SPECTRUM OF MRI FINDINGS IN AVASCULAR NECROSIS OF HIP JOINT

Dr. ROHIT MORGE [1] , Dr. AMOL JAGDALE[2] , Dr. SUSHANT BHADANE[3] , Dr. MEENAL MOHGAONKAR[4], Dr. DEVENDRA KULKARNI[5]

[1]Junior resident 3, Department of Radiology, SMBT IMS & RC NASHIK.
[2]PROFESSOR, Department of Radiology, SMBT IMS & RC NASHIK.
[3]PROFESSOR AND H.O.D., Department of Radiology, SMBT IMS & RC NASHIK.
[4]PROFESSOR AND DEAN, Department of Radiology, SMBT IMS & RC NASHIK.
[5]ASSISTANT PROFESSOR Department of Radiology, SMBT IMS & RC NASHIK.

INTRODUCTION :
Avascular necrosis of femoral head (AVNFH) is a progressive, multifactorial and challenging, debilitating disease affecting mostly the middle aged population.

AVN can present with a broad spectrum of clinical manifestations ranging from incidental finding in asymptomatic patients to severe pain, functional limitations, and compromising the quality of life.[1,2]

Magnetic resonance imaging has recently emerged as the most sensitive, specific, and widely used diagnostic tool for avascular necrosis of femoral head. In most reports, MRI can diagnose very early lesions with a greater than 90 percent specificity and sensitivity.[3]

Present study was aimed to assess the role of MRI in the evaluation of clinically suspected cases of AVN of hip and to describe the imaging features along with proper staging.

AIMS AND OBJECTIVES

AIM:
This study aims to assess the role of MRI in the evaluation of cases of AVN of hip and to describe the imaging features along with proper staging.

OBJECTIVES:
- ❖ To study the MRI features of avascular necrosis of hip joint.
- ❖ To categorise the patients of avascular necrosis on the basis of staging.

MATERIALS AND METHODS

Study Design
Descriptive cross-sectional

Source of data
Patients coming to the department of Radio-diagnosis, Tertiary Health Centre. Participant size – 40

Inclusion criteria
Patient of all age groups, of either gender, diagnosed case of AVN of hip referred for MRI.

Exclusion criteria
1. Contraindications to MRI study such as cardiac pacemaker, Aneurysmal clips and cochlear implant.

2. Patient with claustrophobia.
3. Pregnant women.
4. Patients not willing to participate

APPARATUS AND MATERIALS

❖ Study was explained & a written consent was taken for participation.

❖ MRI hip was performed on GE BRIVO MR 355 1.5 tesla. machine with the help of dedicated surface coil. Patients were asked to lie in a supine position and both hips were scanned simultaneously using hip protocol.

❖ The sequences obtained were T1 and T2 weighted axial,coronal,sagittal and short-tau inversion recovery,PDFS.

❖ Data was collected and compiled using Microsoft Excel. Statistical analysis was done using descriptive statistics.

RESULTS

In present study, 40 patients of suspected AVN hip joint were studied.
Mean age was 46.77 ± 10.42 years.

Majority of patients were male (72.50%) as compared to female (27.50%).
In majority of patients bilateral (62.50%) hip joint involvement was seen.

In my study common risk factors were excessive alcohol consumption (45 %), idiopathic (27.5 %), Trauma (12.5 %), prolonged Steroid consumption (10 %).

TABLE 1- GENERAL CHARACTERISTICS

Characteristics	No of patients (n=40)	Percentage
Mean age in years (Mean ± SD)	46.77 ± 10.42	
Gender		
Male	29	72.50%
female	11	27.50%
Side		
Right	7	17.50%
Left	8	20.00%
Bilateral	25	62.50%
Risk factors		
Alcohol	18	45.00%

Idiopathic	11	27.50%
Trauma	5	12.50%
Steroids	4	10.00%
Sickle cell disease	1	2.50%
Radiotherapy	1	2.50%

RESULTS

Common MRI findings noted in present study were focal subchondral signal abnormality (100 %), hip joint effusion (67.5 %), bone marrow edema (55 %), collapse / flatting of head (60 %), double line sign (52.5 %), decreased joint space (45 %), osteophytes (17.5 %), thinning / loss of articular cartilage (12.5 %) & subchondral cyst (12.5 %).

