Plain X-Ray and MRI Evaluation of Painful Hip Joint

S. Althaf Ali1, Dwara Manojna Devi2
1Associate Professor, Department of Radiology, Deccan College of Medical Sciences, Hyderabad, Telangana, India, 2Private Practitioner, Radiologist, Yashoda Super Speciality Hospital, Hyderabad, Telangana, India.

Abstract

**Background:** Hip joint pain is a frequent problem in current practice and can be due to different causes since the investigations are invariably used to diagnose the source of the injury. The primary examination is accompanied by MRI, which is a valuable instrument in hip disease evaluation since it requires a detailed study of articular cartilage, epiphysis, joint fluids, bone marrow and extra-articular soft tissue which may be impaired by hip disease. **Subjects and Methods:** In a total of 60 individuals who had hip joint pain and subsequently had plain radiographs accompanied by the hip joint MRI was studied in a prospective cross-sectional analysis. The data is interpreted and the results of basic X-rays are compared to the MRI.

**Results:** Of the 70 cases the males (67%) are commonly affected than females (33%). The majority of the patients fall under the age group of 31-40 years (28.33%). In our study, we find the commonest pathology for the hip joint pain is AVN of femoral head 20 cases (28.57%), followed by joint effusion 15 cases (21.42%), Osteoarthritis 13 cases (18.57%), TB hip 10 cases (14.28%), Perthes 4 cases (5.71%), DDH 4 cases (5.71%) and metastatic disease 4 cases (5.71%). Of the twenty AVN cases, only 6 (30%) are found on a plain x-ray whereas all 20 (100%) are detected on MRI. Similarly, out of 15 cases diagnosed as joint effusion, only 5cases (33.33%) are detected on plain radiograph, but all the 12 cases (100%) are detected on MRI. The remaining 100% pathologies are observed on X-ray and MRI; moreover, MRI helps to improve the identification of articular cartilage, epiphysis, and additional soft tissue articular anomalies.

**Conclusion:** MRI is a better way to identify joint effusion and synovial proliferation. Unlike standard x-rays. In proven cases with clear radiography such as Perthe’s and metastatic disease, Hip MRI helps to enhance disease staging, clinical implication, and soft tissue expansion.

**Keywords:** Plain Xray, MRI, Hip joint, TB of hip, Arthritis, Perthes disease

**Corresponding Author:** Dwara Manojna Devi, Private Practitioner, Radiologist, Yashoda Super Speciality Hospital, Hyderabad, Telangana, India.
E-mail: drdwaramanojna@gmail.com

Received: 12 July 2020 Revised: 19 August 2020 Accepted: 28 August 2020 Published: 30 December 2020

Introduction

Hip imagery has been one of the early applications for magnetic resonance imaging (MRI) musculoskeletal published. MRI is a valuable instrument to diagnose hip condition because it allows assessment of hip joints, extra-articular soft tissue and osseous tissues damaged by hip disease. Diagnostic dilemmas can be challenging in setting chronic hip pain, a regular radiograph, an unspecific history, and clinical results. Traumas, infections, inflammation, avascular necrosis, and hip dysplasia can all exhibit highly subtle x-rays.

The key advantage of actual coronal and axial planes is that they have symmetrical, bilateral images that are critical for diagnose and can significantly reduce the time needed for both hips to be examined. On coronal and axial MRI, natural hip anatomy may be regularly illustrated. On coronal MRI, the femoral head and neck and the intertrochanteric area are better seen. Axial MRI has strong articular spatial visualizations, hip musculature, and ligaments support.

In assessing AVN, the diagnostic function of the MRI is growing. MRI is carried out to identify AVN in its early phases so that early treatment and eventual bone destruction are avoided. The most responsive formulation for AVN imaging was found to be MRI. Screening asymptomatic patients at high risk may facilitate early surgery. MRI’s key purpose is to assess AVN diagnostic in symptomatic patients before the presence of radiography changes.

MRI shows marrow and soft tissue defects occult or deficient of radiographs of sarcoidosis in patients with musculoskeletal symptoms.

In most cases of dysplasia, a simple X-ray can accurately be diagnosed, and MRI is only used for the regular work of bone dysplasia patients.
### Subjects and Methods

Adequate MRI and multiplanar imagery sequences for each patient are carried out. Both patients reported a clinical history of hip pain in the radiodiagnosis department.

**Sample size:** 70 patients

**Type of study:** The data is analysed and a cross-sectional analysis is conducted.

**Inclusion Criteria:**
Patients with acute or chronic hip pain. Patients of any age group and gender were included in our study.

**Exclusion Criteria:**
Patients with a history of acute trauma, claustrophobia, metal implant insertion, heart pacemaker and metallic foreign body in situ.

### Results

The majority of the patients were males around 67% and females were around 33%. Most of the patients belong to the age group of 31 to 40 yrs accounting for 28.57% and the least belong to the age group of 61 to 70 yrs with 6.66%. Avascular Necrosis of the Femoral head was seen in the majority of the patients around 32% and the least were Perthe’s, DDH and Metastasis with each accounting for 5.71%.

