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**Original article**

# Study of MRI evaluation of painful hip joint

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**ABSTRACT:**

**Introduction-** Hip pain is a major cause of morbidity amongst patients of all age groups. Early and accurate detection of hip pathologies and institution of appropriate treatment will lead to significant improvement in outcomes. MRI is proven to be one of the most sensitive diagnostic modalities for hip pathologies. The aim of this study was to evaluate the radiological features of various diseases leading to a painful hip joint on MRI with their frequency, and hence determine the role of MRI in evaluation of painful hip. This will help in better understanding and diagnosis of the diseases and better patient management.

**Materials and methods-**This study was carried out on 75 patients, referred to our department with a painful hip joint over a period of 18 months.

**Results**-In our study,18 cases(24%) were diagnosed with avascular necrosis of femoral head,16 cases(21.33%) with infective pathologies involving the hip joint,7 (9.33%)with osteoarthritis of hip,10(13.33%) were tumours involving the hip joint,4 (5.33%)trauma cases,9 (12%)miscellaneous pathologies causing painful hip and 11 (14.66%)were radiologically normal.

**Conclusion:** MRI is useful to detect early stages of AVN, better delineates cartilage destruction in osteoarthritis and also helps in better delineation of synovial involvement, bone marrow involvement and detection of joint effusion in early stages of septic arthritis. Also MRI helps in optimally imaging paediatric cartilaginous hip, staging of hip tumours and is valuable in diagnosis of radiographically occult osseous abnormalities. Thus MRI is a valuable imaging modality and acts a 'problem solving tool' in most cases of painful hip joint.

**Keywords:** MRI, hip, avascular necrosis, septic arthritis.

## INTRODUCTION:

MRI of the hip was amongst the earliest reported applications of Musculoskeletal Magnetic Resonance (MR) Imaging. MR imaging of hip not only enables assessment of osseous structures but also of articular structures and extra-articular soft tissues that can be affected by hip disease[1]. Trauma, avascular necrosis, infection, tumours, arthritis and hip dysplasia can all manifest with subtle radiographic abnormalities. So, MRI plays a pivotal role in

evaluation of a painful hip joint. MRI is capable to detect bone marrow changes such as edema and sclerosis in early stages .It is useful in staging and also to guide treatment [2].MRI has been increasingly used for assessment of musculoskeletal infections, including septic arthritis. Synovial enhancement, peri-synovial soft tissue edema, marrow edema, bony erosions and joint effusion highly correlate with the clinical diagnosis of septic arthritis. In osteoarthritis, MR imaging is uniquely capable of characterizing the soft-tissue abnormalities that occur in primary and secondary osteoarthritis & JRA, which include articular cartilage destruction, synovial inflammation and joint effusion. MRI Imaging is done in evaluation of suspected benign and malignant bone lesions involving the hip joint as a local staging procedure.MR arthrography offers the best imaging technique for labral pathologies. MR imaging, especially GRE sequences is unique in its capability to delineate cartilage and is therefore, especially effective in the evaluation of the pediatric hip.[3]Thus, MRI aids in comprehensive evaluation of the articular cartilage, labrum, synovium, joint cavity, articulating bones and adjacent soft tissues. This helps in better identification and characterization of hip pathologies, and hence in patient management.

**AIMS AND OBJECTIVES:**

- To note the various causes of painful hip joint presenting to a tertiary referral centre.
- To assess the various radiological findings detected on MRI of the hip joint.
- To assess the frequency of each radiological finding on MRI in a given clinical scenario and hence chart out an algorithm for a sequential radiological differential diagnosis.
- To assess findings of conventional radiography in these patients.