According to Mitchelles classification of AVN Stage, majority of patients were from Stage C (42.5 %) followed by Stage B (25 %), A (17.5 %) & Stage D (15 %).

According to Ficat and Arlet classification of AVN Stage, majority of patients were from Stage III (40 %) followed by Stage II (27.5 %), Stage I (17.5 %), Stage IV (12.5 %) & Stage 0 (2.5 %).

TABLE 2- MITCHELLES CLASSIFICATION OF AVN

AVN stages	No of patients(n=40)	Percentage
Stage A	7	17.50%
Stage B	10	25.00%
Stage C	17	42.50%
Stage D	6	15.00%

TABLE 3- FICAT AND ARLET CLASSIFICATION OF AVN

AVN stages	No of patients(n=40)	Percentage
Stage 0	1	2.50%
Stage I	7	17.50%
Stage II	11	27.50%
Stage III	16	40.00%
Stage IV	5	12.50%

TABLE 4- MRI FINDINGS

MRI Findings	No of patients(n=40)	Percentages
Focal subchondral signal abnormality	40	100.00%
Hip joint effusion	27	67.50%
Bone marrow edema	22	55.00%
Collapse / Flattening of Head	24	60.00%
Double line sign	21	52.50%

|		
Decreased joint space	18	45.00%
Osteophytes	7	17.50%
Thinning / Loss of articular cartilage	5	12.50%
Subchondral cyst	5	12.50%
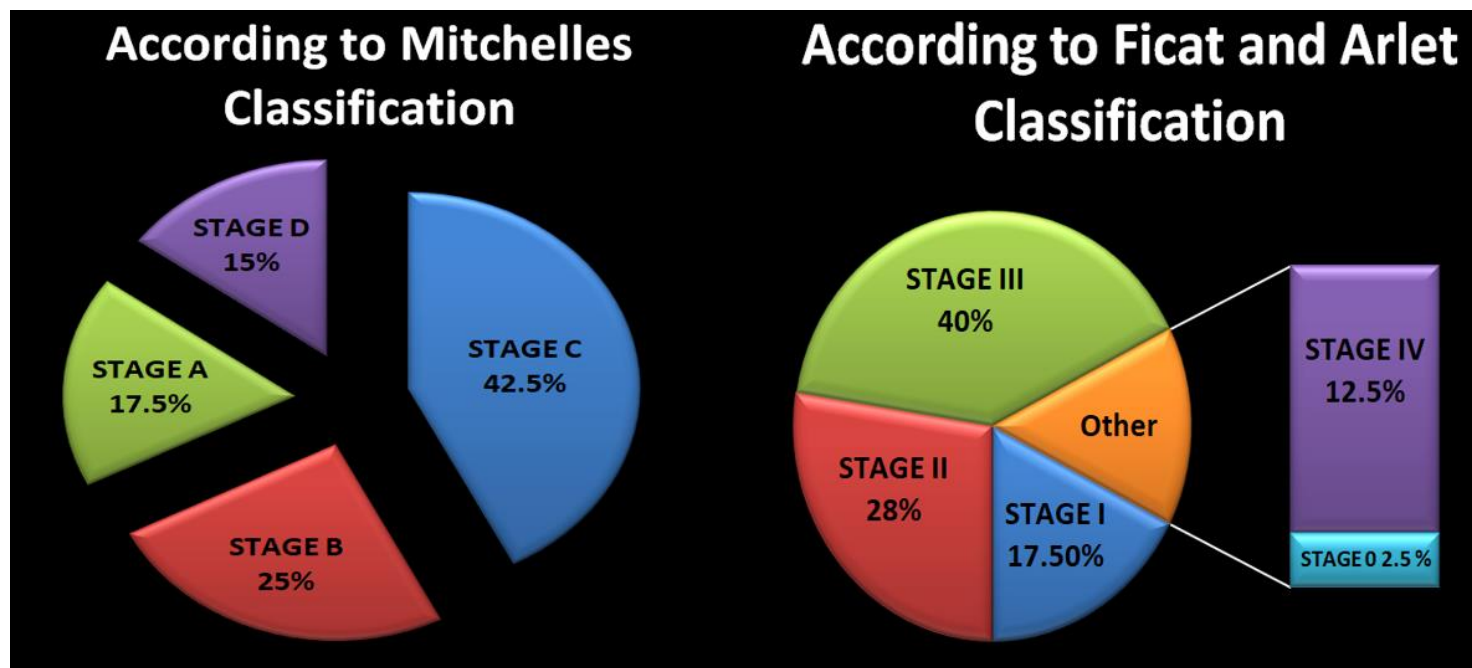
IMAGING FEATURES
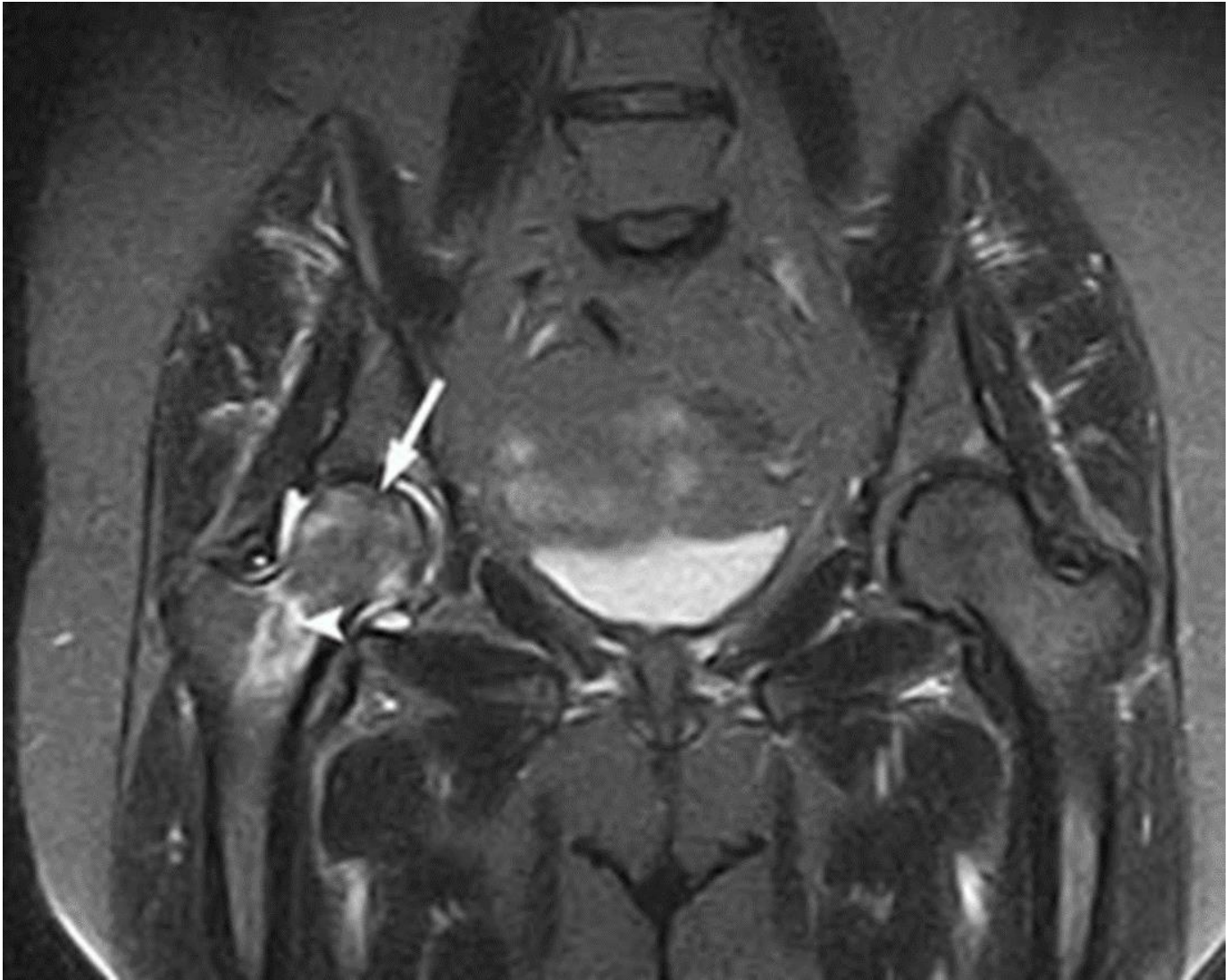
IMAGING FEATURES