### Discussion

Plain radiography is a widely used, inexpensive investigation that is readily accessible in all sorts of health facilities for the imaging of the hip joint. Whereas MRI is a costly,
Table 4: Osteoarthritis on X-ray and MRI findings

| X-Ray findings                  | Number of patients | Percentage % |
|---------------------------------|--------------------|--------------|
| possible osteophytes            | 5                  | 38.46%       |
| Definite osteophytes            | 5                  | 38.46%       |
| Joint space narrowing           | 9                  | 69.23%       |
| Sclerosis                       | 6                  | 46.15%       |
| Cyst formation                  | 3                  | 23.07%       |
| Deformation of the femoral head | 3                  | 23.07%       |

MRI Findings

| MRI Findings                      | Number of patients | Percentage % |
|-----------------------------------|--------------------|--------------|
| Articular cartilage T2W high signal | 6                | 46.15%       |
| Indistinct trabeculae/signal deficiency in femoral head and neck on T1W | 10               | 76.92%       |
| The indistinct zone between femoral head and acetabulum | 4                | 30.76%       |
| Subchondral signal loss           | 4                  | 30.76%       |
| Femoral head deformity            | 3                  | 23.07%       |

Table 5: TB of the hip joint on X-ray and MRI

| TB HIP Joint | ON X-Ray | ON MRI |
|--------------|----------|--------|
| TOTAL 10     | 8 (80%)  | 10 (100%) |

X-Ray findings

| X-Ray findings       | Number of patients | Percentage % |
|----------------------|--------------------|--------------|
| Osteopenia           | 5                  | 50.0%        |
| Joint effusion       | 2                  | 20.0%        |
| Soft tissue swelling | 2                  | 20.0%        |
| Joint erosions and reduction of joint space | 4          | 40.0%        |

MRI Findings

| MRI Findings                      | Number of patients | Percentage % |
|-----------------------------------|--------------------|--------------|
| Synovial hyperintensity on T2W    | 1                  | 12.25%       |
| Joint effusion                    | 2                  | 25.0%        |
| Bone marrow edema                 | 3                  | 37.5%        |
| Subarticular cysts                | 1                  | 12.25%       |
| Joint space reduction             | 3                  | 37.5%        |
| Joint destruction & bony ankylosis| 1                  | 12.25%       |
| Soft tissue hyperintensity on T2W | 3                  | 37.5%        |

Table 6: Perthe’s Disease on X-ray and MRI

| X-Ray findings                | No. of patients | Percentage (n=4) |
|-------------------------------|-----------------|------------------|
| Small epiphyses               | 2               | 50.0%            |
| Complete resorption of epiphyses | 2             | 50.0%            |

MRI Findings

| MRI Findings                  | No. of patients | Percentage (n=4) |
|-------------------------------|-----------------|------------------|
| Epiphyseal hyperintensity on T2W | 2              | 50.0%            |
| Bone marrow edema             | 4               | 100.0%           |

In our research, 70 cases both with basic x-rays and MRI consecutively reported with acute and chronic hip pain. The maximum number of patients were males around 67% and female were around 33%. Most of the patients belong to the age group of 31 to 40 yrs accounting for 28.57% and the least belong to the age group of 61 to 70 yrs with 6.66%. Avascular inaccessible investigation at the level of primary healthcare centers. However, the non-invasive gold investigation is more accurate in early detection, determining the degree of pathological intervention, and narrowing the differential diagnosis.

In our research, 70 cases both with basic x-rays and MRI consecutively reported with acute and chronic hip pain. The maximum number of patients were males around 67% and female were around 33%. Most of the patients belong to the age group of 31 to 40 yrs accounting for 28.57% and the least belong to the age group of 61 to 70 yrs with 6.66%. Avascular
Table 7: Dysplasia of HIP

| X-Ray Findings                  | No. of patients | Percentage (n=4) |
|---------------------------------|-----------------|------------------|
| Epiphyses lateral to Perkin’s line | 2               | 50.0%            |
| Epiphyses inferior to Hilgenrein’s line | 2               | 50.0%            |
| Epiphyses superior to the acetabular rim | 2               | 50.0%            |
| Broken Shenton’s line             | 2               | 50.0%            |
| Complete femoral head dislocation | 2               | 50.0%            |

| MRI Findings                  | No. of patients | Percentage (n=4) |
|--------------------------------|-----------------|------------------|
| Hyperintensity of epiphyses    | 2               | 50.0%            |
| Displaced epiphyses            | 4               | 100.0%           |
| Bone marrow edema              | 4               | 100.0%           |
| Hypointense epiphyses          | 2               | 50.0%            |

Table 8: Metastasis on Xray & MRI findings

| X-ray Findings                  | No. of patients | Percentage (n=4) |
|---------------------------------|-----------------|------------------|
| Osteolytic lesions              | 2               | 50.0%            |
| Osteoblastic lesions            | 2               | 50.0%            |
| Sclerosis                       | 2               | 50.0%            |
| Altered femoral contour         | 2               | 50.0%            |

| MRI Findings                  | No. of patients | Percentage (n=4) |
|--------------------------------|-----------------|------------------|
| Hyperintensity signal on T2W   | 2               | 50.0%            |
| Hypointensity signal on T2W    | 2               | 50.0%            |
| Altered femoral contour        | 2               | 50.0%            |
| Soft tissue hyperintensity signal on T2W | 2 | 50.0% |

Hip, 4 cases as DDH, 4 cases Perthe’s and 4 cases showing Metastatic disease to Hip joint.