**MATERIALS & METHODS**

After approval by the Institutional Ethics committee, we conducted an Observational prospective study including 75 consecutive patients referred to our department with a painful hip joint, over an 18 month period. We excluded patients with contraindications for an MRI study such as cardiac pacemaker, aneurismal clips etc. and deranged renal function if contrast study was anticipated. All patients underwent MRI Hip joints after obtaining the written informed consent, according to our hospital protocol. MR imaging of these patients was performed on a “PHILIPS ACHIEVA 1.5 Tesla MRI MACHINE”, at our department. A detailed clinical history of patient was taken and relevant examination findings and investigations including the plain radiograph were recorded. MRI was performed using a Torso coil. After a localizer series, the standard protocol consisted of the following sequences- Fat saturated PDW coronal, STIR coronal, T2W axial,T1W axial ,T1W coronal and 3D WATS coronal. T1W sagittal, Fat saturated pre-contrast T1W axial and post contrast FS T1W axial and coronal were done whenever required. Dimeglumine gadopentetate at a dose of 0.1mmol/kg body weight was given whenever indicated**.**

The patients were divided into groups on the basis of their age, gender and the pathologies detected on MRI of hip joints. Various radiological findings such as bone involvement(marrow signal intensity changes, cortical erosions, fractures, focal lesions, periosteal reaction etc.),joint space (increase/decrease, effusion, loose bodies), synovium (thickening, enhancement, pannus formation), articular cartilage, labrum, surrounding tissues with overall alignment of the hip joint (subluxation, dislocation, protrusion acetabuli) was documented. The frequency of each finding and the distribution of these findings in various pathologies were analyzed. As avascular Necrosis is the most common pathology found in patients presenting with painful hip joint, a grading system according to Ficat and

Arlet Classification [4] (Table 1) was used for our study.

**OBSERVATION AND RESULTS**:

In our study, 75 cases of acute or chronic hip pain underwent MRI examination. Maximum numbers of patients were between the age group of 21-30 (30%) (Table 2). Out of 75 cases, 50(67%) were males and 25(33%) were females thus, showing male preponderance (Table 2).

In our study,18 cases(24%) were diagnosed with avascular necrosis of femoral head,16 cases(21.33%) with infective pathologies involving the hip joint,7 (9.33%)with osteoarthritis of hip,10(13.33%) were tumours involving the hip joint,4 (5.33%)trauma cases,9 (12%)miscellaneous pathologies causing painful hip and 11 (14.66%)were radiologically normal.(Table 3) The most common radiological (MRI and plain X-ray) findings and the relative frequency of each in different pathologies are as follows: avascular necrosis (Table 4), osteoarthritis (Table5), infections (Table 6), tumours (Table 7 & 8), Trauma (Table 9).

In our study, AVN of femoral head was the commonest pathology identified as the cause for painful hip joint.18 cases (24%) of avascular necrosis of femoral head were studied. Mean age of the patients was 37 years (SD-14 and range 11-70 years), with 14 (78%) males and 4(22%) females being affected.

Bilateral hip joints were affected in 8 cases (44%), whereas 10 (56%) cases had unilateral involvement. Post traumatic AVN (60%) was the most common etiological factor in unilateral involvement, while steroid intake (62.5%) in bilateral involvement. In cases with bilateral AVN, mean age of the patients was 32 years, 6 (75%) being males and 2 (25%) being females. The mean duration of symptoms prior to hospital presentation was 10 months. Maximum number of patient presented in an advanced stage involving one of the hip joints, 4 (50%) in stage IV, 1 (12.5%) in stage III and 3 (37.5%) in stage II. The contralateral hip most commonly showed lesser involvement with commonest stage of presentation being II [6 (75%)] followed by stage I and III [1 each (12.5%)].

In unilateral involvement, mean age of the patients was 46 years, 8 (80%) being males and 2 (20%) females. The mean duration of symptoms prior to hospital presentation was 9 months. Maximum number of patient presented in an advanced stage, 4 (40%) in stage III and 3 (30%) in stage IV.2 (20%) patients presented in stage II and 1(10%) in stage I.

In our study, 7 cases (9.33%) were diagnosed as primary osteoarthritis. Mean age was 52years (SD-+ 7 years and range: 45 to 65 years), 4 (57%) being males and 3 (43%) being females. Bilateral hip joints were affected in 3 (43%) cases while 4 (57%) had unilateral involvement. In our study, cartilage loss & defects & joint space narrowing (100%) were the most common findings noted in all the patients (Table IV). Other findings were subchondral cysts (70%), femoral head deformity (57%), osteophytes (42%), effusion (57%) & marrow edema (57%).

