

## Tc-99m HDP Single Photon Emission Computed Tomography/Computed Tomography in Stress Fracture of Base of Metatarsal Bone

### Abstract

Proximal metatarsal stress fractures are common at base of the second metatarsal, typically seen in repetitive impact athletes, dancers, and those with cavus feet. It is caused by increased bone resorption rather than formation in a state of abrupt increased physical activity or intensity, leading to repetitive microfractures and eventually stress fracture. It is characterized by swelling and tenderness of a prolonged duration. We report a case of a 40-year-old female having left foot pain diagnosed with stress fracture on Tc-99m HDP single-photon emission computed tomography (SPECT)-CT. We emphasize the use of SPECT/CT in allocating active source of pain in the feet.

**Keywords:** Foot pain, stress fracture, Tc-99m HDP single-photon emission computed tomography-computed tomography

A 40-year-old female presented with a 1-month history of left ankle and feet pain. Pain started after new-fangled strenuous exercise. Clinical examination shows mild swelling and tenderness. Plain X-ray is normal. Three-phase bone scintigraphy is performed by injecting 22 mCi of Tc-99m HDP intravenously. Dynamic flow and blood pool images showed increased flow and hyperemia at the left midtarsal region. The delayed whole body show focal area of increase tracer uptake at the base of left second metatarsal bone [Figure 1]. Noncontrast computed tomography (CT) coronal, sagittal, and transaxial images show fracture line with corresponding increased uptake on fused images [Figure 2]. Tc-99m HDP single-photon emission computed tomography (SPECT)-CT images better delineate the uptake at base of the second metatarsal bone which may present a source of pain, suggestive of stress fracture.

Proximal metatarsal fractures occur most commonly at the base of the second metatarsal and are characterized by swelling and tenderness. A proximal stress fracture in the second metatarsal is less as compared to nonproximal stress fracture; however, it is frequently seen with dancers that particularly often performed “*en pointe*” position, repetitive impact athletes,

and those with canvus feet.<sup>[1,2]</sup> There is loss of bone integrity seen in a stress fracture develop after cyclical, submaximal loading that occurs in a state of usually abrupt increased in physical activity and intensity, leading to bone weakening and eventually stress fracture.<sup>[3]</sup> Diagnosis is reached through a proper history collection and physical examination followed by imaging with X-ray. In the first few weeks following the onset of symptoms, X-ray images are likely to be normal; thus, if highly suspicious of stress fracture, CT scan or magnetic resonance imaging (MRI) is performed. CT scan can accurately locate the fracture line whereas MRI is the preferred sensitive diagnostic tool of choice.<sup>[4]</sup> Similarly, bone scintigraphy can show evidence of stress fracture on few days of the onset of symptoms. It has been known as a highly sensitive modality with limited specificity in imaging of metatarsal stress fractures.<sup>[5]</sup> The addition of SPECT-CT increased the specificity of bone scintigraphy making it compatible with MRI study.<sup>[6]</sup> SPECT-CT allows precise anatomical localization of bone turnover abnormalities.<sup>[7]</sup> SPECT-CT is reportedly useful for localizing active disease in foot and ankle pathology.<sup>[8,9]</sup> In our case, SPECT-CT helps in localizing the source of pain and diagnosing the stress fracture with confidence.

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Figure 1: Dynamic flow and blood pool images showing increased flow and hyperemia at the left midtarsal region. The delayed whole body showing focal area of increase tracer uptake at the base of left second metatarsal bone. Right foot is unremarkable

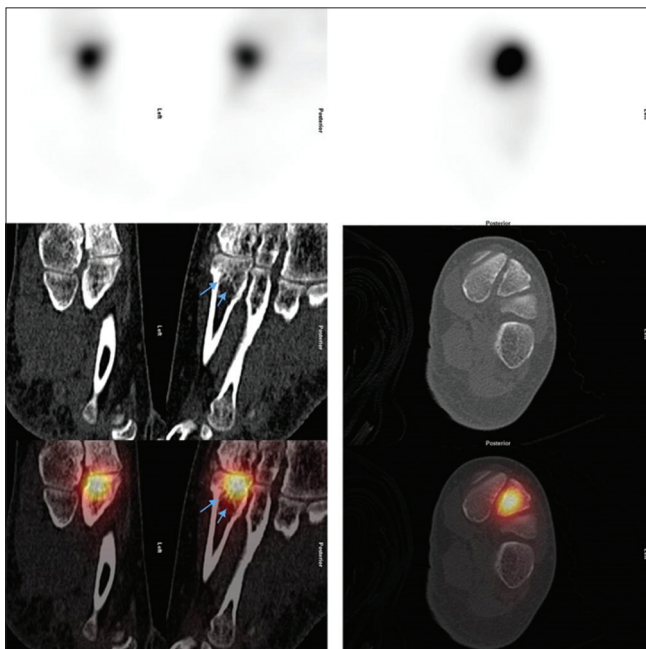


Figure 2: Noncontrast computed tomography sagittal, coronal, and transaxial images showing fracture line with corresponding increased uptake on fused images

Management of proximal metatarsal stress fractures is mainly conservative with abstinence from the causative activity and wearing the proper supportive footwear and cast.<sup>[10]</sup> The amount of mobilization limitation required to

achieve healing is dependent on the severity of symptoms and etiology of the fracture. In some cases, nonunion occurs and may require surgical intervention.<sup>[1]</sup>

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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#### Conflicts of interest

There are no conflicts of interest.

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