

Role of Magnetic Resonance Imaging in Non-Traumatic Hip Pain

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Abstract

Introduction: Magnetic resonance is the best imaging modality to assess hip joints in non-traumatic cases. It has a great ability to diagnose bone, cartilage, ligaments, muscles, and soft tissue disorders. MRI can also detect joint effusion and bone marrow edema.

Aim: To study various causes of non-traumatic hip pain and assess MRI appearances of hip joint pathologies.

Methods: 55 patients were included who were referred to the department of radiodiagnosis with a history and clinical suspicion of hip pathologies. All patients of any age/sex with a history and clinical suspicion of hip joint pathologies referred to our department for MRI hip, and patients on follow up will be included in this study. The patient was given supine positing and legs straight with 15-degree internal rotation. Images were obtained using a body surface coil.

Results: Out of 55 patients with hip pain, 11 patients were normal, and 44 patients (80%) had a pathological cause of hip pain. The most common aetiology for the cause of non-traumatic hip pain was Avascular necrosis of the femur (34%), followed closely by Erosive arthritis (14%). Sacroiliitis was the third most common cause of hip pain in 4 patients (7.2%).

Conclusion: Contrast-enhanced MRI should be done in infective cases and sacroiliitis, as enthesitis, synovitis and capsulitis are better delineated in contrast-enhanced T1 images.

Key words: MRI, Paediatrics hip joint, Avascular necrosis

INTRODUCTION

Hip pain is a common problem with varied aetiology. There are various differential diagnoses for non-traumatic hip pain in adults and children. There can be various causes of hip pain which are broadly classified into two categories, the intra-articular causes and the extra-articular causes. Femoral head osteonecrosis, also referred to as avascular necrosis (AVN), is a pathological state that causes decreased blood supply to the subchondral bone of the femoral head, resulting in osteocyte death and eventual collapse of the articular surface.^[1,2] Primary osteoarthritis of the hip is the less common cause of hip pain than secondary osteoarthritis. Labrum, cartilage

and chondrolabral junction can also cause hip pain. MRI is sensitive enough to detect early changes in early osteoarthritis, leading to a prompt and better treatment option for the patient.^[3] MRI differentiate different types of Femoro-acetabular impingement FAI, e.g. Pincer type, CAM or mixed (most common), thus helping in preventing associated complications.^[4] MRI is useful in the early stages of tuberculosis where plain radiograph shows diagnostic dilemma. In combination with USG guided aspiration of synovial fluid and MRI, early diagnosis of tuberculosis in the hip joint is possible.^[4] Legg Calve Perthe's disease and Transient synovitis cause hip pain in children. Contrast-enhanced T1 fat-suppressed images with dynamic MRI help differentiate septic arthritis from transient synovitis in paediatric cases. MRI in adjunction with inflammatory and biochemical markers help in differentiating children who require active management from children who can be conservatively treated. MRI detects pelvic osteomyelitis, a diagnostic challenge in children.^[5] MRI serves as a reliable investigation for assessing hip involvement in ankylosing spondylitis and yields a higher value than radiograph in these cases. The focus of our study was to find MR features

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of the particular disease and evaluate the best sequence for various hip pathologies.

AIM

To study various causes of non-traumatic hip pain and assess MRI appearances of hip joint pathologies.

MATERIALS AND METHODS

This prospective study was done from June 2017 to July 2018 and was approved by our institutional review board. The present study was undertaken to evaluate the role of MRI in a patient presenting with hip pain. In this study, 55 patients were included who were referred to the department of radiodiagnosis with a history and clinical suspicion of hip pathologies. All patients of any age/sex with a history and clinical suspicion of hip joint pathologies referred to our department for MRI hip, and patients on follow up will be included in this study. The patient was given supine positioning and legs straight with 15-degree internal rotation. Images were obtained using a body surface coil.

All the scans were done in a 1.5 T MRI machine by GE health care. The patient was asked to remain stationary during the scan and avoid moving the limbs. In the coronal plane, volume from skin to skin is included. A large field of view was selected, covering hips from the iliac crest to the lesser trochanter. MRI is first done with a large FOV of 30-40 cm to include pubic symphysis and sacroiliac joint. FOV is then reduced to 18-20 cm to see the area of interest. The double oblique view is taken for a better delineation of anatomy. Axial PDFS is the first sequence taken on the coronal localiser. Other sequences are planned on axial PDFS. T1 and STIR sequences were taken in all the axial, coronal and sagittal planes. The contrast was given as and when required to the patient. Pre and post-contrast fat-saturated images in all the planes were taken. In the case of avascular necrosis of the femur, the extent of the necrotic lesion was assessed by two methods, 1. The proportion of cross-sectional area (as a percentage) of femur head involved by necrotic lesion as described in the study of Nam *et al.* as "Kim YM *et al.*" method. (12) The combined angle of the necrotic lesion or combined necrotic angle measured from midcoronal and midsagittal MRI views as described in the study of Ha *et al.* (13) as the "modified Kerboul *et al.* method".

RESULTS

A total of 55 cases were studied for clinical profile evaluation of non-traumatic hip pain. The maximum

number of patients were in the age group of 11 to 20 years (29.09%), followed by 21 to 30 years (23.64%) [Table 1].

Various causes of non-traumatic hip pain are shown in the table below with percentages. The most common cause was avascular necrosis of the femoral head noted in 34 % of the patient (19 patients), followed closely by erosive arthritis 14 % (14 patients). In addition, 20% (11 patient) had normal MRI findings [Table 2].

Case 1. Bilateral Avascular Necrosis of Hip Clinical details- 34 yrs male on steroids with bilateral hip pain for one month. Image shows altered signal intensity involving both the femoral head with subchondral hypointensity in both the femoral head in T1WI and T2W1 images (geographical pattern), STIR shows superiorly bone marrow oedema involving bilateral femoral head and left iliac bone.

