

## ORIGINAL ARTICLE

### STUDY OF AGE INCIDENCE AND SYMMETRY IN NON-TRAUMATIC AVASCULAR NECROSIS OF FEMORAL HEAD

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**ABSTRACT: INTRODUCION:** Avascular necrosis of the femoral head is an increasingly common cause of musculoskeletal disability, and it poses a major diagnostic and therapeutic challenge. The aim of diagnostic imaging procedures in avascular femoral head necrosis is to provide the patient with a stage-adapted therapy. The aim of this paper is to present the age incidence and symmetricity of involvement of the non-traumatic avascular necrosis of femoral head.

**MATERIALS AND METHODS:** This is a prospective observational study done during January 2013 to June 2013. The study included a total 30 patients referred to the Department of Radiology, Kurnool medical college, Kurnool, for X ray pelvis with both hips. 10 patients out of them were further investigated with MRI pelvis. **RESULTS:** More than half of the patients (72.6 %) were within the age groups 30-50 years with male to female ratio of about 4:1. 60% of patients showed bilateral involvement, 20 % showed right femoral head and 20 % showed left femoral head involvement. **CONCLUSION:** We conclude that disease affects mostly adults within their 3rd and 5th decade and majority of the patients are being men with bilateral involvement. Our study results are comparable with previous studies. Hence we recommend MRI both hips for early identification of AVN changes in asymptomatic contra-lateral hip or normal appearing hip on X-Ray.

**KEYWORDS:** Avascular necrosis of Femoral Head (AVN), age incidence, Symmetry, Plain Radiography, Magnetic Resonance imaging.

**INTRODUCTION:** Avascular necrosis of the femoral head is an increasingly common cause of musculoskeletal disability, and it poses a major diagnostic and therapeutic challenge. Although patients are initially asymptomatic, AVN usually progresses to joint destruction, requiring total hip replacement, usually before the fifth decade.<sup>1,2,3</sup> The aim of diagnostic imaging procedures in avascular femoral head necrosis is to provide the patient with a stage-adapted therapy.<sup>4</sup>

**AIMS AND OBJECTIVES:** The aim of this paper is to present the age incidence and symmetricity of involvement of the non-traumatic avascular necrosis of femoral head.

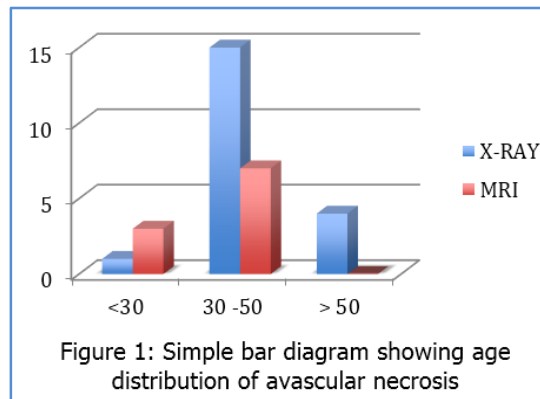
**MATERIALS AND METHODS:** This is a prospective observational study done during January 2013 to June 2013. The study included a total 30 patients referred to the Department of Radiology, Kurnool medical college, Kurnool, for X ray pelvis with both hips. 10 patients out of them were further investigated with MRI pelvis.

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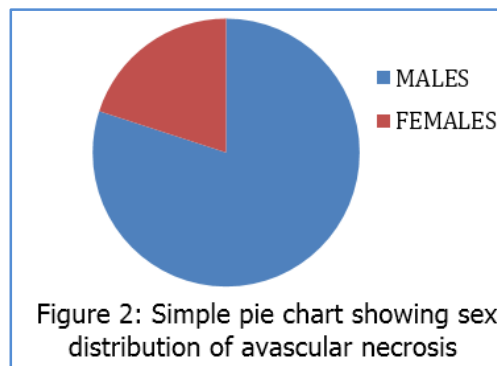
### Inclusion and Exclusion Criteria:

1. Both male and female patients of all age groups with hip pain.
2. The patients with history of trauma were excluded.

**RESULTS:** By performing an analysis on the ages of the 30 patients at the time of the study, we observed that more than half of the patients, about 22 patients (72.6 %) were within the age groups 30-50 years.