   "Double line sign" (on T2W sequences inner bright line representing granulation tissue and outer dark line suggestive of sclerotic bone) is a pathognomonic imaging indicator for AVN. This sign was predominantly seen in stage II disease. Femoral head collapse and degenerative changes occurred in advanced stages of AVN.4
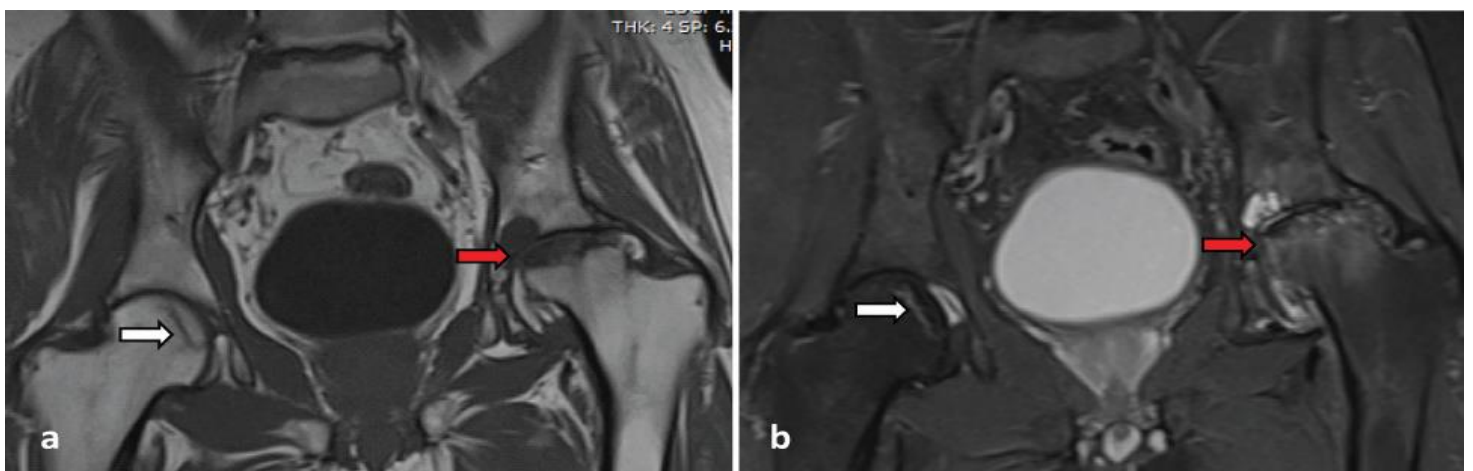