

## Spectrum Of Imaging Findings In Infective And Inflammatory Arthritis Of Hip Joint—A Cross-Sectional Diagnostic Imaging Case Series

Dr. Aditi N<sup>1</sup>, Dr. Abhisek Saha<sup>2\*</sup>, Dr. Suresh A<sup>3</sup>, Dr. Vinay Kumar Reddy K<sup>4</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Junior Resident, <sup>3</sup>Professor and Head, <sup>4</sup>Junior Resident

Department of Radiodiagnosis & Imaging,

Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bengaluru, Karnataka 560066

**\*Corresponding Author:**

**Dr. Abhisek Saha**

Junior Resident, Department of Radiodiagnosis & Imaging, Vydehi Institute of Medical Sciences and Research Centre, Whitefield, Bengaluru, Karnataka 560066

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

### Abstract

Mono-articular arthritis is challenging to diagnose clinically. Conventional radiography is the primary modality of choice, however normal findings do not necessarily mean that disease is not present. Due to its higher soft tissue resolution, MRI is more sensitive and specific for early detection and disease characterization which contributes towards timely management of these conditions.

**Keywords:** Inflammatory and infective arthritis, Conventional radiography & MRI

### Introduction

The hip joint is a stable, major weight-bearing, ball and socket type of joint with wide range mobility. Hip pain is a common yet non-specific symptom that may result from a number of articular as well as extra articular conditions [1]. It can be involved in various conditions; namely congenital, developmental, infective, inflammatory, degenerative, metabolic, traumatic, autoimmune and neoplastic etiologies. Early radiological detection helps to clinch early diagnosis for better curtailment of disease. This study aims to evaluate the role of MRI in the diagnosis of painful hip pathology and its correlation with X-ray.

Mono-articular arthritis is a diagnostic and clinical challenge. Conventional radiographic imaging, although primary, has poor sensitivity and specificity for early detection. [2] X-ray however does provide good accuracy for bony involvement and for detection of late stage cases.

MRI has higher soft tissue resolution which provides better diagnostic precision for early disease characterization and progression.

Our study mainly considers inflammatory and infective etiology due to their similar presentation and imaging findings but drastically different treatment strategies. The value of MRI has been advocated in both type diseases because of its superior contrast and its ability to depict changes in cartilage, ligaments and synovial tissue [3].

### Material And Methods

Patients were referred to the Department of Radiology with complaints of non-traumatic hip pain.

Bilateral hip protocol using pelvic/body coil was employed in all cases with T1 weighted, T2 weighted and STIR images obtained in axial, coronal and sagittal planes.

Intravenous contrast (Gadolinium @ 0.1mmol/kg) was administered when thought necessary based on the MRI findings. Three radiologists evaluated all plain radiographs and MRI studies independently.

The lab parameters (C - reactive protein, RA factor and leukocyte count) of the patients were collected along with relevant clinical details. Correlation of

imaging and biochemical findings were done and are furnished below. Written consent from patients was taken along with hospital ethical committee clearance.

### Inclusion Criteria

1. Patients presenting with unilateral hip pain
2. Patients of all age groups and both sexes

### Exclusion Criteria

1. Patients with significant trauma.
2. Patients with bone tumour
3. Patients with avascular necrosis
4. Patients with previous history of hip surgery.
5. Patients with cardiac pacemakers, ferromagnetic aneurysm clips, cochlear implants and other ferromagnetic implants.
6. Patients with claustrophobia.
7. Final diagnosis was based on clinical, laboratory and imaging findings and further confirmed by cyto/ histopathology where indicated.

### Observations & Results:

In our series of over 15 cases, we have found that most X-rays usually present as normal in the initial stage. This is often due to a radiological lag with early clinical findings.

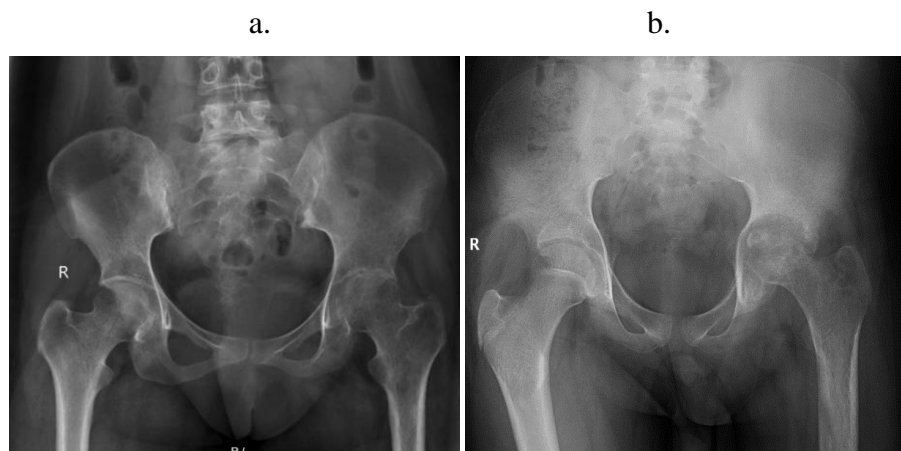
However, we did find a number of specific but not sensitive findings - In early stages of infective arthritis, on X-ray, we see widening of the hip joint space with joint effusion as well as displaced fat pads. Juxta articular osteopenia secondary to hyperemia is usually present.