The study group was composed of 24 men and 6 women, resulting in a male to female ratio of about 4:1. The data we found was similar to that described in the literature, where it is considered that the femoral head avascular necrosis affects men, four times more frequently than women.



The study group was further divided according to symmetry and stage of disease based on imaging findings.

In this study we observed that bilateral involvement at different stages is more common than unilateral involvement and more than half of the patients were diagnosed in the later stages of the disease.

Of the 30 patients we analyzed, 60% showed bilateral involvement, 20 % (6 patients) showed right femoral head and 20 % (6 patients) showed left femoral head involvement.

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|                    | <b>Bilateral involvement</b> | <b>Right side</b> | <b>Left side</b> |
|--------------------|------------------------------|-------------------|------------------|
| Pelvis Radiography | 10                           | 5                 | 5                |
| MRI pelvis         | 8                            | 1                 | 1                |
| Total              | 18                           | 6                 | 6                |

**DISCUSSION:** The increase in the number of patients diagnosed with avascular necrosis of the femoral head has increased in recent years throughout the world due to widespread use of corticosteroid therapy and the increase in alcohol consumption and the high incidence of local trauma.

Avascular necrosis of bone results generally from corticosteroid use, trauma, pancreatitis, alcoholism, radiation, sickle cell disease, infiltrative disease (Gaucher's disease) and caisson's disease.<sup>1</sup>

Avascular necrosis is characterized by osseous cell death due to vascular compromise. The site of necrosis is usually immediately below the weight bearing articular surface of the bone, most commonly at the anterolateral aspect of the femoral head<sup>5</sup>. Spontaneous resolutions of osteonecrosis of the femoral head can occur.<sup>6</sup>

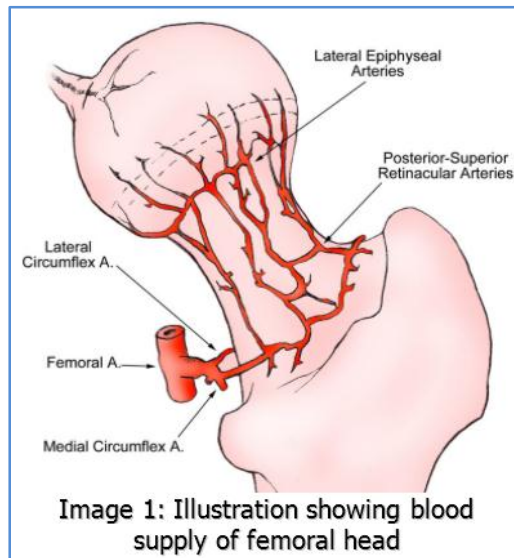


Illustration of the normal circulation of the femoral head, viewed from the posterior approach. The posterior-superior retinacular arteries provide the major blood supply to the epiphysis. They traverse the femoral neck and are contained within the joint capsule and give rise to the lateral epiphyseal vessels at the junction of the femoral head and neck. From there, they penetrate the femur and supply the femoral epiphysis.<sup>7</sup>

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## IMAGING:

### Plain Film Radiography:



Image 2: Pelvis AP Radiogram of 51 year old male showing bilateral AVN

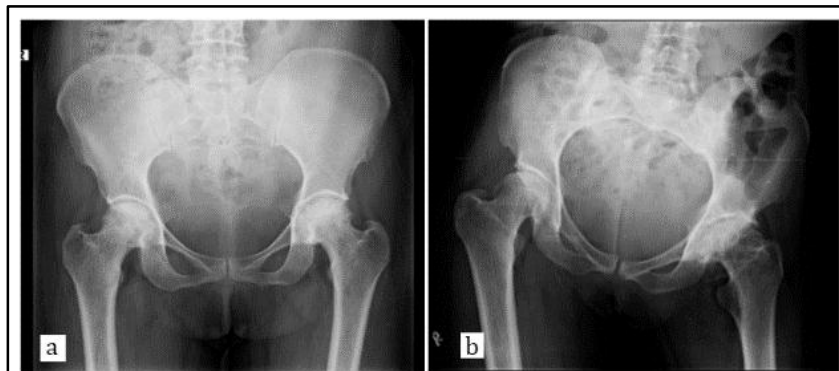


Image 3: a. AP Radiogram of bilateral hips in 45 year old female showing left side AVN, b. AP Radiogram of a 58 year old female with left side AVN

