

Plain X-Ray and MRI Evaluation of Painful Hip Joint

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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 5 cases (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 Perthes' 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

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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.^[1] 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.^[2]

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.^[3]

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.

Table 1: Distribution based on Age, Sex and pathology

Gender	Number of patients	Percentage
Male	40	67%
Female	20	33%
Age		
0-10	5	8.33%
11-20	7	11.66%
21-30	13	21.66%
31-40	17	28.33%
41-50	9	15.0%
51-60	6	10.0%
61-70	3	6.66%
Pathology		
AVN	20	28.57%
Joint Effusion	15	21.42%
OA	13	18.57%
TB	10	14.28%
Perthe's	4	5.71%
DDH	4	5.71%
Metastasis	4	5.71%

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

Table 2: AVNXray and MRI findings

AVN	On X-Ray	On MRI
Total 20	6 (30%)	20 (100%)
X-Ray find-ings		
Osteoporosis	6	100.0%
Sclerosis	3	50.0%
Subchondral cysts	3	50.0%
Crescent sign/subchondr lucency	3	50.0%
Altered mor-phology	3	50.0%
MRI Find-ings		
Bone marrow edema	17	85%
Double line sign	13	65%
Subchondral cysts	15	75%
Femoral head altered contour	3	15%
Femoral head fragmenta-tion with the collapse	3	15%

Table 3: Joint Effusion on X-ray and MRI, and severity on MRI

Joint effusion	Positive on X-Ray	Positive on MRI
Total 15 cases	5 cases (33.33%)	15 (100%)
On MRI joint effusion		
Mild	7	46.66%
Moderate	6	40%
severe	2	13.33%

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.^[4] Whereas MRI is a costly,

Table 4: Osteoarthritis on X-ray and MRI findings

X-Ray findings	Number of patients	Percentage (n=13) %
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	Number of patients	Percentage (n=13) %
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%

inaccessible investigation at the level of primary healthcare centers.^[5] However, the non-invasive gold investigation is more accurate in early detection, determining the degree of pathological intervention, and narrowing the differential diagnosis.^[6-8] Our research aims at early diagnosis of the disease prior to the presence of signs on radiography or in patients with clear observations on simple radiography using an MRI that allows the clinician to treat the patient at an early stage to prevent further development of the disease. It also aims at precise disease staging and assesses the degree of pathology intervention in cases that have already been identified on X-Ray, using MRI to direct the clinician in proper care according to the level of pathology intervention. Our discussion further illustrates that MRI is a gold standard in soft tissue assessment and in articular cartilage, with pathology identification limits on simple x-rays.

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 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	Number of patients	Percentage (n=5) %
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%
Subchondral cysts	3	30.0%
Joint destruction & bony ankylosis	2	20.0%
MRI Findings	Number of patients	Percentage (n=8) %
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	No. of patients	Percentage (n=4)
Epiphyseal hyperintensity on T2W	2	50.0%
Bone marrow edema	4	100.0%

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%. In our study of 70 cases, 20 cases are diagnosed as AVN, 15 cases showing Joint effusion, 13 cases showing Osteoarthritis, 10 cases as TB

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 20 AVN-diagnosed cases, only 6(30%) are diagnosed with a plain x-ray, and all 20 cases diagnosed with MRI, indicating MRI becoming more susceptible to AVN detection, even at the very start when plain x-rays are common or subtle. MRI also helps to recognize the bone marrow edema, which is not detected by plain x-ray. The MRI aids in the correct onset of a disease that allows the clinician with a viable treatment plan in the established cases of AVN on a simple radiograph.

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 osteolytics 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.

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