



FDG-Avid Non-Ossifying Fibromas Mimicking Metastases in Pediatric Ewing Sarcoma: A Diagnostic Pitfall on PET/CT

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Abstract

Objective:

To describe a rare diagnostic pitfall on F-18 FDG PET/CT caused by FDG-avid non-ossifying fibromas (NOFs) in a pediatric patient with Ewing sarcoma.

Case: We retrospectively evaluated PET/CT findings in a 15-year-old male diagnosed with histologically confirmed Ewing sarcoma of the thoracic wall. Whole-body F-18 FDG PET/CT was performed for initial staging. Lesions with abnormal uptake were further evaluated using radiologic imaging to assess morphology and confirm the benign nature of incidental findings.

Results: PET/CT showed no evidence of distant metastasis. However, two focal FDG-avid bone lesions were identified incidentally: one in the distal right femur (SUVmax: 19.9) and another in the proximal left tibia (SUVmax: 6.8). Both demonstrated higher FDG uptake than the primary tumor (SUVmax: 6.7). Radiographs and MRI revealed well-circumscribed, cortically based lesions with imaging features typical of non-ossifying fibromas, confirming their benign nature.

Conclusion: FDG-avid NOFs may mimic skeletal metastases on PET/CT, potentially leading to misinterpretation and unnecessary interventions. Correlation with conventional imaging such as MRI and radiographs is crucial to avoid overstaging and guide appropriate clinical management in pediatric oncology.

Keywords: F-18 FDG PET/CT, non-ossifying fibroma, pediatric oncology, benign bone tumor, Ewing sarcoma

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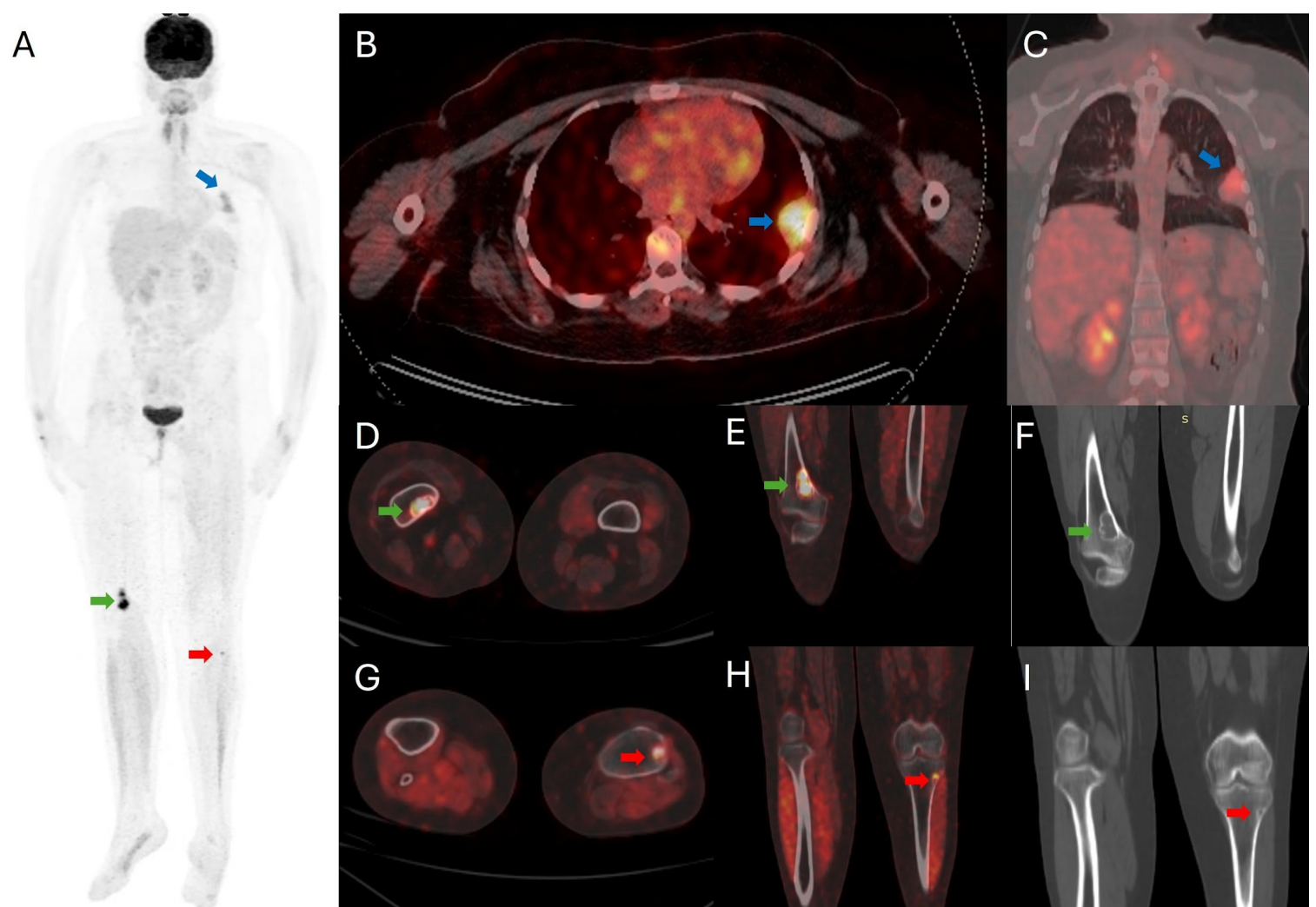
Introduction