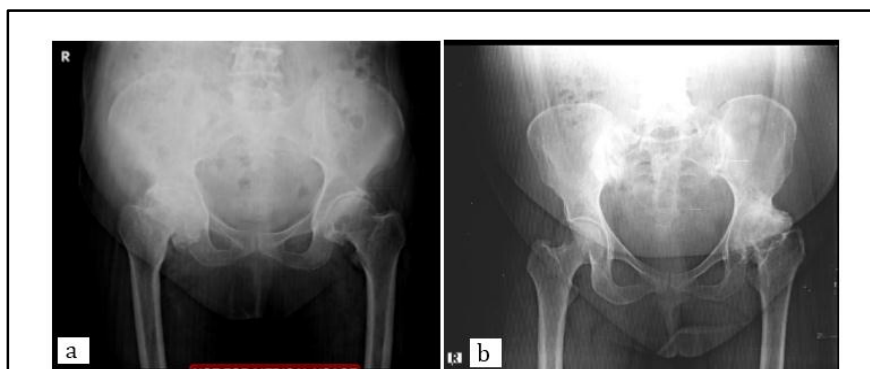
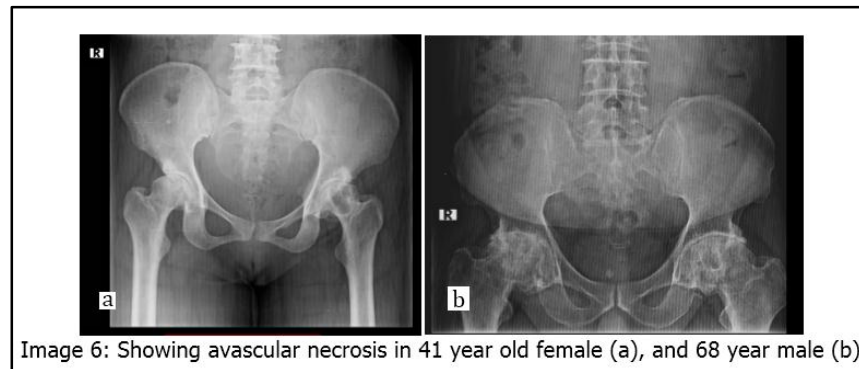
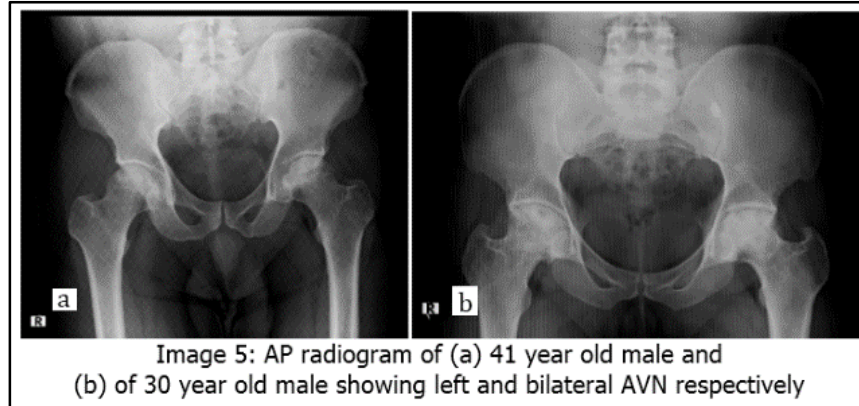


Image 4: a. AP radiogram of both hips in 65 year old female showing right side AVN b. AP radiogram of pelvis in 44 year old female with features of left side AVN