Case 2. Altered signal intensity involves right ischial bone appearing hypointense on T1, hyperintense on T2WI, STIR with a subchondral cyst, right femoral head irregularity and reduced joint space. Tubercular arthritis of the right Hip joint.

DISCUSSION

MR imaging and new advances can diagnose the exact cause of non-traumatic hip pain and thereby significantly influence the management of the patient. The present study evaluated various causes of non-traumatic hip pain and discussed the MR appearance of various hip joint pathologies. Our study found a broad spectrum of pathologies causing hip pain. The most common pathologies noted were Avascular necrosis of the femoral head. Only 1 case of Primary Osteoarthritis and SCFE was noted. In our study, 88.9 % had secondary osteoarthritis the patient with osteoarthritis, and 90 % had bilateral involvement. Among the paediatric population with hip pain, we found three significant causes: Perthes disease, Transient synovitis, and Septic arthritis. Other causes were developmental dysplasia of the hip, and one child was found to have SCFE. Non-traumatic hip pain most commonly affects young adults between 11- 20 years, followed by 21 to 30 years. The minimum age of presentation was six months, and the maximum age of presentation was 75 years. The mean age was 28.53 years.

Vaghamashi *et al.*^[6] where the mean age of presentation for non-traumatic hip pain was 21 to 30 years. Our finding is comparable to that of Elatif Drar *et al.*^[7] who, in their study of 100 patients with non-traumatic hip pain recorded mean age of 30- 40 years.

Table 1: Distribution of patients' characteristics

Patient characteristics	Frequency	Percentage
Age group		
<10	3	5.45%
11 to 20	16	29.09%
21 to 30	13	23.64%
31 to 40	11	20.00%
41 to 50	8	14.55%
51 to 60	2	3.64%
61 to 70	1	1.82%
>70	1	1.82%
Gender		
Male	37	67.27%
Female	18	32.73%
Laterality		
Bilateral	15	27.27%
Unilateral	40	72.73%

Table 2: Distribution of aetiology

Aetiology	Frequency	Percentage
Avascular Necrosis	19	34.55%
Osteomyelitis	3	5.45%
Erosive arthritis	8	14.55%
Transient synovitis	1	1.82%
Primary Osteoarthritis	1	1.82%
Perthes disease	2	3.64%
Slipped capital femoral epiphysis	1	1.82%
Femoro-Acetabular Impingement	1	1.82%
Labral Tear	1	1.82%
Sacroiliitis	4	7.27%
Marrow conversion disorder	1	1.82%
Non-specific myositis/abscess	2	3.64%
Normal	11	20.00%
Total	55	100.00%

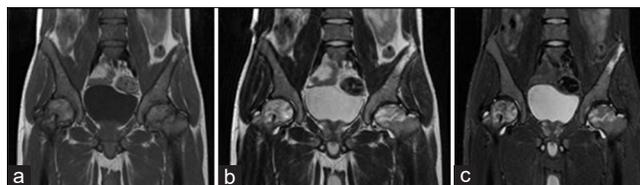
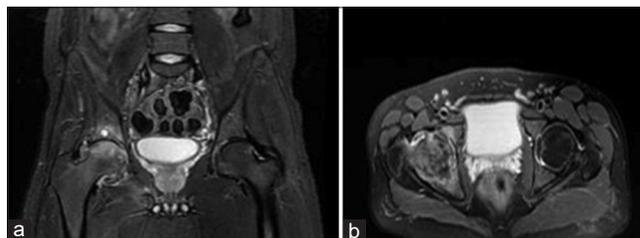
Out of 55 patients with hip pain, 11 patients were normal, and 44 patients (80%) had a pathological cause of hip pain. The most common aetiology for the cause of non-traumatic hip pain was Avascular necrosis of the femur (34%), followed closely by Erosive arthritis (14%). Sacroiliitis was the third most common cause of hip pain in 4 patients (7.2%).

Ragab Y *et al.*^[8] studied 34 patients with hip pain using MRI and found a similar spectrum of disease.

MRI in the evaluation of avascular necrosis was found by Glickstein *et al.*^[9] and 95 % sensitivity of MRI in detecting AVN was reported by Elatif Drar *et al.*^[10]

Xu *et al.* reviewed that bone marrow oedema is a common MRI finding in cases of osteoarthritis of the hip with a degree of bone marrow oedema correlating with the severity of osteoarthritis.^[11]

The most common cause of Erosive arthritis was tubercular aetiology. Overall, 9 cases of osteoarthritis were diagnosed, out of which 8 cases (88.9%) of secondary osteoarthritis

**Figure 1: a) Coronal T1WI, b) Coronal T2WI, c) Coronal STIR****Figure 2: a) Coronal STIR, b) Axial PDFS**

were noted. Only one patient with primary osteoarthritis was present, suggesting that secondary hip osteoarthritis is more common than primary osteoarthritis. Cartilage loss and marginal osteophytes were noted in 100% of patients with osteoarthritis. The extent of marrow oedema correlates with the severity of osteoarthritis.

Bone marrow oedema was present in 70.5 % of cases with osteoarthritis which is by the study of Elatif Drar *et al.*^[7] who reported bone marrow oedema in 70 % of cases of the hip with osteoarthritis [Figures 1 and 2].

CONCLUSION

This study shows that MR imaging and new advances can diagnose the exact cause of non-traumatic hip pain and significantly influence the patient's management. Contrast-enhanced MRI should be done in infective cases and sacroiliitis, as enthesitis, synovitis and capsulitis are better delineated in contrast-enhanced T1 images. MRI differentiates the origin of hip pain from bony, cartilaginous, soft tissue and facilitates appropriate management.

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