

Unusual Diffuse and Heterogeneous FDG Uptake in Appendicular Bone Marrow Space in a Patient with Acute Lymphoblastic Leukemia

Abstract

We describe a case of F-18-2-fluoro-2-deoxyglucose (FDG) uptake in the appendicular bones on a positron emission tomography/computed tomography (PET/CT) scan in a 20-year-old woman with a diagnosis of acute lymphoblastic leukemia. An FDG PET/CT was performed on this patient because of fever of unknown origin, revealing diffuse and heterogeneous FDG uptake in the bone marrow space of both humeri, femurs, and tibiae. The patient underwent magnetic resonance imaging, which demonstrated bone infarction with heterogeneous high, intermediate, and dark signal intensities on T1- and T2-weighted images in the same areas.

Keywords: Bone infarction, F-18-2-fluoro-2-deoxyglucose uptake, false-positive finding, positron emission tomography/computed tomography

A 20-year-old woman with acute B lymphoblastic leukemia (ALL) underwent F-18-2-fluoro-2-deoxyglucose (FDG) positron emission tomography (PET)/computed tomography (CT) for fever of unknown origin (FUO). Her condition was diagnosed as ALL in February 2018 and she underwent anti-leukemic treatment until September 2020. At the time of diagnosis, she had bone involvement of ALL, which was demonstrated by bone scintigraphy (BS). On a follow-up BS in April 2019, the previous bone lesions had disappeared, but a new photon defect appeared in both femoral heads, indicating avascular necrosis (AVN). Therefore, the patient underwent total hip arthroplasty in both hips in April 2021. In December 2021, she was admitted to our hospital with an FUO. Laboratory test results, including antinuclear antibody titer and antibacterial and antiviral antibodies, were within normal ranges. C-reactive protein and erythrocyte sedimentation rate levels were elevated at 9.68 mg/dL (normal range: 0.0–0.3) and 82 mm/hr (normal range: 0–20), respectively. On FDG PET/CT images prepared for investigation of fever focus, heterogeneous FDG uptake along the bone marrow space of the humeri, femurs, and tibiae was observed [Figure 1].

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These findings were suspected to be bone infarcts, but bone marrow involvement in the malignancy could not be excluded. No other abnormal FDG uptake was observed, suggesting either metastasis or active inflammation in the whole body. BS at this time showed diffuse radioactive uptake in the same areas, indicating the possibility of both bone infarction and metastasis. To verify this uptake in bones, magnetic resonance imaging (MRI) was used. On lower extremity MRI, intramedullary irregular serpentine lesions in the femur and tibia with heterogeneous high, intermediate, and dark signal intensity on T1- and T2-weighted images were observed, consistent with osteonecrosis (ON) [Figure 2]. The patient was administered symptomatic treatment accordingly.

ON is a progressive and disabling pathological process associated with reduced perfusion, leading to ischemia and death of bone and marrow cells, a process referred to as bone infarction or AVN.^[1,2] There have been several case reports of ON and bone infarction on nuclear imaging.^[3-8] ON on FDG PET has been reported in several cases and these reports showed that focal FDG uptake in the femur, tibia, and rib of the ON lesion was initially mistaken for bone metastasis in patients with cancer.^[5-8]

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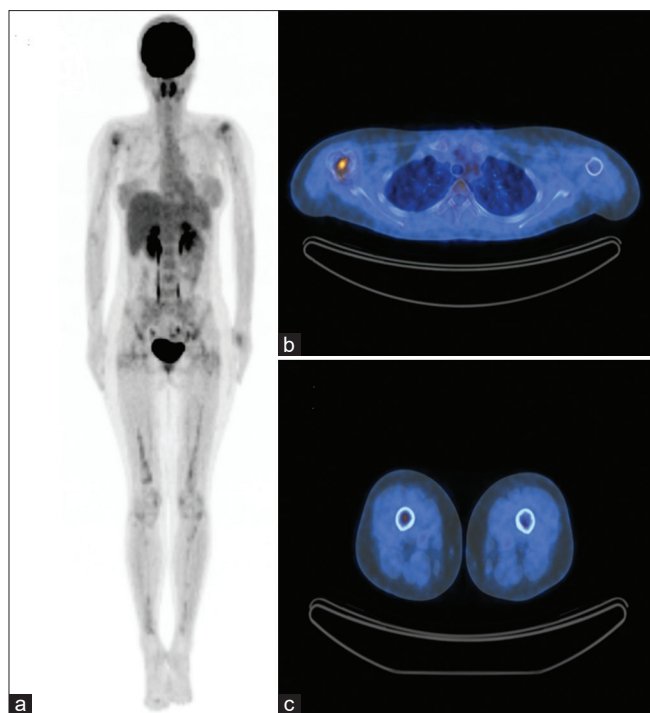


Figure 1: MIP image (a) and transaxial fused images (b and c) on 18F-FDG PET/CT showing heterogeneous FDG uptake in the appendicular bones (humeri [b], femurs [c]). MIP: Maximum intensity projection, PET/CT: Positron emission tomography/computed tomography

This is the first report of diffuse and heterogeneous FDG uptake in ON, while previous reports have demonstrated local uptake on FDG PET/CT. The possible mechanism for false-positive ON may be an inflammatory reaction with revascularization and an increased bone marrow reaction during the healing process. Because FDG uptake can be observed in benign lesions such as bone infarction, careful interpretation, and combined imaging modalities may help avoid misdiagnosis as malignancy/metastasis based on FDG PET/CT results.

Declaration of patient consent

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

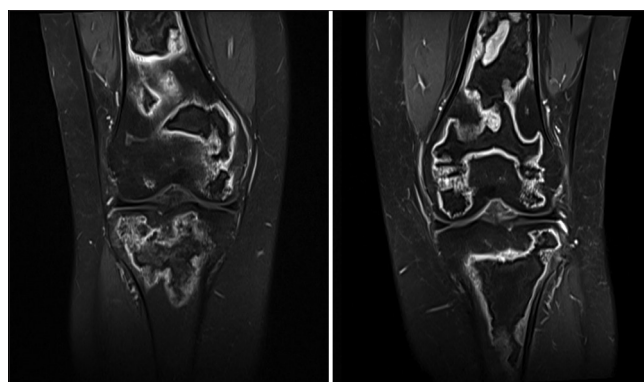


Figure 2: MRI of both knees (left: right knee, right: left knee) showing a double line sign with well enhancement indicating bone infarction was seen. MRI: Magnetic resonance imaging

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Conflicts of interest

There are no conflicts of interest.

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