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Letter to Editor

Osteoid Osteoma Mimicking Femoral Bone Metastasis in a Primary Laryngeal Cancer Case on PET/CT: Diagnostic Challenge

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ABSTRACT

Osteoid osteoma is a benign osteogenic tumor that may occasionally mimic malignant bone lesions on oncologic imaging. We report a diagnostically challenging case of a 59-year-old male with primary laryngeal squamous cell carcinoma in whom staging 18F-FDG PET/CT demonstrated intense uptake in the proximal femur, initially raising suspicion for skeletal metastasis. The patient had mild intermittent thigh pain with nocturnal exacerbation and rapid relief after nonsteroidal anti-inflammatory drug use. Further evaluation with magnetic resonance imaging demonstrated a small cortical-based lesion with surrounding sclerosis and bone marrow edema, while computed tomography revealed a central lucent nidus with reactive cortical sclerosis, findings consistent with osteoid osteoma. CT-guided biopsy confirmed the diagnosis histopathologically. The patient was managed conservatively with nonsteroidal anti-inflammatory drugs, and no systemic oncologic treatment was initiated for the femoral lesion. This case emphasizes that not all FDG-avid bone lesions in patients with known malignancy represent metastasis. Correlation of PET/CT findings with clinical features, MRI, CT, and histopathological confirmation when needed is essential to avoid misdiagnosis and unnecessary treatment.

Keywords: femur, F-18 FDG PET / CT, laryngeal cancer, CT, metastasis, osteoma

Dear Editor,

Osteoid osteoma is a benign osteogenic tumor that may occasionally present with imaging characteristics suggestive of malignancy [1] It is a relatively common benign bone tumor, usually seen in young adults. The typical clinical presentation consists of pain that becomes worse at night and is relieved by nonsteroidal anti-inflammatory drugs. The most common imaging finding is a lytic lesion, known as a nidus, with variable intralesional mineralization, accompanied by bone sclerosis, cortical thickening and surrounding bone marrow edema, as well as marked enhancement with intravenous contrast injection. When the lesion is located in typical locations (intracortical bone and the diaphyses of long bones. We report a rare and diagnostically challenging case in which a femoral osteoid osteoma was initially interpreted as a bone metastasis on PET/CT in a patient with primary laryngeal squamous cell carcinoma. This case underscores the importance of considering differential

diagnoses when interpreting PET/CT findings and highlights the essential role of histopathological confirmation in avoiding misdiagnosis and unnecessary treatment.

A 59-year-old male with recently diagnosed primary laryngeal squamous cell carcinoma underwent staging with 18F-FDG PET/CT. The imaging revealed intense radiotracer uptake in the proximal femur, raising suspicion for skeletal metastasis (Figure 1). The patient reported mild, intermittent pain in the left thigh without trauma or systemic symptoms. The pain was described as a dull ache that occasionally became more intense at night. Notably, the pain showed significant relief within approximately 20–30 minutes after the use of nonsteroidal anti-inflammatory drugs (NSAIDs).

Further evaluation with magnetic resonance imaging (MRI) demonstrated a small, well-defined cortical-based lesion surrounded by extensive reactive sclerosis and bone marrow edema, findings suggestive of osteoid osteoma (Figure 2). Computed tomography (CT) revealed a cortical-based sclerotic lesion with a central lucent nidus, supporting the diagnosis (Figure 3). A CT-guided biopsy was performed, and histopathological examination confirmed osteoid osteoma, showing a nidus composed of woven bone and osteoblastic rimming within a vascular stroma.

The patient was managed conservatively with NSAIDs and did not undergo systemic oncologic therapy for the femoral lesion.

PET/CT is widely used in the staging of head and neck cancers, including laryngeal carcinoma, due to its high sensitivity in detecting regional and distant metastases [2]. However, its limited specificity may result in false-positive findings, particularly in benign conditions such as infection, inflammation, stress-related lesions, and benign bone tumors, including osteoid osteoma [3,4]. Because FDG is not a cancer-specific agent, and knowledge of the differential diagnosis of benign FDG-avid bone alterations that may resemble malignancy is important for correct patient management, including the avoidance of unnecessary additional invasive tests such as bone biopsy. A broad spectrum of benign bone conditions may demonstrate increased FDG uptake and mimic metastatic disease, including osteomyelitis, Brown tumors, gout, Langerhans cell histiocytosis, and sarcoidosis. Numerous studies in the literature have demonstrated both false-positive and false-negative PET/CT findings, highlighting the importance of cautious interpretation, especially in oncologic patients [5–7].