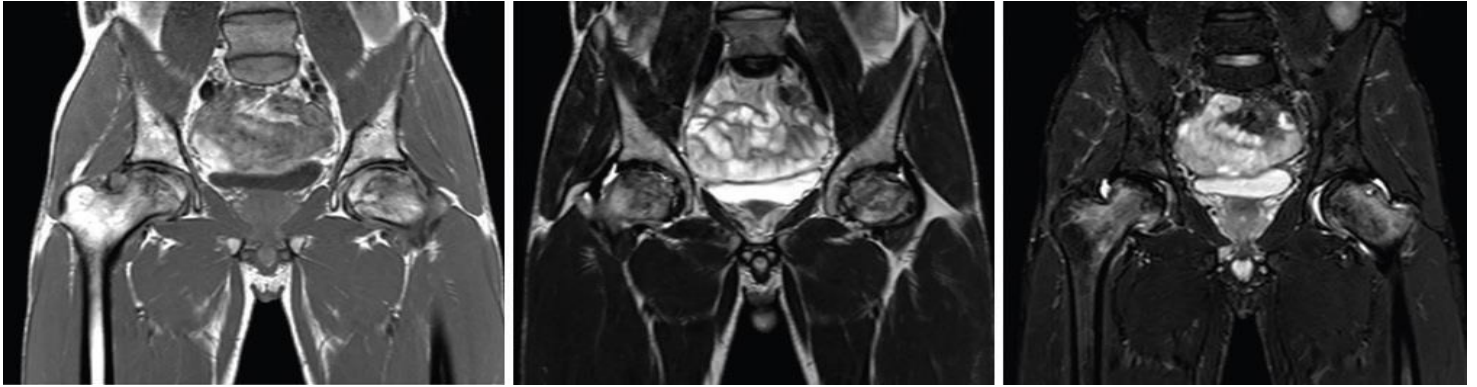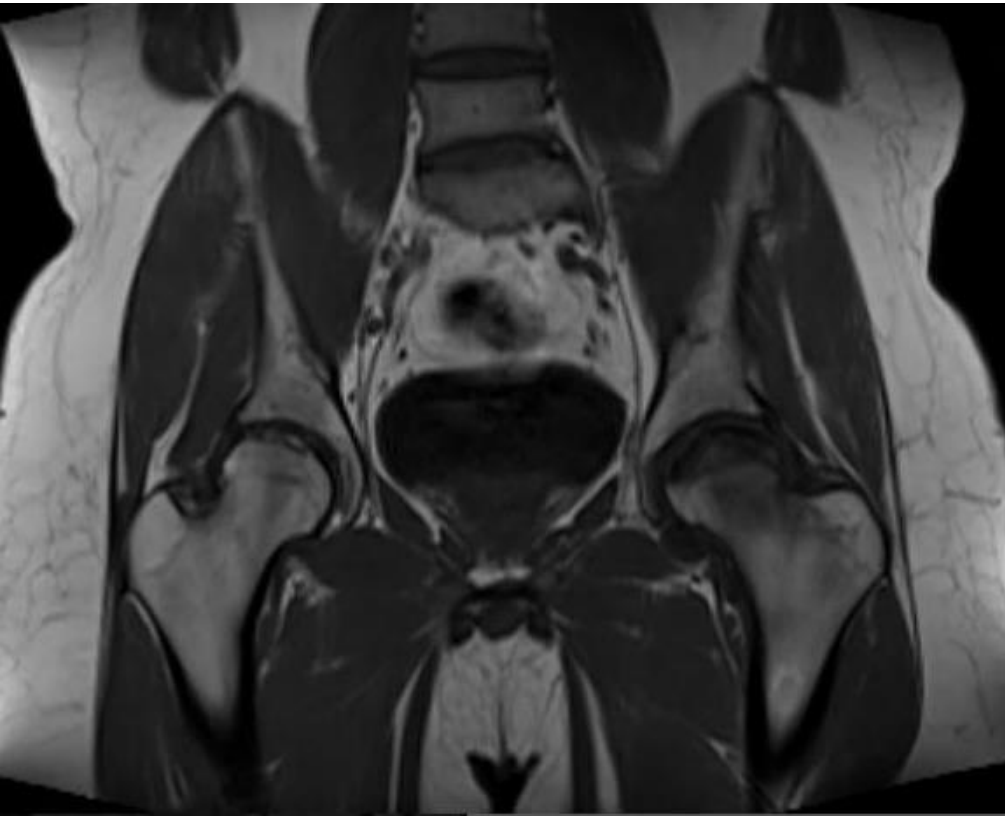
IMAGING FEATURES
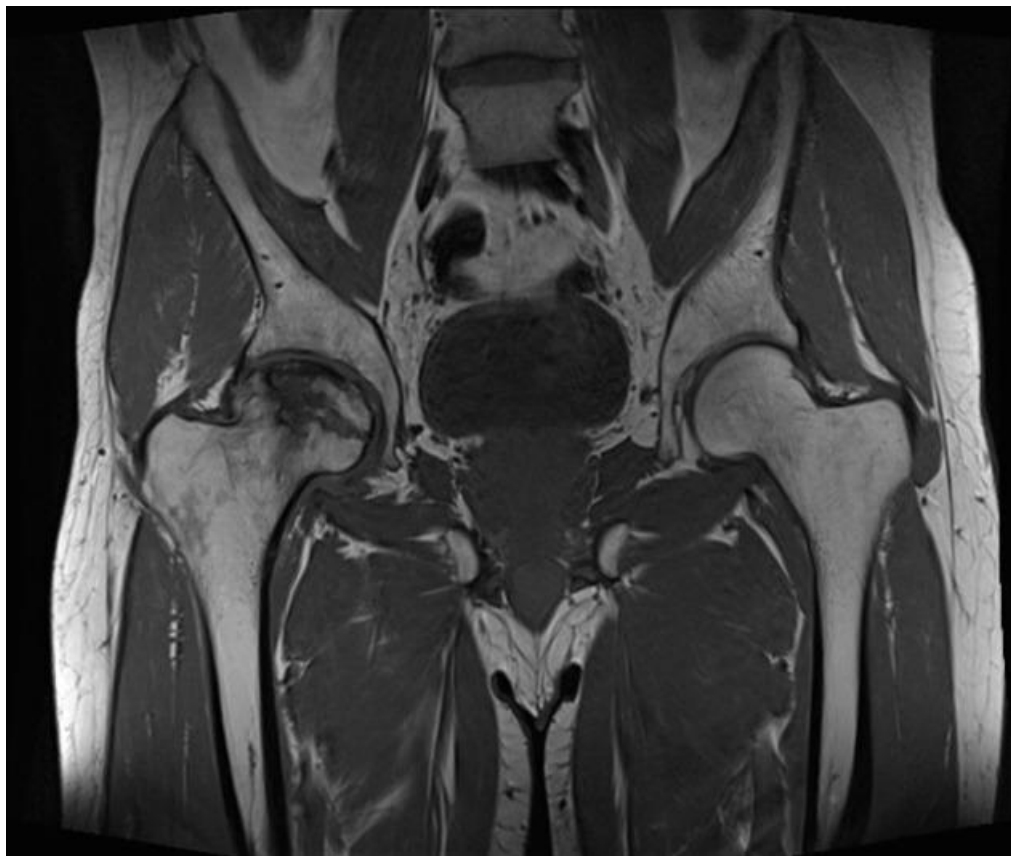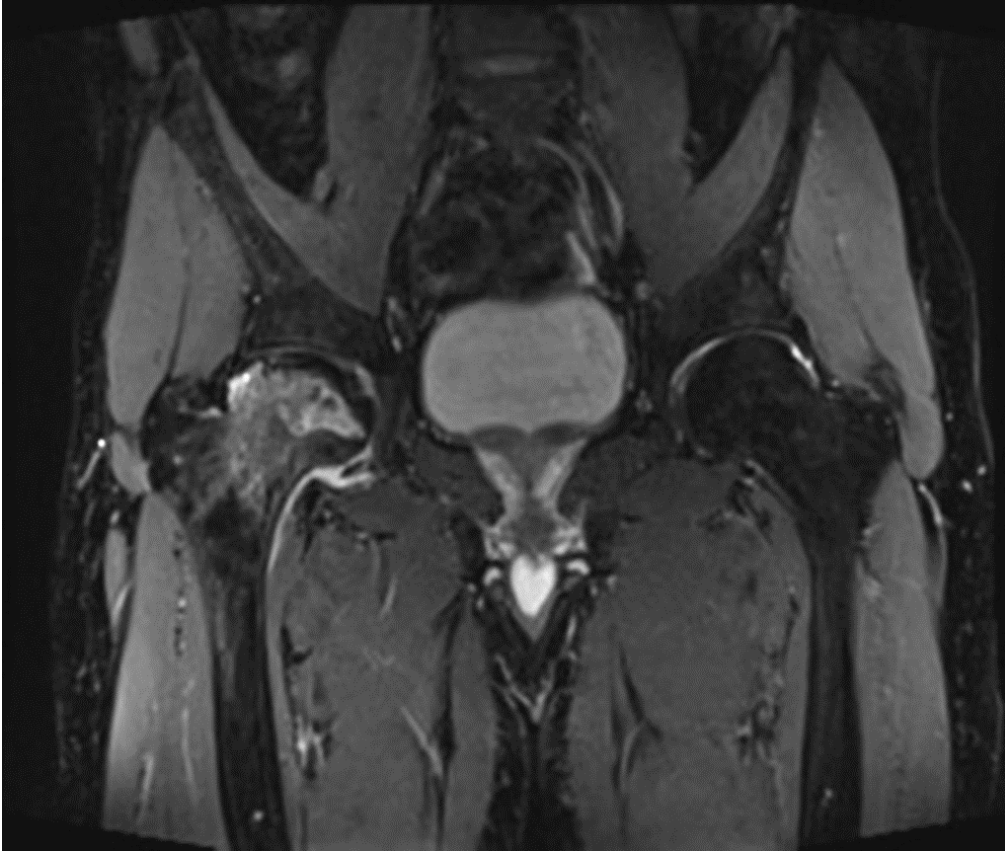
IMAGING FEATURES