In late stages of infective etiology, on X-ray, there is asymmetrical decrease in the joint space with marginal bone erosions and articular cartilage destruction. It can even progress to a complete ankylosis state where there is immobility secondary to bony fusion and sclerosis.

Associated changes of osteomyelitis like cortical lucencies and irregularity, periosteal reaction, sequestrum, involucrum and cloaca with adjacent soft tissue collections should also be looked for.

Tubercular arthritis presents with a long-standing history with features of marginal eccentric erosions and juxta-articular osteopenia. Late stages typically depict fibrous ankylosis.

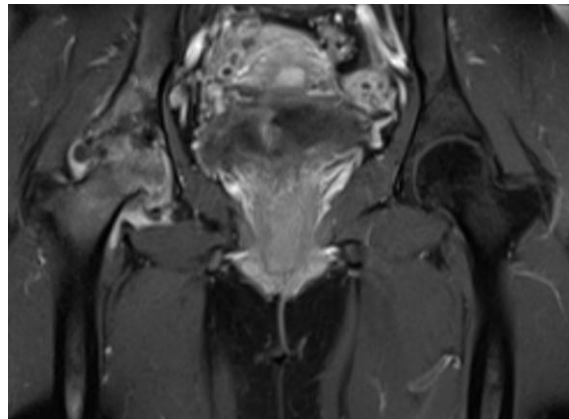
The classic appearance of Pheemister triad is not always visualized and it is often difficult to distinguish the type of infection [4]. Correlation with joint fluid aspiration analysis is always recommended.



**FIG 1:** a) In a case of infective arthritis, X-ray shows asymmetrical narrowing of the superior aspect of the left hip joint. b) decreased bone density in the visualized left femur with marginal erosions, joint space irregularity and protrusion acetabuli.



**Figure 2:** In a case of pyogenic arthritis (a) X-ray of right femur shows decreased right hip joint space with irregular contour of femoral head (curved arrow), periosteal thickening (arrow) in the meta-diaphyseal region (b) T1 post-contrast coronal image shows enhancing bone lesions involving medullary cavity and the cortex of the right femoral head and neck. Multiple small collections noted within the medullary cavity of the involved right femur with significant surrounding edema.



**Figure 3:** In a case of tubercular arthritis, on T1 post Gad coronal image, there is marginal bone & articular cartilage erosions (arrow), bone marrow edema (curved arrow)

On MRI, bone marrow edema can be seen as early as 24 hours after complaints. Usually in pyogenic arthritis, severity of bone marrow edema is more extensive compared to tubercular arthritis. However, bone erosions are predominant in tubercular etiology due to the presence of pannus and granulation tissue which erodes the bare and marginal areas [5]. Joint space reduction is seen late in cases of tubercular etiology.

Synovial thickening and inflammation is a concurrent finding seen in both cases, but synovial heterogeneity is more prevalent in pyogenic etiology.

Joint effusion also shows intermediate and heterogeneous signal in pyogenic arthritis

Post contrast enhancement is seen in the infected synovium, bone erosions as well as the marrow.

Abscesses if present show thick irregular rim in pyogenic arthritis and thin smooth wall in tubercular arthritis.

Inflammatory arthritis can include seropositive and seronegative causes and usually shows multisystemic and multi-joint involvement. Mono-articular inflammatory arthritis is relatively rare.

Early features are nonspecific and it is often difficult to distinguish from an infective cause.

In early stages of inflammatory disease, X-ray shows juxta-articular osteopenia with subtle irregularity of the articular surfaces in the early stages.

Symmetrical joint space reduction is often seen with subchondral sclerosis in the late stage. Cyst-like formation can also occur, particularly in cases of rheumatoid arthritis [6]. Chronic long-standing cases can show deformities like flattening and altered contour of femoral head, protrusio acetabuli and femoral head subluxation.

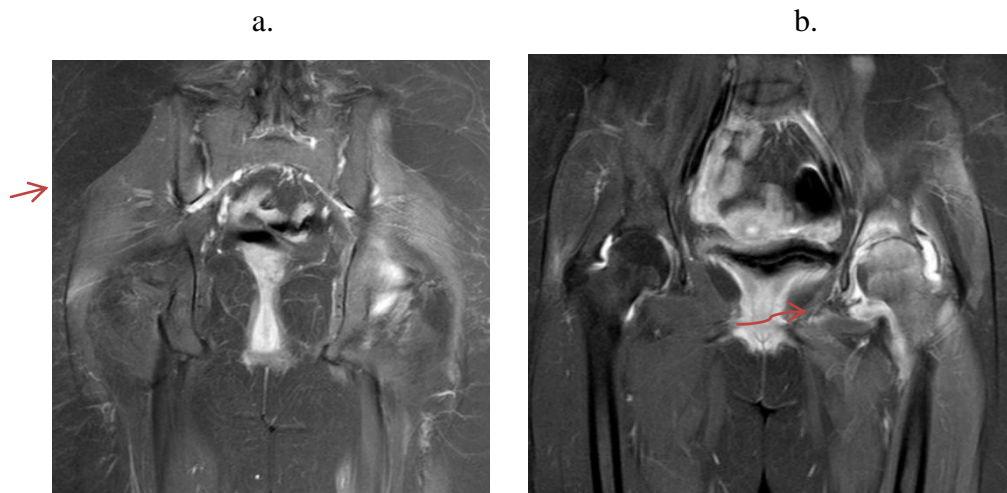
Seronegative cases show higher prevalence of enthesopathy at the tendon and ligament attachments rather than joint involvement.