Osteoid osteoma is a benign osteogenic tumor that typically affects adolescents and young adults, most commonly in the second or third decade of life [8]. It is classified based on location

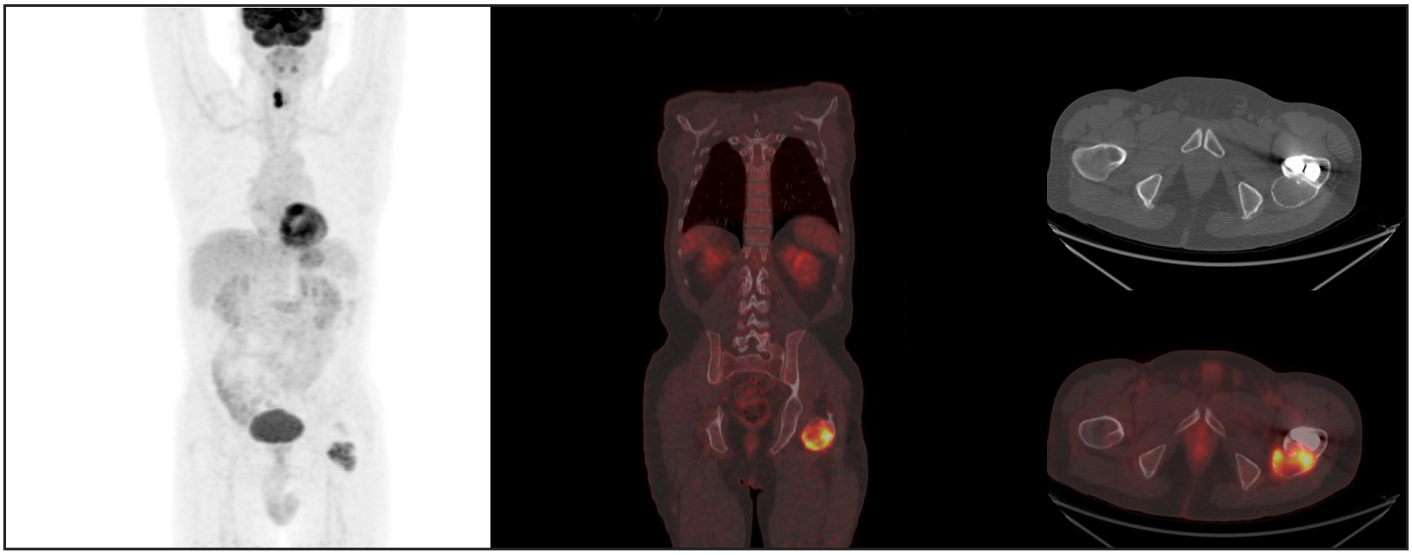

Figure 1. 18F-FDG PET/CT imaging findings in a 59-year-old male with primary laryngeal squamous cell carcinoma.
(A) Maximum intensity projection (MIP) image showing intense FDG uptake in the larynx and left proximal femur. (B) Coronal fused PET/CT image localizing the hypermetabolic focus to the proximal femur. (C) Axial CT image demonstrating a cortical-based sclerotic lesion. (D) Axial fused PET/CT image showing marked FDG uptake in the corresponding lesion.

as cortical, cancellous, or subperiosteal. Nocturnal pain is the most common symptom that usually responds to salicyclates and non-steroidal anti-inflammatory medications. CT is the modality of choice not only for diagnosis but also for specifying location of the lesion, i.e. cortical vs sub periosteal or medullary. Non-operative treatment can be considered as an option since the natural history of osteoid osteoma is that of spontaneous healing. Surgical treatment is an option for patients with severe pain and those not responding to NSAIDs. Available surgical procedures include radiofrequency (RF. Therefore, its occurrence in an older patient, as in our case, represents an atypical presentation and may contribute to diagnostic confusion. In oncologic patients, this age discrepancy may further bias clinicians toward interpreting FDG-avid lesions as metastatic disease.

In the present case, the lesion demonstrated increased FDG uptake on PET/CT, mimicking skeletal metastasis. This increased uptake can be attributed to active osteoblastic activity and associated inflammatory processes within the nidus, which are known to cause elevated FDG accumulation. Similar cases have been reported in the literature, where osteoid osteoma exhibited significant FDG uptake, leading to potential misinterpretation as malignant lesions [9,10].

The differential diagnosis of FDG-avid bone lesions is broad and includes metastatic disease, primary bone tumors, infection, inflammatory conditions, and stress-related bone changes [6]. In patients with known malignancy, such findings are often initially presumed to represent metastasis, which may lead to unnecessary systemic treatment if not carefully evaluated.

Imaging modalities play a complementary role in lesion characterization. MRI is highly sensitive in detecting bone marrow edema and surrounding soft tissue changes but may be less specific for identifying the nidus. CT remains the most reliable modality for demonstrating the nidus and cortical changes characteristic of osteoid osteoma. In our case, although CT demonstrated features suggestive of a nidus, it was not prominently visualized in initial assessments, further contributing to the diagnostic challenge. Additionally, no prior imaging studies were available for comparison, which limited the assessment of lesion chronicity and evolution. This represents another factor that may complicate the differentiation between benign and malignant lesions in oncologic patients.