16 cases (21.33) of infective pathologies of the hip were studied. Out of these, 8 (50%) were of tuberculous etiology while 8 (50%) were pyogenic arthritis ,which were proven by aspiration of joint effusion/collection Most common organism detected from joint aspirate in pyogenic arthritis was Staphylococcus aureus in our study (%) .

Out of the 8 cases of tuberculous arthritis, 4 (50%) were females and 4(50%) were males, with a mean age of 25 years (SD-+12 years and range: 12-45 years). 5 (62.5%) cases had unilateral involvement and 3 (37.5%) cases had bilateral involvement. The average duration of symptoms was 6 months

Out of the 8 cases of pyogenic arthritis, 5 (62.5 %) were males and 3 (37.5%) were females with a mean age of 21years (SD-+18 years and range: 1 to 60 years).All the cases of pyogenic arthritis had unilateral involvement. The average duration of symptoms was 15 days .Altered marrow signal intensity in the bones and joint effusion were the most common radiological finding noted in both pyogenic and tuberculous arthritis (78%)(Table 11).Marked synovial thickening with enhancement and bony erosions were more commonly seen in tuberculous than pyogenic arthritis.

FIGURE I: Bilateral AVN grade 2-Geographic lesion in subchondral region of bilateral femoral heads with a serpiginous low signal margin on T1W coronal images and fatty centre (arrow).No evidence of collapse of femoral head noted. Acetabulum appears normal. Bilateral AVN.

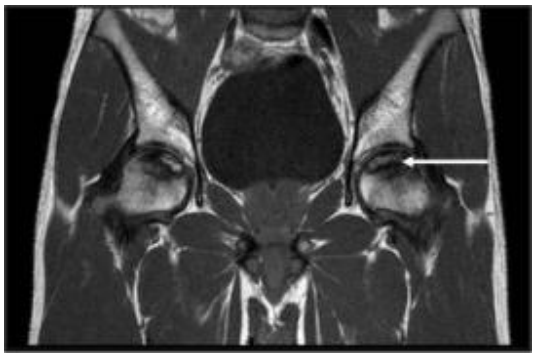

Figure II: Grade III AVN-T1WI sagittal images show a linear T1 hypointense subchondral fracture line (arrow) along the anterosuperior quadrant of the femoral head.

FIGURE III: Grade IV on left-Geographic area of altered signal intensity in left femoral head appearing hypointense on T1W coronal images .Femoral head is collapsed and shows deformity (arrow).There is decrease in joint space, mild effusion &irregularity of articular surface of acetabulum noted. Grade II AVN is noted on the right.

FIGURE IV: Double line sign i.e. Inner hyperintense line representing granulation tissue with outer hypointense rim representing sclerotic bone (arrow) is seen on T2WI.

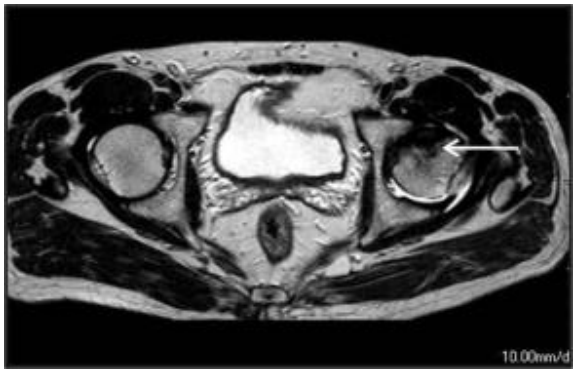

FIGURE V: Osteoarthritis involving both hip joints (reduction of joint space with diffuse cartilage thinning seen on both sides). Osteophytes are seen involving the head of right femur on T1W coronal images (arrow)

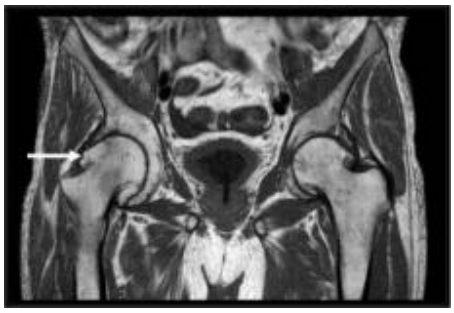

FIGURE VI: Left hip joint tuberculosis -lytic destructive changes seen to involve the articular surface of femoral head & acetabulum with extensive enhancing and thickened synovium (arrow) on T1W post contrast images. There is superior migration of femoral head with protrusio acetabuli.