Of the 15 cases that display joint effusion, only 5 (33.33 percent) are identified with a simple X-ray with an increased tear drop gap, compared to all 15 (100 percent) with MRI. Thus, the improved sensitivity of MRI in joint effusion detection is demonstrated.

While 13 cases show osteoarthritis, both in plain x-rays and MRI, the MRI shows stronger cartilage deterioration delineations, specific pathological intervention, and osteoarthritic stage.

TB Hip is diagnosed in 10 cases. Simple x-ray observes specific observations such as gap loss, altered articular surface contour, osteopenia and joint degradation. MRI applies hyperintensity of the articular cartilage to the findings of the straightforward X-Ray through the identification of limited accumulation of articulated fluid, the only effects of the early stage of TB Hip. MRI also aids in recognising bone marrow edema, further describing the degree of the deterioration of the articular cartilage and proper delimitation of the presence of para-articular soft-tissue.

Even in Perthe’s disease, simple X-rays help to detect the assessment of the cessation in the form of tiny epiphyses of the epiphyseal development. It also facilitates the measurement of femoral head resorption. MRI helps diagnose the early stages of DDH and Perth, however, by demonstrating that epiphyses are associated with T2W hyperintensity before epiphyses are eventually displaced. It also assists in determining the edoema of the bone marrow. [9,10]

Simple X-Ray allows osteolitics and osteoblastic lesions to be properly described. However, MRI helps to determine the role of the T2W hyperintensity in the articular cartilage phase. It also assists in determining the presence of soft tissue and in identifying bone marrow edema.

Conclusion

MRI is a better way to identify joint effusion and synovial proliferation. Unlike standard x-rays. In proven cases with clear radiography such as Perthe’s and metastatic disease, Hip MRI helps to enhance disease staging, clinical implication, and soft tissue expansion.

References

1. Manaster BJ. Adult Chronic Hip Pain: Radiographic Evaluation. Radiographics. 2000;20(suppl_1):3–25. Available from: https://dx.doi.org/10.1148/ radiographics.20.suppl_lg00oc06s3.
2. Gabriel H, Fitzgerald SW, Myers MT, Donaldson JS, Poznanski AK. MR imaging of hip disorders. Radiographics. 1994;14(4):763–781. Available from: https://dx.doi.org/10.1148/ radiographics.14.4.7938767.
3. Ragab Y, Emad Y, Abou-Zeid A. Bone marrow edema syndromes of the hip: MRI features in different hip disorders. Clin Rheumatol. 2008;27(4):475–482. Available from: https://doi.org/10.1007/s10067-007-0731-x.

4. Shih TT, Su CT, Chiu LC, Erickson F, Hang YS, Huang KM. Evaluation of hip disorders by radiography, radionuclide scanning and magnetic resonance imaging. J Formos Med Assoc. 1993;92(8):737–744.

5. Heuck A, Lehner K, Schittich I, Reiser M. Die Wertigkeit der MR für Diagnostik, Differentialdiagnostik und Therapiekontrolle des Morbus Perthes. RöFo. 1988;148(2):189–194. Available from: https://dx.doi.org/10.1055/s-2008-1048174.

6. Kwack KS, Cho JH, Lee JH, Cho JH, Oh KK, Sy K. Septic Arthritis Versus Transient Synovitis of the Hip: Gadolinium-Enhanced MRI Finding of Decreased Perfusion at the Femoral Epiphysis. Am J Roentgenol. 2007;189(2):437–445. Available from: https://dx.doi.org/10.2214/ajr.07.2080.

7. Yang WJ, Im SA, Lim GY, Chun HJ, Jung NY, Sung MS. MR imaging of transient synovitis: differentiation from septic arthritis. Pediatr Radiol. 2006;36(11):1154–1162. Available from: https://doi.org/10.1007/s00247-006-0289-9.

8. Khanna AJ, Yoon TR, Mont MA, Hungerford DS, Bluemke DA. Femoral Head Osteonecrosis: Detection and Grading by Using a Rapid MR Imaging Protocol. Radiology. 2000;217(1):188–192. Available from: https://dx.doi.org/10.1148/radiology.217.1.r00oc26188.

9. Mitchell DG, Rao V, Dalinka M, Spritzer CE, Gefter WB, Axel L. MRI of joint fluid in the normal and ischemic hip. Am J Roentgenol. 1986;146(6):1215–1218. Available from: https://dx.doi.org/10.2214/ajr.146.6.1215.

10. Beltran J, Burk JM, Herman LJ, Clark RN, Zuelzer WA, Freedy MR, et al. Avascular necrosis of the femoral head: Early MRI detection and radiological correlation. Magn Reson Imaging. 1987;5(6):431–442. Available from: https://dx.doi.org/10.1016/0730-725x(87)90377-8.