DISCUSSION

❖ The MRI findings in avascular necrosis among patients showed that majority of patients had focal subchondral signal abnormality (100%) followed by hip joint effusion(67.5%). The other findings include marrow edema (55%) and double line sign(37.5%).

❖ These finding are well correlated to study done by Anjali P et al.5, Chaudhari NH et al.6 and Choudhary J et al.7

❖ In my study, avascular necrosis among patients by Mitchelles classification showed that majority of patients had Stage C AVN (42.5%) followed by Stage B (25%) while by Ficat and Arlet classification patient had Stage III AVN (40%) followed by Stage II (27.5%).(8)

CONCLUSION
❖ MRI has distinct advantage over other modalities in being radiation free, non-invasive, excellent soft tissue contrast, multiplanar imaging capability, and high sensitivity in detecting osteonecrosis of femoral head.
❖ MRI is very useful in staging of avascular necrosis.

REFERENCES

1. Matos MA, dos Santos Silva LL, Brito Fernandes R, Dias Malheiros C, Pinto da Silva BV. Avascular necrosis of the femoral head in sickle cell disease patients. Ortop Traumatol Rehabil. 2012 Mar-Apr;14(2):155–60.
2. Lafforgue P. Pathophysiology and natural history of avascular necrosis of bone. Joint Bone Spine. 2006 Oct;73(5):500–7.
3. Stoica Z, Dumitrescu D, Popescu M, Gheonea I, Gabor M, Bogdan N. Imaging of avascular necrosis of

femoral head: familiar methods and newer trends. Curr Health Sci J. 2009;35(1):23-28.

4. Huang GS, Chan W, Chang Y, Chang C, Chen C, Yu J. MR imaging of bone marrow edema and joint effusion in patients with osteonecrosis of the femoral head: relationship to pain. Am J Roentgenol. 2003;181(2):545-49.
5. Anjali Pawar-Dahiphale, Ashish Lule, Varsha Rote- Kaginalkar. Role of magnetic resonance imaging in evaluation of avascular necrosis of hip joint. MedPulse International Journal of Radiology. June 2020; 14(3): 67-69.
6. Chaudhari NH, Murkey NS, Patel KA. Study of MRI features of avascular necrosis of femoral head and to study association of bone marrow edema and hip joint effusion with avascular necrosis. Int J Health Sci Res. 2015; 5(2):116-122.
7. Choudhary J, Dubepuria A, Kaushal L, Rajput P. Magnetic Resonance Imaging in Evaluation of Avascular Necrosis of Femoral Head. Int J Sci Stud 2019;7(7):50-55.
8. Kaushal L, Choudhary J, Dubepuria A, Rajput P. Magnetic Resonance Imaging in Evaluation of Hip Pain. Int J Sci Stud 2019;7(4):58-6