FIGURE VII: Biopsy proven case of plasmacytoma - ill-defined heterogenously enhancing soft tissue lesion is noted on T1W post contrast images within right hip joint, pelvis and adjacent soft tissues with destruction of head & neck of femur and acetabulum (arrow)

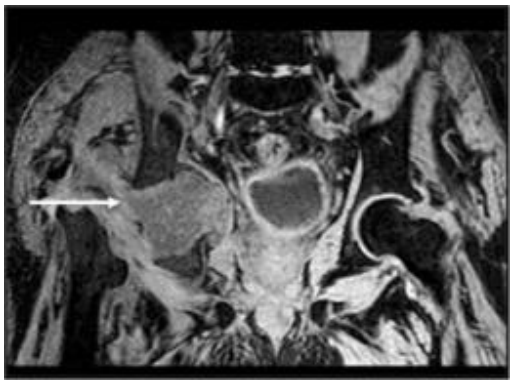

FIGURE VIII: Skeletal metastasis in k/c/o CA oral cavity. STIR coronal images depict heterogenous soft tissue lesion in the intertrochanteric region of the left femur (arrow) leading to its pathologic fracture.

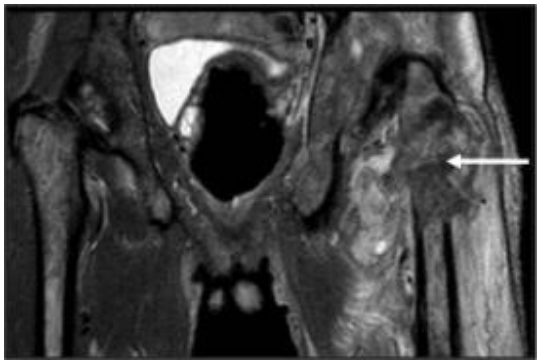

FIGURE IX: Left sided slipped capital femoral epiphysis-axial T2WI depict widened epiphysis with posteroinferior and medial displacement of epiphysis relative to the femoral neck (arrow)

FIGURE X: Right femoroacetabular impingement (cam type)-axial T2WI show decreased femoral head neck offset with a dysplastic bump noted lateral to the physeal scar at the head neck junction (arrow).

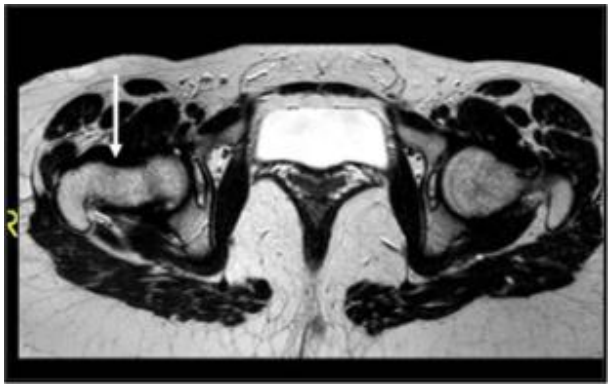

FIGURE XI: Right sided labral injury- anterosuperior labrum appears bulky which appears hyperintense on STIR coronal images associated with a paralbral cyst (arrow).

