent reports have suggested that labral tears are a frequent but unrecognized cause of groin and hip pain.[13,14–22] Labral tears, which also have been known as *acetabular rim syndrome*,[16] have been reported in association with dislocation of the hip[23–25] and following minor trauma.[12,15,26]

Received for publication September 2002; accepted February 2003.

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Arthroscopy is the current gold standard for diagnosing intraarticular hip joint pathology and abnormalities. MR arthrography has been suggested as a sensitive imaging method to detect labral tears, but there have been conflicting results as to its accuracy.[1–4,13,20]

We prospectively studied 25 consecutive hip arthroscopies to (1) determine the range of pathologic diagnoses, (2) determine the clinical presentation, and (3) determine the correlation between MR arthrographic, ultrasonographic, and arthroscopic findings.

METHODS

Clinical Assessment

Subjects were enrolled sequentially over 4 months from 2 sports medicine centers in Melbourne, Australia. In all cases, a single experienced sports clinician (B.M.) took the history and performed the examination at the time of presentation. Particular attention was paid in the clinical history to the mechanism of injury, site of pain,

and duration of symptoms. Examination findings noted were the hip quadrant position (flexion, adduction, and rotation), and flexion, abduction, external rotation (FABER) test. In this test, the leg is placed in a "figure 4" position, with the hip flexed and abducted and the ipsilateral foot resting on the contralateral thigh, just above the knee. An external rotation force is then applied to the ipsilateral knee. The test result is considered to be positive if the patient reports reproduction of hip pain in this position.

Imaging Studies

Images were obtained in all patients and included plain radiographs (anteroposterior of pelvis and lateral of relevant hip) in all patients, ultrasound examination of the hip in 8 patients, and MR arthrography in 24 patients (MR arthrography was not performed on the patient in whom ultrasound had diagnosed a labral tear). Ultrasound was performed by a single experienced sonologist in all cases. MR arthrography was performed after injection of 10 to 15 mL of diluted gadolinium (0.2 mL in 20 mL saline) into the hip joint under fluoroscopic control. The hip joint was hydraulically distended to the point of mild discomfort. MR imaging was then performed on a 1.5-T Signa LX MR system (General Electric, Milwaukee, WI), with T1-weighted imaging with fat saturation in three planes (sagittal, coronal, and axial) and T2-weighted imaging in the coronal plane. Two radiologists blinded to the clinical symptoms and surgical pathology independently reviewed the imaging studies.

Examination Under Local Anesthesia

In those patients with negative hip imaging results, an examination under local anesthetic (EULA) was performed. This involved an intraarticular injection of local anesthetic, with the patients assessed pre- and postinjection by a single experienced sports clinician. Specific clinical signs documented included (1) maximum hip flexion in 30° of hip abduction in supine posture, maximal adduction from there, and then maximal hip internal rotation; and (2) maximum hip adduction from the 90° flexed position with maximum hip internal rotation. Range of motion and pain during the FABER test were also assessed. Pain in this position was recorded on a 10-point self-assessment scale. An x-ray–guided injection of 6 mL of 0.5% bupivacaine into the hip joint was performed, and the patient was reassessed 1 hour after the injection. If the result was equivocal at 60 minutes, the joint was reexamined at 75 minutes.

Hip Joint Arthroscopy

All patients in this study underwent hip joint arthroscopy by 1 of 2 Melbourne-based orthopedic surgeons experienced in the technique. The decision to perform arthroscopic surgery was based on either positive imaging (MR arthrography or ultrasound) or a positive EULA. A standard arthroscopic technique was used in all cases. The patients were placed in the supine position on an orthopedic traction table. Under image intensifier control, 20 mL of air was injected into the hip joint to provide an air arthrogram and to break the normal vacuum of the hip. Lateral and longitudinal traction was then applied to distract the hip approximately 1 to 2 cm. Spinal needles were placed again under image intensifier control to mark the anterior and posterior trochanteric portals, and then guide wires and cannulated trocars were used to introduce cannulae, arthroscopes, and other instruments through these marked portals. Both 30° and 70° arthroscopes were used to adequately visualize the entire acetabular labrum, acetabulum, ligamentum teres, transverse acetabular ligament, and the anterior, superior, and posterior aspects of the femoral head. These areas of the hip were inspected and also probed to assess labral attachment and articular cartilage softening. In all cases in which surgically treatable pathology was identified (ie, labral tears, chondromalacia, loose bodies, synovitis, and ligament teres tears), such treatment was performed arthroscopically (removal of loose bodies or debridement of abnormal area).

An anterior portal was not needed in this study. Our indications for using this portal would be imaging or arthroscopic evidence of medial pathology that could not be accessed using our standard portals.