Ultimately, histopathological confirmation remains the gold standard in cases where imaging findings are inconclusive. In our patient, biopsy confirmed the diagnosis of osteoid osteoma, thereby preventing misdiagnosis and unnecessary oncologic treatment.

This case highlights an important diagnostic pitfall in oncologic imaging. Awareness that benign lesions such as osteoid osteoma may demonstrate intense FDG uptake is essential. Careful correlation of PET/CT findings with MRI, CT, clinical presentation, and, when necessary, histopathological evaluation is crucial to ensure accurate diagnosis and appropriate management.

In patients with known malignancy, not all FDG-avid bone lesions represent metastasis. Clinicians should interpret PET/CT findings with caution, as benign entities such as osteoid osteoma may mimic metastatic disease. Awareness of such diagnostic pitfalls and correlation with MRI, CT, and histopathological findings are essential to avoid misdiagnosis and overtreatment.

Yours sincerely,

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Informed Consent: Written informed consent was obtained from the patient.

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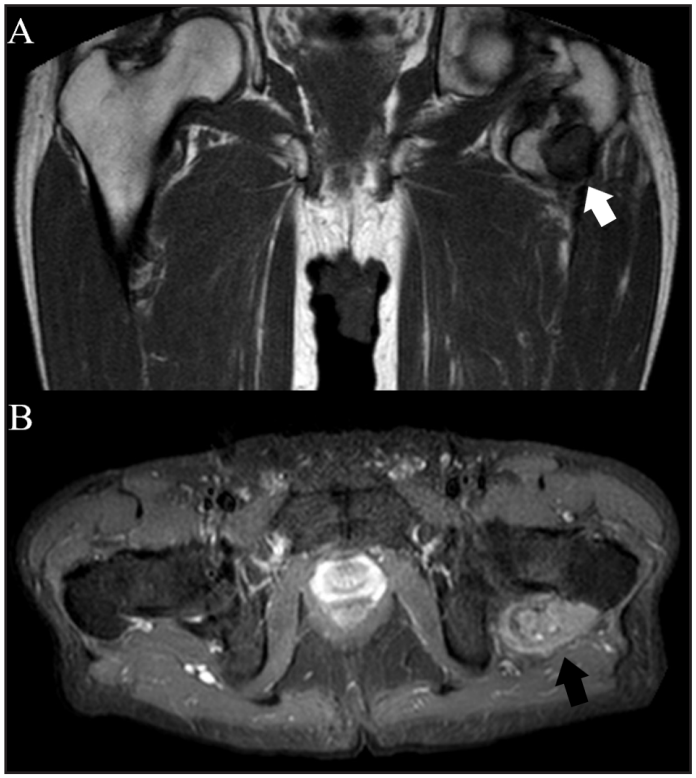

Figure 2. Magnetic resonance imaging findings of the proximal femoral lesion. (A) Coronal T1-weighted image demonstrating a small, well-defined cortical-based lesion with surrounding low-signal sclerosis (arrow). (B) Axial STIR image showing prominent bone marrow edema and surrounding soft tissue signal changes associated with the lesion (arrow).
These imaging findings are suggestive of osteoid osteoma.

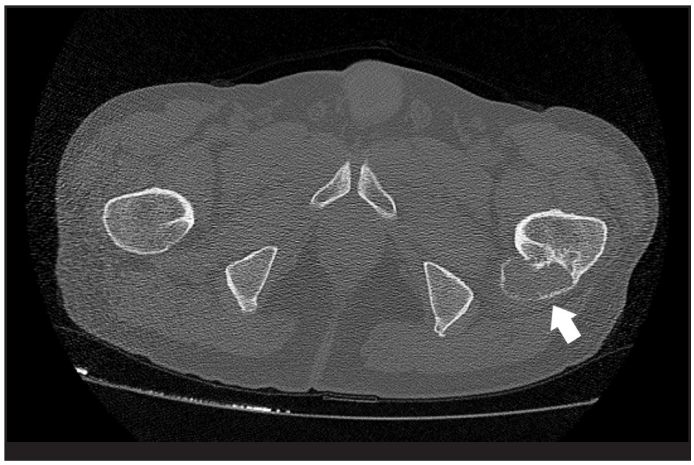

Figure 3. Computed tomography findings of the proximal femoral lesion. Axial CT image demonstrating a cortical-based sclerotic lesion with a central lucent nidus (arrow) and surrounding reactive sclerosis, characteristic of osteoid osteoma.

Author Statement Regarding the Use of Artificial Intelligence-Enhanced Tools: The authors declare that artificial intelligence (AI)-supported tools (ChatGPT, OpenAI) were used during the preparation of this manuscript for language editing and improving clarity and readability. The AI tool was not used for data analysis, interpretation of clinical findings, generation of scientific content, or decision-making. All final content, critical revisions, and responsibility for the manuscript belong solely to the authors.

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