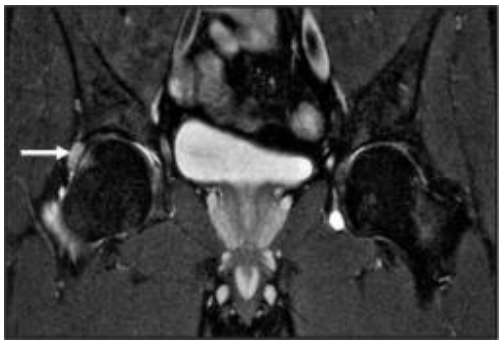

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**Table 1: FICAT AND ARLET CLASSIFICATION**

| Stage | Findings |
|---|---|
| Stage 0 | Normal hip with contralateral disease |
| Stage I | Normal radiograph<br>Diagnosis following MRI, bone scan or histology |
| Stage II | Radiographic changes of repair (osteoporosis / sclerosis / cysts)<br>No osteochondral fracture<br>Head spherical |
| Stage III | Wedge shaped increased density<br>Mottled osteoporosis<br>Subchondral lucent line- Crescent sign<br>Head no longer spherical "out of round"<br>Usually affects antero-lateral area of femoral head (best seen on lateral view) |
| Stage IV | Marked changes with secondary degenerative changes in the joint<br>Collapse of subchondral bone & severe deformity of the head |

**Table – 2 : Age wise distribution**

| AGE | NUMBER OF PATIENTS | PERCENTAGE |
|---|---|---|
| 0-10 | 5 | 6% |
| 11-20 | 14 | 18% |
| 21-30 | 23 | 30% |
| 31-40 | 13 | 17% |
| 41-50 | 10 | 13% |
| 51-60 | 8 | 11% |
| 61-70 | 4 | 5% |
| **Total** | **75** | **100%** |

**Gender distribution**

| GENDER | NUMBER OF PATIENTS | PERCENTAGE |
|---|---|---|
| Male | 50 | 67 |
| Female | 25 | 33 |
| **Total** | **75** | **100%** |

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**Table – 3 : PATHOLOGY**

| Sl. No | PATHOLOGY | NUMBER OF PATIENTS | PERCENTAGE |
|---|---|---|---|
| 1. | AVN | 18 | 24% |
| 2. | INFECTIVE | 16 | 21.33% |
| 3. | OA | 7 | 9.33% |
| 4. | TUMOURS | 10 | 13.33% |
| 5. | TRAUMA | 4 | 5.33% |
| 6. | MISCELLANEOUS | 9 | 12% |
| 7. | NORMAL | 11 | 14.66% |
| | Total | 75 | 100% |

**Table 4: AVASCULAR NECROSIS OF FEMORAL HEAD:**

**MRI Findings**

| MRI FINDINGS | NUMBER OF PATIENTS | PERCENTAGE |
|---|---|---|
| BONE MARROW EDEMA | 12 | 66% |
| FEMORAL HEAD ALTERED CONTOUR | 4 | 22% |
| FEMORAL HEAD COLLAPSE | 5 | 27% |
| DEGENRATIVE CHANGES | 5 | 27% |
| SUBCHONDRAL CYSTS | 2 | 11% |
| JOINT EFFUSION | 12 | 66% |
| DOUBLE LINE SIGN | 10 | 56% |

**X-RAY FINDINGS FOUND COMMONLY WERE:**

1) Osteoporosis of femoral head
2) Sclerosis of femoral head
3) Subchondral cysts
4) Subchondral lucency (crescent sign)
5) Altered morphology of femoral head

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**Table 5:OSTEOARTHRITIS :**

**MRI findings**

| MRI FINDINGS | NUMBEROF PATIENTS | PERCENTAGE |
|---|---|---|
| JOINT SPACE NARROWING | 7 | 100% |
| CARTILAGE LOSS | 7 | 100% |
| FEMORAL HEAD DEFORMITY | 4 | 57% |
| SUBCHONDRAL CYSTS | 5 | 70% |
| OSTEOPHYTES | 3 | 42% |
| EFFUSION | 4 | 57% |
| MARROW EDEMA | 4 | 57% |

**X-RAY FINDINGS FOUND COMMONLY WERE:**

1) Osteophytes
2) Joint space narrowing
3) Sclerosis
4) Cyst formation
5) Deformation of femoral head

