Case Report

Avascular Necrosis of Talus Diagnosed on Tc-99m MDP Bone Scan

Ashish R Kamra, Shwetal U Pawar, Suruchi Shetye, Preeti R Singh

Department of Nuclear Medicine, Seth G S Medical College, KEM Hospital, Parel, Mumbai, Maharashtra, India

Abstract

Avascular necrosis (AVN) of bone is defined as the cellular death of bone components due to the interruption of the blood supply; the bone structures then collapse, resulting in pain and loss of joint function. Magnetic resonance imaging (MRI) is the gold standard to diagnose AVN. We present an unusual case of AVN of talus in a patient of thalassemia major that was diagnosed on the Tc-99m MDP bone scan with equivocal findings on MRI.

Key Message: The diagnosis of AVN is primarily done using radiological investigations. However, the bone scan plays a role in the diagnosis in atypical presentations and should be considered when MRI is equivocal.

Keywords: *avascular necrosis, bone scan, talus*

Introduction

Avascular necrosis (AVN) or osteonecrosis is cellular death (necrosis) of bone components due to the interruption of blood supply. It can occur at various sites with common sites being head of femur, proximal pole of scaphoid, body of talus, lunate, second metatarsal head.[1,2]

The common causes of AVN of bone include trauma, dislocation or minor blunt trauma, and non-traumatic causes being use of corticosteroids (iatrogenic/hyper secretion), sickle-cell disease, Gaucher's disease, thrombophlebitis, smoking, hyperuricemia (gout), SLE, orthopedic disorders (slipped capital femoral epiphysis, congenital dysplasia of the hip, Perthes disease), infection/idiopathic, embolism, radiation, and so on.[1]

Avascular necrosis usually affects people between 30 and 50 years of age. Many patients have no symptoms in the early stages of AVN. As the condition worsens, the affected joint may cause pain. Untreated, AVN worsens with time. Eventually, the bone may become weak and collapse. Avascular necrosis also causes bone to lose its smooth shape, potentially leading to severe arthritis.[3]

Magnetic resonance imaging (MRI) is considered to be the gold standard for diagnosing AVN. Positron emission tomography with computerized tomography (PET/CT) has also shown a promising role in addition to the Tc-99m methyl di-phosphonate (MDP) bone scan (bone scan).[4] We present an unusual case, where the diagnosis of AVN was clinched on the bone scan.

Case History

A 22-year-old gentleman, a known case of thalassemia major, presented with complaints of pain and swelling in the left ankle since 8 months; no history of trauma was reported. He was undergoing treatment for the thalassemia major with a trial of wheat grass and thalidomide. The other drug history did not include drugs that cause vaso-occlusive complications.

The MRI performed on two occasions 8 months apart raised suspicion of inflammation or infection (with minimal bone marrow edema) of ankle joint region on the left side. The serum markers for arthritis (RA factor, HLA B27) were found to be negative. The hematological investigations were negative for sickle-cell trait.

He was referred to Nuclear Medicine Department for evaluation of joint pain and swelling, to rule out arthritis or infection of the left ankle and subsequently distant joints. 20 mCi (740 M Bq) of Tc-99m

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Address for correspondence:
Dr. Shwetal U Pawar, Department of Nuclear Medicine, Seth G S Medical College, KEM Hospital, Parel, Mumbai, Maharashtra, India.
E-mail: shwetal13@yahoo.com

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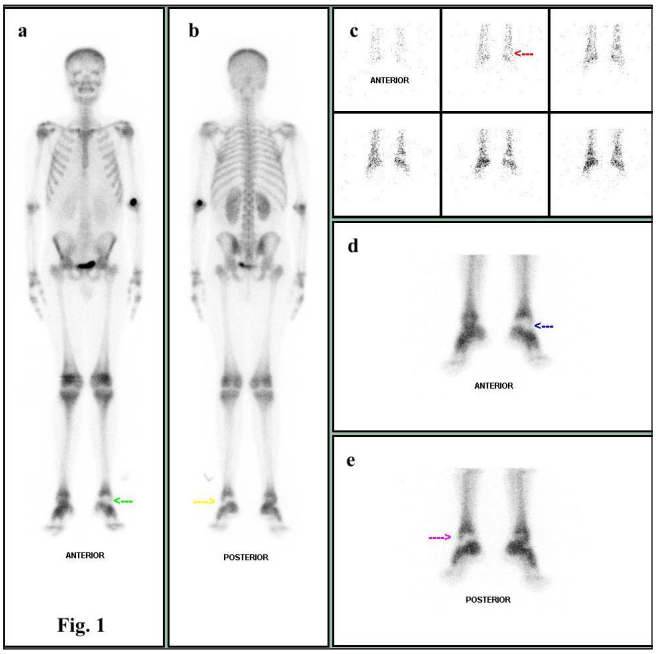