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**MRI:** Magnetic resonance imaging is most sensitive, specific, and widely used diagnostic tool for avascular necrosis of femoral head. It is also useful for follow up after treatment. Screening of asymptomatic, high-risk patients may enable early intervention. In the early stages of the disease, there may not be any alteration of the normal signal intensity of the femoral head.<sup>8</sup>

The first sign of AVN is nonspecific diffuse areas of decreased signal intensity seen in the normally high-signal-intensity fatty marrow on T1-weighted images. Focal findings along the anterosuperior aspect of the femoral head are more specific: low signal-intensity bands or lines within the femoral head are seen surrounding the area that corresponds to ischemic bone on T1- and T2-weighted images. The band is thick on T1-weighted images and is thinner and accompanied by a second, inner band of high signal intensity on T2-weighted images. The appearance on T2-weighted images is known as the "double-line sign" and is considered highly specific for AVN.<sup>9</sup>

The MRI staging classification of Mitchell et al. describes four classes of AVN based on the signal characteristics within the center of the lesion on T1 and T2-weighted images.<sup>10</sup>

### Class T1W T2W Definition:

- A. Bright Intermediate "fat" signal.
- B. Bright Bright "blood" signal.
- C. Intermediate Bright "fluid or edema".
- D. Dark Dark "fibrosis" signal.

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Image 7: Coronal T1W & T2W MR images in 41 year old male with bilateral AVN, class A lesion in right hip and class D lesion in left hip



Image 8: Pelvic Radiogram, Coronal T1W and T2W MR images of a 13 year old male patient with bilateral AVN showing class B lesion on right side and class a lesion on left side

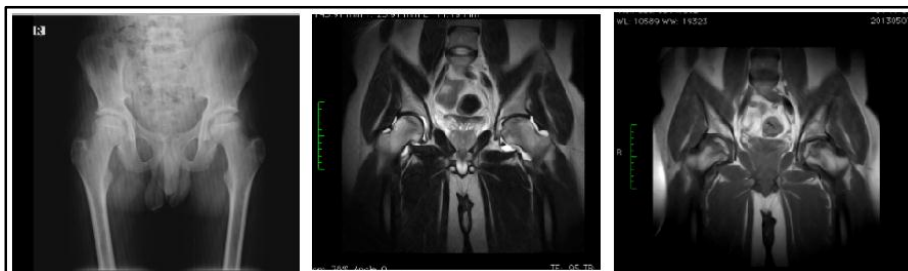


Image 9: Radiograph of both hips and coronal T1W & T2W images in a 13 year old male with bilateral AVN, Class C lesion on both sides

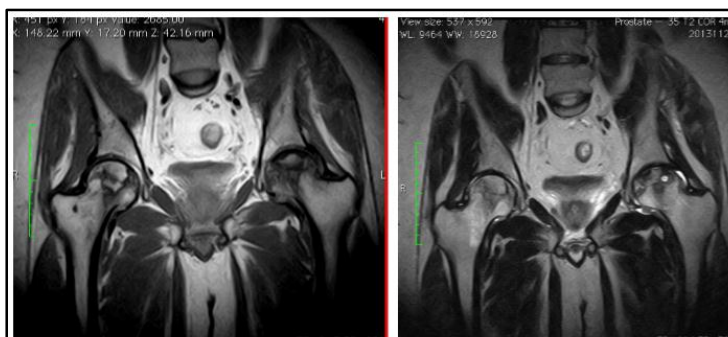


Image 10: Coronal T1W and T2W images of a 40 yr old male patient with bilateral AVN, class D lesion on both sides

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**CONCLUSION:** Over the past years, the diagnosis of AVN has improved due to the use of MRI. Today MRI is the most sensitive diagnostic imaging procedure. We conclude that disease affects mostly adults within their 3rd and 5th decade and majority of the patients are being men with bilateral involvement.

Our study results are comparable with previous studies. Hence we recommend MRI of both hips for early identification of AVN changes in asymptomatic contra-lateral hip or normal appearing hip on X-Ray.

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