MRI shows features of bone marrow edema and subtle articular irregularity, however the severity of bone marrow edema and erosions are often lesser as compared to pyogenic etiology. Intraosseous cysts and erosions are quite common in rheumatoid arthritis. Cartilage destruction is seen in late cases.

Joint effusion is often homogenous.

It was observed that soft tissue edema and enhancement was more prevalent in inflammatory conditions as opposed to septic joint.

Synovial inflammation and edema showing increased enhancement secondary to increased vascularity is seen. Associated bursitis and tendinitis is often seen.



**Figure 4:** In a case of inflammatory arthritis STIR coronal images (a) & (b) show right sacroiliitis (arrow) (a) and left synovial thickening (curved arrow) with bone marrow edema.

**Table 1:** Radiological findings in infective vs tubercular vs inflammatory arthritis

FEATURES	INFLAMMATORY ARTHRITIS	TUBERCULAR ARTHRITIS	PYOGENIC ARTHRITIS
1. Bone marrow edema	+	++	+++
2. Juxta-articular bone erosions	++	+++	-
3. Extra-articular cystic lesions/	-	+	++

abscess			
4. Juxta-articular cystic lesions	++	+	-
5. Metaphyseal involvement	-	-	+
6. Synovial thickening	Bulky	Discrete or nodular	Laminated
7. Sequestrum	-	+	++
8. Involucrum	-	+	++
9. Cloaca	-	+	++

**Table 2:** Differentiating features

FEATURES	INFLAMMATORY ARTHRITIS	TUBERCULAR ARTHRITIS	PYOGENIC ARTHRITIS
1. Bone marrow edema	less	less	more
2. Bone erosions	Bone erosions present	more frequent in tubercular arthritis	Less common
3. Synovial thickening	Bulky synovial thickening	Discrete or nodular thickening	Laminated synovial thickening
4. Bone involvement	Pannus formation start at non cartilaginous part.	First involvement is bare area of the bone [non-cartilaginous part].	First involvement is metaphysis and extends to the joint.
5. Others	Multiple joint involvement	Pulmonary symptoms	Clinical symptoms: fever and body ache [acute]

The imaging protocol used in our study was selected to combine the speed of examination with imaging sequences (T1, T2, STIR and TIW Post Gd) and imaging planes (coronal, axial and sagittal). It was found that STIR and post-contrast T1W coronal images were the most sensitive and informative in screening out normal from abnormal cases.

**Conclusion:**

Infective and inflammatory hip diseases are common conditions MRI today is the modality of choice for evaluation of non-traumatic hip pain. MRI has distinct advantages over other modalities in being radiation free, excellent soft tissue contrast

resolution, multiplanar imaging capability and high sensitivity in detecting early musculoskeletal lesions.

It is difficult to easily distinguish between mono-articular inflammation or infection. Correlation with history, ANA profile and joint fluid aspiration should always be done due to similarity of features

**References:**

1. Reddy KV, Kapoor A. MR Evaluation of Non-Traumatic Hip Pain. JMSCR. 2017;05(03):19090–101.

2. Choi JA, Koh SH, Hong SH, Koh YH, Choi JY, Kang HS. Rheumatoid arthritis and tuberculous arthritis: differentiating MRI features. *AJR Am J Roentgenol.* 2009 Nov. PMID: 19843752
3. Khurana B, Okanobo H, Ossiani M, Ledbetter S, Dulaimy KA, Sodickson A. Abbreviated MRI for patients presenting to the emergency department with hip pain. *AJR;* 2012 Jun; 198(6): W581-8.
4. Jacobson, Jon A.; Girish, Gandikota; Jiang, Yebin; Resnick, Donald (2008). *Radiographic Evaluation of Arthritis: Inflammatory Conditions*
5. Moshe Graif; M. E. Schweitzer; Diane Deely; Theresa Matteucci (1999). *The septic versus nonseptic inflamed joint: MRI characteristics.* , 28(11), 616–620.
6. Sudoł-Szopińska I, Jans L, Teh J. Rheumatoid arthritis: what do MRI and ultrasound show. *J Ultrason.* 2017;17(68):5-16. doi:10.15557/JoU.2017.0001