Figure 1: (a,b) Three phase bone scan with the photopenic area in anterior and posterior delayed images corresponding to the left talus (green and yellow arrows, respectively); (c) the absence of blood flow to talus (red arrow); (d,e) the absence of pooling of tracer in anterior and posterior blood pool images (blue and pink arrows, respectively)

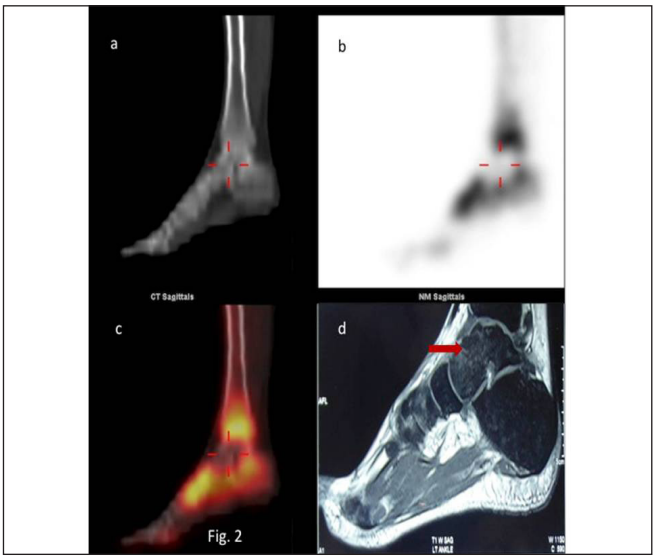

Figure 2: (a) CT sagittal, (b) SPECT sagittal, (c) fused sagittal, images showing the photopenic area corresponding to the left talus on the fused CT images (triangulation) suggesting AVN. (d) MRI sagittal images showing marrow signal abnormality (red arrow)

MDP was injected intravenously under the gamma camera, and the blood flow pool images dynamic images were acquired immediately followed by blood pool static images [Figure 1d,e] of the bilateral ankle region. The delayed (figure 1a,b) whole body static images and single photon emission computer tomography/computer tomography (SPECT/CT) [Figure 2] of ankle region were acquired after 3 hours.

The suggested the absence of blood flow [Figure 1c] to the left talus. The revealed photopenic areas corresponding to the left talus. The absence of perfusion and cortical uptake of tracer clinched the diagnosis of AVN of the left talus.

The patient has been undergoing treatment with analgesics and bisphosphonate therapy along with physiotherapy for modification of joint function. The trial with wheat grass and thalidomide was discontinued. The swelling and the pain were reduced after the bisphosphonate therapy. Thus, the bone scan clinched the diagnosis of AVN, to guide the rheumatologist for appropriate therapy and also ruling out the possibility of suspected infection or inflammation.

Discussion

AVN is most commonly encountered in the hip.[2] Most available data regarding the natural history, pathology, pathogenesis, and treatment of AVN pertains to femoral head necrosis. Most cases (75%) of talar AVN are traumatically induced and only 25% of talar AVN pertains to non-traumatic causes.[5]

Multiple studies and reviews have confirmed that plain radiographs are highly specific for advanced disease but exhibit very low sensitivity for the earliest stages of the disease.[6,7] MRI remains the gold standard of diagnosis and staging. It may not be as effective in identifying sub-chondral fractures as tomography or CT scanning.[8] Features of MRI in AVN are diffuse edema that occur in advanced stages, reactive interface line, double line sign, rim sign, and secondary degenerative changes.[9] In the presence of only minimal marrow, edema seen on MRI with clinical finding of swelling raised the possibility of infection/inflammation of the joint. The radiological findings of AVN of talus are very well described in traumatic ethology (Hawkins classification) and can be easily detected on radiographs and MRI. Atraumatic AVN is uncommon and moreover difficult to diagnose.