Non-ossifying fibromas (NOFs) are common benign bone lesions characterized by well-defined, solitary fibrous proliferations (1,2). They are typically present during childhood and are most frequently discovered incidentally during the second decade of life due to their asymptomatic nature in nearly 75% of cases (3–5). Radiographically, NOFs are commonly located in the metaphyseal or metaphyseal-diaphyseal regions of the femur or tibia (6). On F-18 fluorodeoxyglucose (FDG) PET/CT, however, these lesions may demonstrate increased FDG uptake (4,7), mimicking bone metastases and potentially leading to diagnostic confusion in oncologic settings.

Case Presentation

A 15-year-old male patient presented with a thoracic wall mass and was diagnosed with Ewing sarcoma following histopathological evaluation. For initial staging, a whole-body F-18 FDG PET/CT scan was performed (Figure 1). The scan revealed an intense FDG uptake in the primary tumor (SUVmax: 6.7). However, two additional FDG-avid lesions were incidentally detected in the lower extremities: one in the distal right femur (SUVmax: 19.9) and another in the proximal left tibia (SUVmax: 6.8). Notably, both lesions demonstrated higher metabolic activity than the primary tumor. On CT, these lesions appeared well-circumscribed, cortically based, and displayed a characteristic centrally lucent area surrounded by peripheral sclerosis—features typical of non-ossifying fibromas. Further evaluation with conventional radiographs and MRI confirmed their benign nature. No additional sites of metastatic disease were detected throughout the body.

Figure 1. F-18 FDG PET/CT findings of a 15-year-old male with histologically confirmed Ewing sarcoma of the thoracic wall. (A) Maximum intensity projection (MIP) image showing focal FDG uptake in the thoracic wall (blue arrow) and bilateral lower extremities (green and red arrows). (B) Axial PET/CT fusion image demonstrating intense FDG uptake in the thoracic wall mass (SUVmax: 6.7). (C) Coronal PET/CT image confirms FDG-avid primary lesion in the thoracic wall. (D–F) Axial, coronal PET/CT, and corresponding CT images of the distal right femur showing a well-circumscribed cortical lesion with intense FDG uptake (SUVmax: 19.9) (green arrow). (G–I) Axial, coronal PET/CT, and corresponding CT images of the proximal left tibia



demonstrating another FDG-avid lesion (red arrow) (SUVmax: 6.8) with similar radiologic features, including a lytic center and surrounding sclerosis, consistent with a benign non-ossifying fibroma. (F and I) Coronal CTs shows a centrally lucent, peripherally sclerotic appearance—typical for a non-ossifying fibroma.

Discussion

In pediatric patients undergoing F-18 FDG PET/CT for malignancy staging, incidental skeletal findings can present a diagnostic challenge. Non-ossifying fibromas (NOFs), although benign and typically asymptomatic (1–3,5), may demonstrate variable degrees of FDG avidity (4,7,8). In our case, two separate FDG-avid lesions were identified in the lower extremities—both displaying SUVmax values that exceeded that of the primary Ewing sarcoma. The coexistence of multiple metabolically active NOFs in a single patient, each with such intense uptake, is particularly striking and rarely described in the literature. This pattern underscores the risk of overinterpreting benign lesions as metastatic disease, leading to unnecessary interventions or inaccurate staging (4,8).

In our patient, the FDG-avid lesions were in the distal femur and proximal tibia—common sites for NOFs (4). Their CT morphology was classic, showing a well-demarcated, cortically based lesion with a central lucency and surrounding sclerosis. These imaging characteristics are pivotal in differentiating NOFs from skeletal metastases (7,8).

Similar diagnostic pitfalls have been reported in the evaluation of lymphoma (7,8), ependymoma (9), and sarcoma patients. In one study, FDG-avid NOFs were identified in 14 children, with seven demonstrating intense uptake (4). However, concurrent multiple lesions with SUVmax surpassing the primary malignancy are uncommon. These observations (10)

reinforce the need for careful correlation with anatomical imaging and clinical context.

Recognizing the characteristic imaging features of NOFs is essential to avoid unnecessary biopsy, overtreatment, or erroneous upstaging. This case further emphasizes the added value of hybrid imaging, where CT findings guide accurate interpretation of metabolic abnormalities seen on PET. A combined metabolic-anatomical assessment is key to avoiding diagnostic pitfalls in this vulnerable patient population.

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the

institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Approved by Istanbul University Ethics Committee.

Conflict of Interests: The authors declare that there is no conflict of interest in the study.

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