

Role of magnetic resonance imaging in evaluation of avascular necrosis of hip joint

Anjali Pawar-Dahiphale¹, Ashish Lule^{2*}, Varsha Rote- Kaginalkar³

¹Associate Professor, Department Of Radiology, Government Medical College, Aurangabad, India.

²Bonded Assistant Professor, Department Of Radiologybonded Assistant Prof, Ltmmc Mumbai, India.

³Professor And Head, Department Of Radiology, Government Medical College, Aurangabad, India.

Email: dranjaliadahiphale@gmail.com, ashulule004@gmail.com, kaginalkar@gmail.com

Abstract

Background: The development of cross-sectional imaging techniques, particularly magnetic resonance imaging (MRI) has ushered in a new chapter in the clinical approach to Avascular necrosis. Now a days MRI is useful in diagnosis of various symptomatic and asymptomatic cases of Avascular necrosis of hip joint. **Materials and Methods:** It was a hospital based cross-sectional study carried out in Government medical college and Hospital Aurangabad from 2016 to 2018. A total of 17 cases with hip pathology attending OPD complaining of hip joint pain and all those participants who consented were subjected to MRI scan. **Results:** It was observed that avascular necrosis showed 94.11% sensitivity. In 16 out of 17 cases, MRI diagnosis correctly matched with provisional diagnosis, giving sensitivity of 94.11% and remaining 1 patient was normal. **Conclusion:** MRI is the modality of choice in diagnosing avascular necrosis of hip joint. MRI is helpful in assessing the extent of osseous, chondral and soft tissue involvement. MR imaging accurately demonstrates joint effusions, synovial proliferations, articular cartilage abnormalities, subchondral bone, ligaments, muscles and juxta articular soft tissues. In present study sensitivity of MRI in diagnosing avascular necrosis is 94.11%. MRI is very useful in staging of avascular necrosis. MRI is the modality which is sensitive in depicting bone and soft tissue edema.

Key Words: Avascular necrosis, Hip joint pathology, Magnetic resonance imaging.

*Address for Correspondence:

Dr Ashish Lule, Department of Radiology, Bonded Assistant prof, LTMMC Mumbai, India.

Email: ashulule004@gmail.com

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INTRODUCTION

The hip joint is large synovial joint which has to bear a lot of weight and its stability is provided by its rigid ball-and-socket or nut-configuration as well as the surrounding strong ligaments and muscles. The acetabular cartilage is horse-shoe-shaped with a central part without cartilage coverage that does not articulate with the femoral head (fossa acetabuli). Within the fossa, fatty tissue and the ligamentum teres are imaged on MRI. The femoral head is

completely covered with hyaline cartilage except for the insertion of the ligamentum teres. The hip joint cartilage is thin in comparison to other joints with the maximum thickness ventrocranially at the acetabulum and ventrolaterally on the femoral head.^{1,2} Hip pain has different etiologies in adults and children. In adults, hip pain may be caused by intra-articular disorders such as avascular necrosis, arthritis, loose bodies, labral tears; peri-articular pathology such as tendinitis and bursitis, or extra-articular conditions such as referred pain from lumbar spine, sacroiliac joint and nerve entrapment syndromes. The prevalence of hip pain in the general population is 10% and increases with age. Pain in the hip and groin region is usually characterized by long-standing symptoms that often do not resolve within 6-12 months. Hip and groin pain has been reported to commonly occur in athletes and old age. Magnetic resonance imaging (MRI) with its excellent soft tissue contrast and resolution, with no operator dependence and no ionizing radiation, is the imaging modality of choice for evaluation of hip joint abnormalities. MRI offers valuable information regarding

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occult bony and cartilage injury such as stress fractures, avascular necrosis of hip joint. The femoral head is the most common location for avascular necrosis and can affect patients both young and old.³ Hence the present study was conducted to study role of MRI in evaluation of hip joint pathologies.

MATERIALS AND METHODS

The present study was hospital based cross sectional study, undertaken to estimate the role of MRI in early evaluation of avascular necrosis of hip joint at Government Medical College and Hospital Aurangabad. The present study period was from December 2016 to October 2018. The study population was referred to Department of Radiology- both indoor and outdoor patients with hip joint pain. A total sample size of 17 patients with hip joint pain referred to Department of Radiology in the hospital was included in the study population.

OBSERVATIONS AND RESULTS

Table 1: Distribution according to age

Age group (years)	No of patients
21-30	04
31-40	08
41-50	05
Total	17

The above table shows distribution of patients according to age. It was observed that majority of patients were in age group 31-40 years followed by 41-50 years. It was observed that majority of patients presented with painful hip joint followed by low back pain. The other clinical presentation includes limited movements swelling of hip joint and hip pain constitutional symptoms. In our study it was observed that majority of patients (16) had abnormal MRI findings while 1 patient was normal.

Table 2: Distribution according to side involved

Side	No of patients
Right	2
Left	4
Bilateral	10
Total	16

The above table shows distribution of patients according to side involved. It was observed that in majority of patient's bilateral side was affected (10) followed by left side (4) and right side (2).