**Table 6: MRI FINDINGS IN SEPTIC ARTHRITIS**

| MRI Findings | Tuberculous | Pyogenic |
|---|---|---|
| ALTERED MARROW SIGNAL INTENSITY | 6(75%) | 6(75%) |
| BONY EROSIONS | 5(62.5%) | 3(37.5%) |
| FOCAL LESIONS | 0 | 3(37.5%) |
| JOINT EFFUSION | 6(75%) | 6(75%) |
| SYNOVIAL THICKENING & ENHANCEMENT | 7(88%) | 4(50%) |
| PERIOSTEAL REACTION | 0 | 2(25%) |
| SURROUNDING COLLECTIONS | 4(50%) | 4(50%) |

**X-RAY FINDINGS FOUND COMMONLY WERE:**

1)Osteopenia
2) Joint effusion
3) Soft tissue swelling
4) Joint erosions and reductions of joint space
5) Subchondral cysts
6) Joint destruction and bony ankylosis

**Table 7:**

| Lesions | Number |
|---|---|
| METASTASIS | 2 |
| OSTEOID OSTEOMA | 2 |
| BENIGN CHONDROID LESIONS | 3 |
| SIMPLE CYSTS | 2 |
| PLASMACYTOMA | 1 |

**Table 8:**MRI FINDINGS:

| MRI FINDINGS | NO OF PATIENTS | PERCENTAGE |
|---|---|---|
| HYPERINTENSITY ON T2W | 8 | 80% |
| ENHANCEMENT ON PC | 4 | 40% |
| ASSOCIATED SOFT TISSUE | 2 | 20% |
| JOINT EFFUSION | 2 | 20% |

**X-RAY FINDINGS FOUND COMMONLY WERE:**

1)Osteolytic lesions
2) Osteoblastic lesions
3) Sclerosis
4) Altered head contour

**Table 9: TRAUMA** MRI FINDINGS

| MRI FINDINGS | NO OF PATIENTS | PERCENTAGE |
|---|---|---|
| FRACTURES | 3 | 75% |
| MARROW EDEMA | 2 | 50% |
| EFFUSION | 2 | 50% |
| SURROUNDING COLLECTION | 2 | 50% |
| DEGENERATIVE CHANGES | 1 | 25% |

**X-RAY FINDINGS FOUND COMMONLY WERE:**

1) Fractures
2)Joint effusion
3)Soft tissue swelling

**DISCUSSION:**

Avascular necrosis of the femoral head (AVN) poses a major diagnostic and therapeutic challenge [5]. It results generally from trauma, corticosteroid use, pancreatitis, alcoholism, radiation, sickle cell disease, infiltrative diseases (e.g. Gaucher's disease), and Caisson disease[6]. In most cases, MRI can diagnose early lesions with a greater than 90 percent specificity and sensitivity as compared to radiographs which have a sensitivity of 41 % for early cases [7, 10, 11]. A staging system using radiographic, clinical & MRI findings has been developed by Ficat and Arlet [8]. Steinberg classification (modification of Ficat classification) has been developed to assess the extent of bone involvement.[9]

In stage I disease, according to Ficat and Arlet classification, MRI reveals marrow edema within the femoral head which persists on follow up scans with normal appearing radiographs. In stage II disease, MRI reveals classical geographic defect within the femoral head representing areas of ischaemia and necrosis (Figure I). In stage III, subchondral fracture and collapse with 'crescent sign' and flattening of femoral head is noted (Figure II) while in stage IV secondary degenerative changes are seen (Figure III). Joint preserving surgeries (such as core decompression) are performed in early (stage I/II) and joint replacement in advanced stages (stage III/ IV) [12]Imaging findings of AVN on MRI are altered signal-intensity bands or lines within the femoral head seen surrounding the area that corresponds to ischemic bone on T1- and T2-weighted images. The band is accompanied by a second, inner band of high signal intensity on T2-weighted images known as the "double-line sign" and is considered highly specific for AVN (Figure IV) .[13]

Kim et al [15]reported that trauma involving the proximal femur or acetabulum may lead to unilateral avascular necrosis however, non-traumatic avascular necrosis, is bilateral in 50-80% of patients Of 18 cases detected on MRI, 12(66%) cases showed bone marrow edema, revealing it to be the most common feature seen. It can be detected only on MRI whereas radiographs have limitation in diagnosing bone marrow edema. Joint effusion was present in 12 patients (66%). On MRI 10(56%, n=18) cases showed 'double line sign' on T2W sequences. Takatori Y et al [16] reported that 85% of the patients with avascular necrosis show a characteristic "double line" sign on T2 weighted images which is a specific finding.