RESULTS

A total of 25 consecutive cases of hip arthroscopy were reviewed. The average age of the patients was 30.9 years (range, 16–56 years). There were 9 women and 16 men. Twelve of the hip arthroscopies were performed on the left hip, and 13 were performed on the right hip. The mean symptom duration prior to diagnosis by arthroscopy was 3.0 years (range, 4 months to 10 years), and pain was constant in all patients. All hips that raised clinical suspicion of hip joint pathology (pain in the listed areas and hip joint signs on examination) and were entered in the trial were found to have pathology at arthroscopy.

The mechanisms of injury are shown in Table 1. Only 12 of the 25 (48%) patients had a clearly defined traumatic event resulting in their hip joint symptoms. There was, however, no correlation between the mechanism of injury and the injury sustained by the hip joint. Those patients with "contact sports" listed as the mechanism of injury had no clearly defined injury to their hip but were subject to repeated minor trauma in their sport.

The sites of pain at the time of presentation are shown in Table 2. The majority of patients reported pain in the region of the hip, groin, and/or the lumbar spine.

TABLE 1. *Mechanism of Injury*

Mechanism	Number	Percentage
Twisting	5	20
Motor vehicle accident	5	20
Distance running	4	16
Physical occupation	4	16
Fall	2	8
Contact sports	3	12
Unknown	2	8

TABLE 2. *Anatomical Site of Pain at Time of Presentation*

Site	Number	Percentage
Lumbar spine	18	72
Groin	18	72
Buttocks	9	36
Dysmenorrhea	8 (of 9 women)	89
Lateral knee	5	20
Lateral hip	4	16
Thigh	4	16
Sciatica	4	16
Hamstring	3	12
Abdomen	2	8

Seventeen patients had the results of their FABER test reported at the time of examination. Of these 17, 15 (88%) were positive, and 2 (12%) were negative. There was no correlation between a positive FABER test result and different hip joint pathology.

Fifteen patients had an EULA, and all 15 had total elimination of pain and improved range of motion. Two subjects required 75 minutes to show a response following injection, whereas the remaining subjects were all positive within 1 hour.

Plain radiographs were normal in all patients. Of the 8 patients who underwent ultrasonographic examination of the hip, only 1 (13%) demonstrated the pathology present. Thus, in this study, ultrasound had a sensitivity of 13% and a specificity of 100%.

Apart from the 1 patient with a positive ultrasound result, all patients (24) underwent MR arthrography. The MR arthrographic findings of the 24 patients who had this procedure performed are shown in Table 3.

The hip pathologies present at arthroscopic examination are shown in Table 4. All hips were found to have some pathology at arthroscopy.

DISCUSSION

Common causes of pain in the hip and groin region include adductor muscle pathology, osteitis pubis, and trochanteric bursitis. Less common causes include psoas strain/bursitis, stress fractures, nerve entrapments, hip synovitis/osteoarthritis, and referred pain.[27] Hip joint labral pathology does not feature prominently in most sports medicine textbooks as a potential differential diagnosis. Recent articles, however, are starting to list hip joint pathology as a cause of groin pain. No previous articles have mentioned the hip joint in relation to back pain.

TABLE 3. *Magnetic Resonance Arthrography Findings (N = 24)*

Radiologic Diagnosis	Number	Sensitivity, %	Specificity, %
Labral tear	4/17	24	100
Other labral abnormality	4/13	31	100
Unusual gadolinium collection	1/24	4	100
Cartilage abnormalities	1/16	6	100
Osteoarthritis	1/24	4	100

TABLE 4. *Hip Pathology at Arthroscopy*

Surgical Pathology	Number	Percentage
Labral tear	17	68
Labral detachment	5	20
Frayed labrum	2	8
Rim lesion	6	24
Chondromalacia	8	32
Loose chondral bodies	2	8
Synovitis (only)	3 (1)	12 (4)

In our study, 72% of patients also reported lumbar back pain in association with hip injury; this has not been reported previously. Although back pain is a common musculoskeletal symptom, a possible cause of the back pain seen with hip joint pathology is the close association of the psoas muscle with the anterior surface of the hip joint.

With regard to the clinical findings, the onset of pain was either acute or insidious. In a number of patients (eg, distance runners), the onset was over months or years, with no specific incident when they first became aware of pain.