Mont *et al.,*[10] found 100% sensitivity for MRI studies compared to 56% sensitivity for bone scans. The authors concluded that although bone scanning may be useful as a screening tool, it shows the least utility in the earliest stages of the disease.[10,11] Beltran *et al.*,[8] reported 88% sensitivity, 100% specificity, and 94% accuracy with MRI and 78% sensitivity, 75% specificity, and 76% accuracy with bone scintigraphy.

Although the previous studies have demonstrated the utility of bone scintigraphy in the diagnosis of AVN, there are not many studies using SPECT/CT for detecting AVN. Gayana *et al.,* studied FHAVN comparing 18F PET-CT and MRI. It was found that MRI was 96.5% sensitive, 100% specific, and 98.03% accurate in diagnosing FHAVN, whereas PET/CT was 100% sensitive, specific, and accurate in diagnosing FHAVN.[12]

AVN of bones is uncommon in patients with thalassemia without sickle trait. The diagnosis of AVN of talus was

made to be idiopathic in this case, and the patient responded well clinically to the bisphosphonate therapy.

Conclusion

The use of X-rays and MRI has been routinely used for diagnosing AVN. But in the present clinical scenario, that is, atraumatic AVN, the bone scan can be incorporated as a useful tool to diagnose AVN. This case brings to light the possibility of use of bone scan in the diagnosis of AVN in atypical presentation.

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Conflicts of interest

There are no conflicts of interest

References

1. Tofferi Jeanne K. *Avascular necrosis*. http://emedicine.medscape.com/article/333364-overview.
2. Bose VC, Baruah BD. Resurfacing arthroplasty of the hip for avascular necrosis of the femoral head: a minimum follow-up of four years. *J Bone Joint Surg Br* 2010;92:922-8.
3. Miller Matthew D. *Osteonecrosis of the Hip.*. http://orthoinfo.aaos.org/topic.cfm?topic=a00216.
4. Murphey MD, Roberts CC, Bencardino JT, Appel M, Arnold E, Chang EY, *et al.* ACR appropriateness criteria osteonecrosis of the hip. *J Am Coll Radiol* 2014;11:114-20.
5. Adelaar RS, Madrian JR. Avascular necrosis of the talus. Orthop Clin North Am 2004;35:383-95.
6. Karantanas AH. Accuracy and limitations of diagnostic methods for avascular necrosis of the hip. Expert Opin Med Diagn 2013;7:179-doi: 10.1517/17530059.2013. 757592.
7. Malizos KN, Karantanas AH, Varitimidis SE, Dailiana ZH, Bargiotas K, Maris T. Osteonecrosis of the femoral head: etiology, imaging and treatment. Eur J Radiol 2007;63:16. doi: 10.1016/j.ejrad.2007.03.019.
8. Beltran J, Herman LJ, Burk JM, Zuelzer WA, Clark RN, Lucas JG, *et al.* Femoral head avascular necrosis: MR imaging with clinical-pathologic and radionuclide correlation. Radiology 1988;166:215. doi: 10.1148/radiology.166.1.3336682.
9. Rezaee A, Gaillard F. Avascular necrosis. https://radiopaedia.org/articles/avascular-necrosis.
10. Mont MA, Ulrich SD, Seyler TM, Smith JM, Marker DR, McGrath MS, *et al.* Bone scanning of limited value for diagnosis of symptomatic oligofocal and multifocal osteonecrosis. J Rheumatol 2008;35:1629.
11. Sed Brenner AI, Koshy J, Morey J, Lin C, DiPoce J. The bone scan. Semin Nucl Med 2012;42:11-26.
12. Gayana S, Bhattacharya A, Sen RK, Singh P, Prakash M, Mittal BR. F-18 Fluoride positron emission tomography/computed tomography in the diagnosis of avascular necrosis of the femoral head: Comparison with magnetic resonance imaging. Indian J Nucl Med 2016;31:3-8.