Huang GS et al. studied the MR imaging of bone marrow edema and joint effusion in patients with nontraumatic osteonecrosis of the femoral head and its relationship to pain in 71 patients. There were 63 men and 8 women, ranging in age from 18 to 68 years (mean age, 32 years), the age and sex predilection being similar to our study. Of the 71 patients, 39 had bilateral involvement while 31 patients had unilateral involvement. The percentage of patients presenting with unilateral disease was higher in our study, since we even included traumatic avascular necrosis, while this study included non traumatic cases of AVN. Potential risk factors for osteonecrosis of the femoral head included alcohol consumption (n = 52) and steroid therapy (n = 11).Bone marrow edema [which was present in 74% patients] & grade 2 or grade 3 effusion [present in 72% of hips] were the most common findings; similar to our study.[17]

Osteoarthritis is a degenerative slowly developing disorder that results from the non-uniform degeneration of articular cartilage in the synovial joints and reparative formation of new bone.[18]

Teichtahl et al. compared community-based adults with no diagnosed hip OA with diagnosed hip OA, and found that the latter have lower femoral head cartilage volume and a higher pre-valence of cartilage defects and bone marrow lesions. In our study, cartilage loss was seen in all cases and marrow edema in 57% cases.[19]

In a study by King.C.Li, 10 patients with osteoarthritis of hip were studied with MRI. There were 9 females and one male with mean age of 62 (range-33-78). Of the 10 patients, 3 had femoral head deformity (30%). Articular cartilage changes (nonhomogeneity and discontinuity of high signal of articular cartilage, or loss of this high signal) were detected in all cases of osteoarthritis by MRI which is similar to our study (Figure V) [20]

Thus MRI, unlike radiography, which better delineates cartilage destruction and various joint changes in osteoarthritis helps in appropriate plan of treatment or intervention by the clinician.

In our study 16 patients of infective pathologies affecting the hip joint were studied, 8 were of tuberculous etiology and 8 were pyogenic arthritis. In a study by Michael Karchevsky et al, 50 cases of septic arthritis were evaluated. The frequency of MRI findings in septic joints was as follows: synovial enhancement (98%), perisynovial edema (84%), joint effusions (70%), fluid outpouching (53%), fluid enhancement (30%), and synovial thickening (22%) (Figure VI). The marrow showed bare area changes (86%), abnormal T2 signal (84%), abnormal gadolinium enhancement (81%), and abnormal T1 signal (66%). Associated osteomyelitis more often showed T1 signal abnormalities. Synovial enhancement, peri-synovial edema, and joint effusion had the highest correlation with the clinical diagnosis of a septic joint. In our study joint effusion and synovial thickening with enhancement were seen in 75% & 31% cases respectively.[21]

MRI helps in better delineation of synovial involvement, detection of bone marrow edema and joint effusion in early stages of septic arthritis where plain X-Ray has limitation in diagnosis. In diagnosed cases on plain X-Ray, MRI helps in better evaluation of the extent of the articular cartilage destruction and also para-articular soft tissue involvement. [22]

11 tumours involving hip joint were studied (proven by biopsy). They included two osteoid osteomas, 3 benign chondroid lesions which included osteochondromas & enchondroma, 2 simple bone cysts & 1 plasmacytoma involving right hip joint &right pelvic musculature (Figure VII) . 2 cases of metastases were also included, one to the femoral head (from Breast carcinoma) & other to the intertrochanteric region from Carcinoma of the oral Cavity (Figure VIII).8 of these cases (80%) showed signal intensity changes on MRI i.e. hyperintensity on T2Wimages (2 out of the above cases were osteochondromas and did not reveal any signal intensity changes).4(40%) cases showed enhancement on PC study,2 cases(20%) showed associated soft tissue &2 cases (20%) showed joint effusion.

