

# Functional Characterization of Posttraumatic Heterotopic Ossification of Tibiofibular Syndesmosis with Dynamic Bone Scan and Single-Photon Emission Computed Tomography/Computed Tomography

## Abstract

A 53-year-old man was investigated for ongoing right ankle pain and lateral malleolus swelling following a traumatic inversion injury 12 weeks prior. The initial ankle radiograph was normal with no evidence of fracturing. The follow-up radiograph showed bridging ossification in the distal tibiofibular syndesmosis. As the pain did not subside, posttraumatic heterotopic ossification (HO) was suspected, and triple-phase dynamic bone imaging with technetium 99m-methylene diphosphonate was performed to guide further management. The bone scan revealed intense focal tracer activity centered on the HO of the tibiofibular syndesmosis, with no evidence of occult fracturing confirming HO as a pain generator.

**Keywords:** *Dynamic bone imaging, heterotopic bone formation, heterotopic ossification, technetium 99m-methylene diphosphonate, tibiofibular syndesmosis*

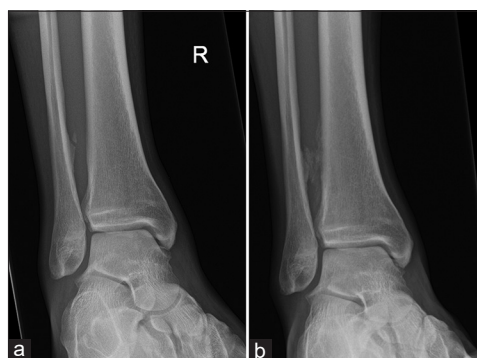
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Heterotopic ossification (HO) of the soft tissues is a well-recognized complication following trauma, resulting in nonneoplastic formation of bone in soft tissue. It has been documented to lead to tibiofibular synostosis, which may require surgical excision to relieve symptoms and facilitate return to normal activity.<sup>[1,2]</sup> The initial plain radiograph is often negative as the lesion is composed of granulation tissue in the early stages of disease development, containing fibroblasts, and cellular tissue.<sup>[3,4]</sup> Radiograph appearances [Figure 1a and b] can also mimic periosteal or parosteal osteosarcoma, and further imaging is often needed to confirm the diagnosis.<sup>[5]</sup> The preexisting history of trauma in this case is a key discriminating factor in identifying the correct diagnosis. Magnetic resonance images are valuable in assessing ligamentous injury, especially of the anterior tibiofibular and posterior tibiofibular ligaments, but are of limited diagnostic utility in syndesmotic HO as appearances can show significant temporal change depending on the stage that the imaging is performed.<sup>[6]</sup>

Dynamic bone imaging [Figure 2a – c] is a useful diagnostic tool in investigating HO. The investigation has a high sensitivity

allowing the evaluation of pathology such as trauma, infection, and malignant disease<sup>[7]</sup> but a low specificity, which in this case necessitates correlation with the history of trauma and other imaging findings. Flow studies and blood-pool imaging in dynamic bone imaging can positively identify tracer activity in HO around 2.5 weeks following trauma, earlier than radiography. Radiography remains less sensitive to findings for at least another 6 days after radionuclide diagnosis.<sup>[8,9]</sup>



**Figure 1:** A 53-year-old man presented with persistent right ankle pain and lateral malleolus swelling following traumatic inversion injury 12 weeks prior. (a) The anteroposterior right ankle X-ray was normal. (b) Follow-up X-ray 2 months later showed bridging ossification and synostosis between the distal tibia and fibula, leading to the diagnosis of posttraumatic heterotopic ossification

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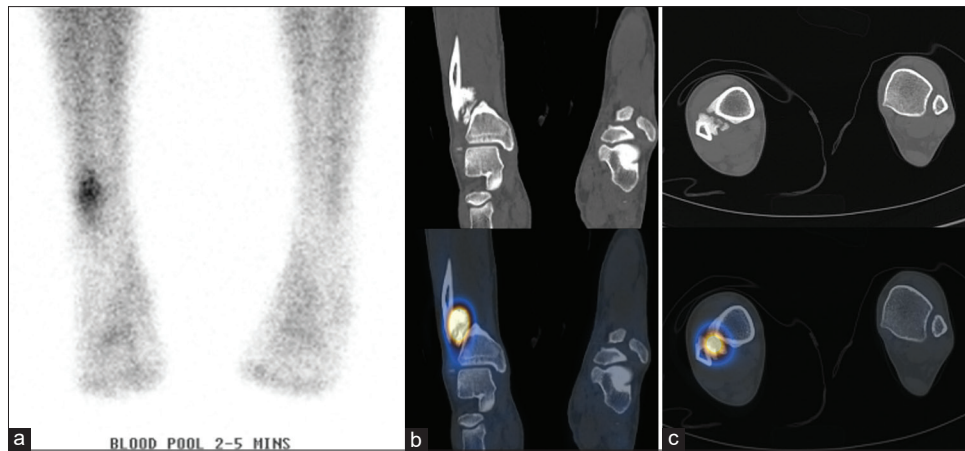
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**Figure 2:** The patient continued to have persistent symptoms and triple-phase dynamic bone imaging with technetium 99m-methylene diphosphonate was performed to direct further management. (a-c) Both blood pool and bone phase imaging revealed intense focal tracer activity. The localization to heterotopic ossification centered on the heterotopic ossification of the tibiofibular syndesmosis was best seen with single-photon emission computed tomography/computed tomography indicating ongoing osteoblastic turnover in the region. There was no scintigraphic evidence of occult fracturing

Surgical management should be considered where limb function is compromised by pain and decreased range of movement. Serial dynamic bone imaging can play a part in deciding on the correct time for surgical intervention. In the early stages of HO, the bone scan demonstrates increased uptake which progresses to a decreased or a lack of tracer activity as the lesion matures.<sup>[3]</sup> As postoperative recurrence rates are high, surgical excision should be planned once the bone scan indicates lesion maturation.<sup>[10]</sup> While surgery is the definitive method of removing established bone, it must be combined with indomethacin therapy and radiotherapy to further reduce the risk of recurrence.<sup>[11,12]</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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