Table 3: Distribution according to MRI findings in AVN

MRI findings	No of patients (n=16)	Percentage
Focal subchondral signal abnormality	16	100.00
Double line sign	12	75.00
Marrow edema	07	43.75
Joint effusion	06	37.50

The above table shows MRI findings in avascular necrosis. It was observed that majority of patients showed focal subchondral signal abnormality (100%) followed by double line sign (75%) The other findings includes marrow edema (43.75%) and joint effusion (37.5%)

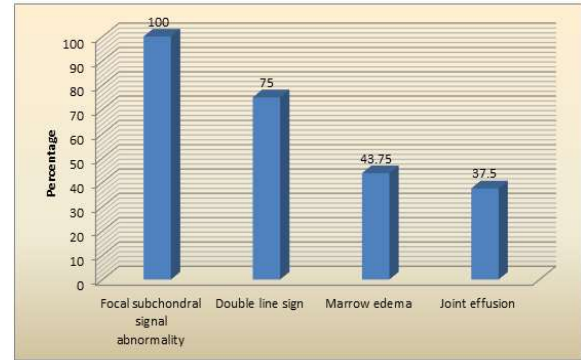


Figure 1: MRI findings in AVN

Table 4: Distribution according to Mitchel's classification of AVN

AVN stages	No of patients	Percentage
Stage A	03	18.75
Stage B	04	25.00
Stage C	06	37.50
Stage D	03	18.75
Total	16	100

The above table shows MRI findings in avascular necrosis by Mitchel's classification⁴. It was observed that majority of patients had Stage C AVN (37.5%) followed by Stage B (25%)

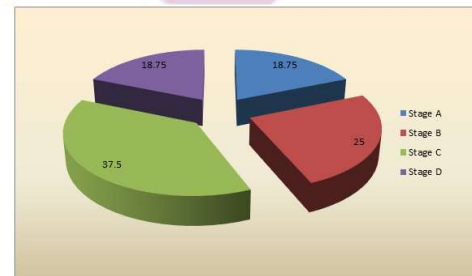


Figure 2: Mitchel's classification of AVN

Table 5: Distribution according to Ficat and Arlet classification of AVN

AVN stages	No of patients	Percentage
Stage 0	00	00.00
Stage I	02	12.50
Stage II	05	31.25
Stage III	07	43.75
Stage IV	02	12.50
Total	16	100

The above table shows MRI findings in avascular necrosis by Ficac and Arlet classification⁵. It was observed that majority of patients had Stage III AVN (43.75%) followed by Stage II (31.25%)

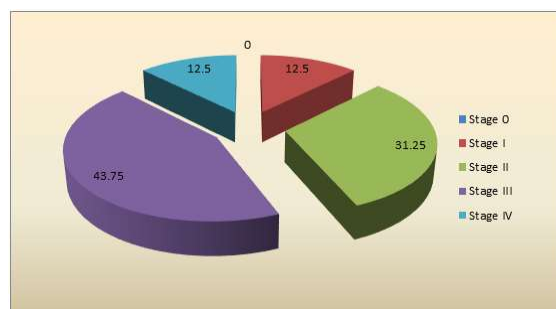


Figure 3: Distribution according to Ficat and Arlet classification of AVN

Table 5: Distribution according to MRI diagnosis sensitivity of different lesions

Provisional Diagnosis	No of patients	MRI +ve	Sensitivity
Avascular Necrosis	17	16	94.11%
Total	17	16	94.11%

The above table shows sensitivity of MRI in diagnosing avascular necrosis of hip joint. In present study 16 out of 17 cases, MRI diagnosis correctly matched with provisional diagnosis, giving sensitivity of 94.11% and 1 patient was normal.

DISCUSSION

In present study 16 out of 17 cases, MRI diagnosis correctly matched with provisional diagnosis, giving sensitivity of 94.11% and 1 patient was normal. In a study done by Hayam Abd *et al.*² MRI sensitivity was 88% in avascular necrosis. In the present study, it was observed that in majority of patient's bilateral side was affected (10) followed by left side (4) and right side (2). Khaladkar Sanjay M *et al.*⁶ had done a study to evaluate diagnostic role of MRI in patients of avascular necrosis and found that bilateral side was affected in 44 (61.1%) and unilateral in 14 patients (38.8%). The MRI findings in avascular necrosis among patients showed that majority of patients had focal subchondral signal abnormality (100%) followed by double line sign (75%). The other findings include marrow edema (43.75%) and joint effusion (37.5%). This finding are well correlated to study done by Hayam Abd *et al.*² and Tushar Kalekar *et al.*⁶. Chaudhari NH *et al.*¹⁰ MRI findings in avascular necrosis among patients by Mitchelles classification⁴ showed that majority of patients

had Stage C AVN (37.5%) followed by Stage B (25%) while by Ficat and Arlet classification⁵ majority of patients had Stage III AVN (43.75%) followed by Stage II (31.25%).

CONCLUSION

- MRI is the modality of choice in diagnosing avascular necrosis of hip joint. MRI is helpful in assessing the extent of osseous, chondral involvement.
- In present study sensitivity of MRI in diagnosing avascular necrosis is 94.11%,
- MRI is very useful in staging of avascular necrosis.
- MRI is the modality which is sensitive in depicting bone edema.

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