Radiographs play an important role in evaluation of the bone tumors. However, MRI has specific indications like assessment of the extent of the lesion, soft tissue extent, neurovascular bundle and joint involvement which helps in the appropriate treatment plan.[23]

4 cases of trauma to hip joint were seen. 2 included fractures, one subcapital neck fracture and the other displaced proximal shaft of femur. Others included old insufficiency fractures & hematoma around the hip joint. MRI demonstrates abnormal bone marrow changes and provides a cross sectional view of soft tissue anatomy in cases of trauma. MRI of the hip has proven to be valuable in the diagnosis of radiographically occult osseous abnormalities such as stress fractures and trabecular bone contusions, avulsion injuries and periarticular

soft-tissue disorders such as musculo-tendinous abnormalities and bursitis. It can effectively identify and quantify the muscle and ligament injury and joint effusion that accompany hip injuries.[24, 25]

Few other cases of painful hip joint in our study included Labral tear, femoro-acetabular impingement, slipped capital femoral epiphysis and developmental dysplasia of hip. 2 cases of DDH were included in our study. MRI helps in better evaluation of pathological involvement & displacement of the epiphyses & to detect associated bone marrow edema.MRI also gives morphologic information about acetabular deficiency in hip dysplasia & early detection of osteoarthritis which manifests as chondral and labral damage.[26]

One case of SCFE was included in our study (Figure IX). MRI detects early physeal changes of both preslip and SCFE, early marrow edema, physeal widening and slippage even when radiographs and computed tomography are normal. It is useful in diagnosing complications (like femoroacetabular impingement, chondrolysis and AVN), detecting SCFE in contralateral asymptomatic hip and to rule out other differential diagnosis in atypical presentation.[27]

One case of CAM type of FAI was studied (Figure X). The most important role of preoperative MR imaging in patients with FAI is to assess the exact extent of the damage already present within the joint.[53] Characteristic MR arthrographic findings of cam FAI include large α angles, acetabular labral lesions ,acetabular cartilage lesions at the anterosuperior position and osseous bump formation at the femoral neck. Characteristic findings of pincer FAI include a deep acetabulum and posteroinferior acetabular cartilage lesions.[28] One case of labral injury was studied (Figure XI). Magnetic resonance arthrography offers the best imaging of the acetabular labrum and is highly specific for the diagnosis of labral tears. Abnormalities of the acetabular labrum include partial tears, complete tears and labral detachment. Criteria for identification of torn labrum at MR arthrography include labrum with intra-substance contrast material, and labrum with irregular margins. Labral detachment is identified by contrast material interposed at the acetabular–labral interface with or without displacement of the labrum.[29]

**CONCLUSION:**

MRI of the hip joint should be performed early in patients with persistent pain and negative radiographic findings. MR imaging is performed to detect AVN in its early stages and in contralateral radiographically normal appearing hip thus allowing early treatment and prevention of subsequent bone destruction. MR imaging has been shown to be the most sensitive modality for imaging AVN and can guide treatment. In osteoarthritis, MR imaging is uniquely capable of depicting the soft-tissue abnormalities that occur, including synovial inflammation, joint effusion, and most importantly articular cartilage destruction. Joint effusion, marrow edema and synovial proliferation can be identified better by MRI than by conventional radiography in infective pathologies affecting hip joint. Most disorders classified as dysplasia can be readily diagnosed with plain radiography. However MRI is used for better evaluation of pathological involvement of head &epiphysis and for early detection of osteoarthritis in patients with DDH. While in cases of tumours involving the hip joint, it helps in assessing the extent of pathological involvement, evaluation of soft tissue extension, joint and neurovascular bundle involvement not routinely evaluated on radiographs. MRI is extremely sensitive to alterations in the bone marrow that may represent pathology

occult to plain radiography of the hips. Thus MRI is an invaluable investigation for evaluating a painful hip joint and analyzes the cause in most cases.

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