

Points

- Avascular necrosis is a common condition affected the femoral head, with significant morbidity
- MRI is the most sensitive and specific technique for both diagnosis and staging
- Attention to technique is critical and high-resolution images with surface coils are a must

Avascular Necrosis of the Femoral Head

Avascular necrosis (AVN) of the femoral head is a condition characterized by cell death, resulting in loss of structural integrity of the bone and eventual collapse of the femoral head. This then leads to osteoarthritis.

Though there are many causes of AVN and the final pathophysiology is debated, the commonest causes in clinical practice are alcohol intake and the use of steroids.

AVN produces significant morbidity, related to pain and difficulty in walking and there are many treatment options. However for this to happen, it needs to be diagnosed accurately.

MRI:

The best modality for diagnosis and staging is MRI. MRI is the most sensitive technique for diagnosing AVN, especially in its early stages, when plain radiographs are negative.

Once AVN is diagnosed, staging is also performed using MRI, in most situations. Accurate staging

allows correct treatment.

Technique:

A regular MRI of the pelvis and both hips is performed using the standard body coil. This is then followed by a high-resolution MRI of the affected hip in the sagittal and coronal planes, using surface coils.

Diagnosis:

In its earliest phase, AVN presents as an area of crescentic altered signal, most commonly seen in the antero-superior aspect of the femoral head (Fig.1). It is usually accompanied by marrow edema, which suggests an active lesion. The extent of marrow edema usually correlates with the level of pain. The lesion itself may have varying signal intensity. The presence of fat signal intensity normal implies a stable lesion (Fig. 2) and is rarely accompanied by marrow edema.



Fig. 1

Fig. 1: AVN. High-resolution T2W sagittal MRI of the femoral head shows a crescentic lesion (arrow) involving the antero-superior aspect of the femoral head.

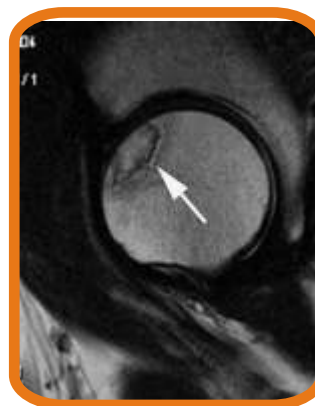


Fig. 2

Fig. 2: AVN. High-resolution T2W sagittal MRI of the femoral head shows a crescentic fat-containing lesion (arrow) involving the antero-superior aspect of the femoral head. This represents a stable lesion.

The online version is up at <http://www.jankharia.com/innerspaces/current.htm>



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Staging:

There are many staging systems. The main philosophy is to differentiate lesions that have already collapsed (Fig. 3) from those that have not (Fig. 2). Those where collapse has not occurred may be salvaged and controlled by aggressive medications and core decompression procedures. Once collapse has occurred, generally a total hip replacement is the only solution for a permanent cure.



Fig. 3

Fig. 3: AVN. High-resolution T2W coronal MRI of the femoral head shows collapse with loss of contour (arrow) and areas of fragmentation and subchondral fracture (arrowheads).

Differential Diagnosis:

1. Insufficiency fracture (Fig. 4): This is not an uncommon entity and in the earlier days before high-resolution MRI was often mistaken for transient osteoporosis of the hip (TOH). A curvilinear area is seen paralleling the femoral head, and is associated with marrow edema.
2. Transient osteoporosis of the hip (Fig. 5): This is an ill-understood condition, most common in pregnant or post-partum women, where there is sudden marrow edema in the femoral head, without a focal crescentic or curvilinear lesion. It is self-limiting with rest.



Fig. 4

Fig. 4: Insufficiency fracture. T2W sagittal MRI of the femoral head shows a curvilinear subchondral hypointensity, paralleling the articular surface (arrow).



Fig. 5

Fig. 5: Transient osteoporosis. STIR coronal MRI of the femoral head shows extensive marrow edema (arrows) without a focal lesion in a post-partum 29-years old lady, which resolved after six months.

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