The only consistently positive clinical test result was a restricted and painful hip quadrant compared with the contralateral hip (the pain in this test could be in the groin, lateral hip, buttock, or lower back). It should be noted that a painful hip quadrant can also arise from other local pathology, such as a psoas bursitis or tendinopathy, and a tight hip quadrant can arise from tight gluteal muscles. A positive FABER test result was found in 88% of the subjects examined, with pain usually in the lateral hip but occasionally in the groin or buttock. The differential diagnosis of a positive FABER test result is sacroiliac joint pathology, especially if it refers to the contralateral buttock.

One of 8 ultrasound examinations was positive, suggesting a low sensitivity of this investigation; the 1 patient with a positive ultrasound finding did not have a MR arthrogram. Of the 24 subjects who underwent MR arthrography, 11 were reported as positive. Although in 5 of these cases the exact radiologic diagnosis was found to be incorrect at arthroscopy, at least MR arthrography did detect that there was something wrong with the hip.

Previous studies have stated that MR arthrography can accurately detect labral tears. In the study by Czerny et al,[28] the sensitivity was 90%, and the specificity was 91%. Petersilge et al[13] reported similar specificity. Although a specificity for the existence of pathology of 100% was achieved in our study, the sensitivity was significantly lower, with a relatively high number of false negatives. Furthermore, the pathology reported was frequently incorrect. This may be explained by the fact that arthroscopy was performed regardless of the MR imaging findings in our study, whereas in other studies, arthroscopy was performed primarily in those cases reported as positive for labral tear.

In addition, in our study, an intermediate linear signal intensity focus at the base of the labrum (lower in signal intensity than intraarticular gadolinium) was interpreted as hyaline cartilage but was shown at arthroscopy to

represent a tear in 8 cases. It is likely that partial volume averaging in a thin column of contrast accounts for this. Similar to recent studies, nonvisualization of the labrum indicated an avulsed labrum, as confirmed by arthroscopy, rather than congenital absence, as was reported in earlier studies.[29] The identification of a paralabral cyst always corresponded with the presence of a labral tear.

Those patients with negative MR arthrographic findings underwent EULA of their hip joint. This was 100% successful in relieving their pain and markedly improving the range of motion of the hip joint, but 2 of 15 subjects required 75 minutes, not 1 hour, for a positive result. The EULA is a nonspecific test that should be positive for most hip joint pathologies—not just labral tears—and may be positive in patients with bursitis through extravasation of local anesthetic or through the bursa communicating with the hip joint, although this should show up on the arthrogram. It has the potential problems of any joint injection, namely infection and trauma to the joint and the surrounding neurovascular structures, and the diagnostic sensitivity of the test remains to be proven.

In the majority of cases in this series, acetabular labral abnormalities were identified either alone or in combination with other pathology, such as acetabular rim lesion or chondromalacia. The labral tear patterns varied but most commonly involved a bucket handle– or partial bucket handle–type tear or parrot beak–type tear. Chondral lesions most commonly have been found in the anterosuperior quadrant of the acetabulum and vary from softening, apparent only to probing, to major full thickness articular cartilage loss associated with the acetabular rim lesion. Chondral loose bodies may be identified either as a result of trauma or in association with synovial chondromatosis. Synovitis identified in this series was nonspecific in all cases, and histopathology demonstrated only chronic low-grade synovitis with no specific distinguishing features. At this point, no long-term follow-up of clinical outcomes beyond 12 months has been achieved to demonstrate the clinical effectiveness of this treatment.

However, at this early stage, we propose the following diagnostic algorithm. When the patient's history and examination suggest hip pathology, and conservative treatment fails, then the first investigation should be MR arthrography with gadolinium. If this is positive, then arthroscopic examination of the hip joint is warranted. If the imaging study is negative, a trial of conservative management is warranted. If this fails to resolve the pain, then an EULA is the next investigation. If positive, we recommend proceeding to arthroscopic examination. If negative, we suggest investigating other diagnoses.

The relevance of MR imaging needs to be questioned in light of its low sensitivity and poor specificity; however, other hip pathologies, such as avascular necrosis of the femoral head and transient osteoporosis, are usually well visualized. If present, these would alter management. Also, outside of the study period, a hemangioma of the acetabular roof, which had fractured through the acetabulum, was detected on MR imaging after failing to show up on other investigations.

CONCLUSIONS

In our experience, hip pathology, particularly labral pathology, may be more common than has been previously recognized. In those patients with chronic groin and low back pain, especially where there is a history of an acute injury, a high index of suspicion should be maintained. Clinical signs of a painful, restricted hip quadrant and positive FABER test result should suggest MR arthrography in the first instance and consideration of hip arthroscopy if positive.

Acknowledgments: The authors thank N. Gelber, MBBS, and Vince Healy, MBBS (East Melbourne Radiology, Melbourne, Australia), for their contribution to this paper.

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