

Extraosseous Mimics of Skeletal Metastases on Bone Scintigraphy Resolved by PET- CT: A Case Report

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ABSTRACT

Surveillance imaging after complex pelvic reconstruction for Ewing's sarcoma (ES) often presents diagnostic challenges due to reactive skeletal changes. This report presents the case of a 34-year-old male with left hemipelvic Ewing's sarcoma who underwent 17 cycles of chemotherapy followed by level I internal hemipelvectomy and reconstruction with a rod-and-screw construct and bone cement. A surveillance bone scan in June 2025 suggested osteoblastic recurrence in the left acetabulum and femoral neck. Subsequent FDG PET-CT demonstrated no focal hypermetabolic activity at these sites, identifying the bone scan findings as false positives caused by chronic remodeling and inflammation. This observation once again proves superior specificity of FDG PET-CT over bone scintigraphy, particularly in the presence of orthopedic hardware.

Keywords: Ewing Sarcoma; Hemipelvectomy; Positron Emission Tomography Computed Tomography; Bone Neoplasms; False Positive Reactions.

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INTRODUCTION

Ewing's Sarcoma (ES) is a highly aggressive primary bone malignancy that requires intensive multimodal therapy. For

pelvic presentations, internal hemipelvectomy with reconstructive stabilization is often necessary (1). However, the introduction of orthopedic hardware and bone cement significantly complicates long-term surveillance. While Technetium-99m MDP bone scintigraphy is a standard tool for monitoring skeletal metastases, its reliance on osteoblastic activity often leads to false-positive results in the context of post-surgical remodeling and mechanical stress (2).

CASE SUMMARY

A 34-year-old male with a history of histopathologically proven left hemipelvic Ewing's sarcoma underwent extensive multimodal treatment, including 17 cycles of chemotherapy and a Level I internal hemipelvectomy. The reconstruction involved a rod-and-screw construct with bone cement. A subsequent surveillance bone scan identified increased tracer uptake at the left acetabular region and the head and neck of the left femur (Figure 1). To rule out disease progression, a whole-body PET-CT was performed.

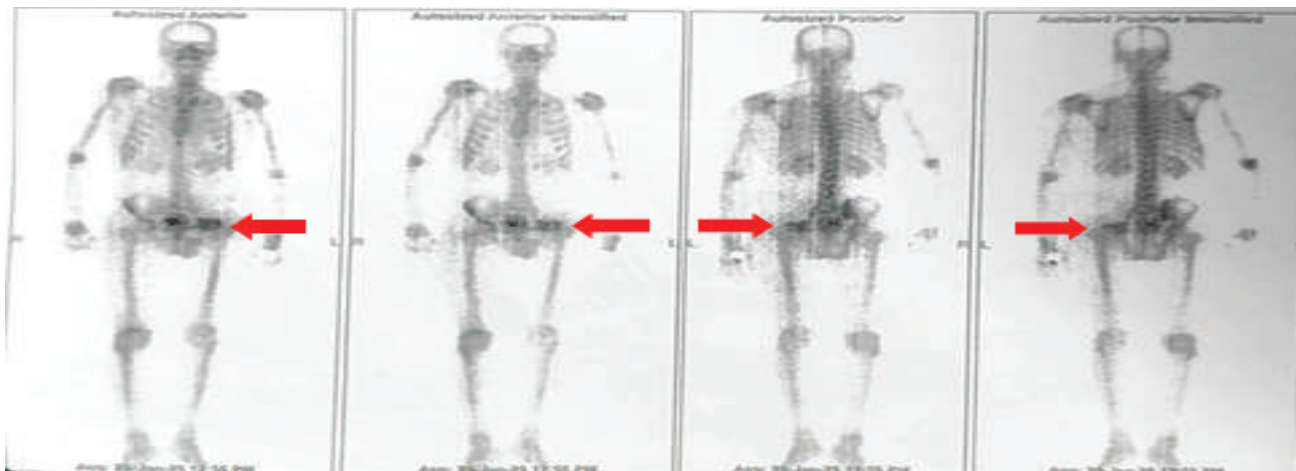


Figure 1: ^{99m}Tc- MDP bone scintigraphy images showing increased radio-tracer uptake at the left acetabular region and proximal left femur (red arrow).

The PET-CT demonstrated no focal or pathologically increased FDG uptake at the sites of the bone scan abnormalities. The areas of increased bone turnover corresponded to the margins of the reconstructive hardware

and bone cement. Only diffuse, low-grade FDG uptake was noted in the surrounding soft tissues, consistent with chronic post-surgical inflammatory response rather than a recurrent mass (figure 2,3).

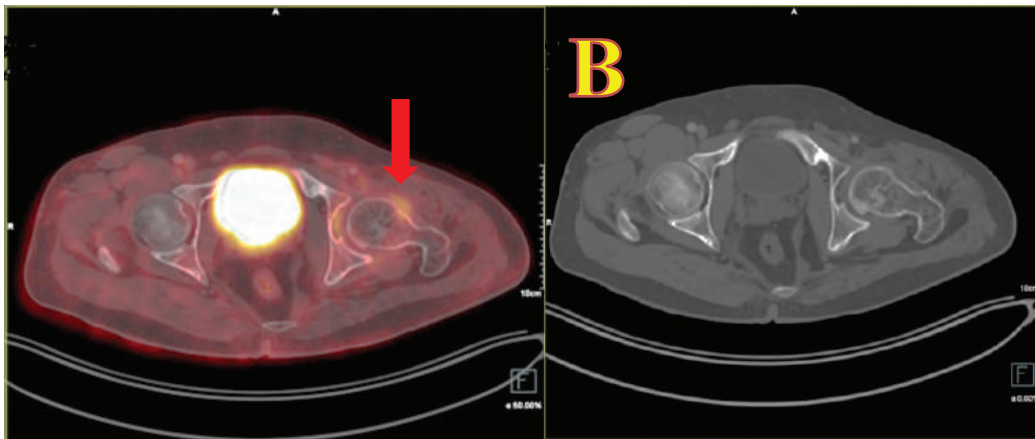


Figure 2: FDG PET/CT axial view showing diffuse low-grade uptake in the soft tissue around left femoral head (red arrow), fusion image (A), CT image (B).

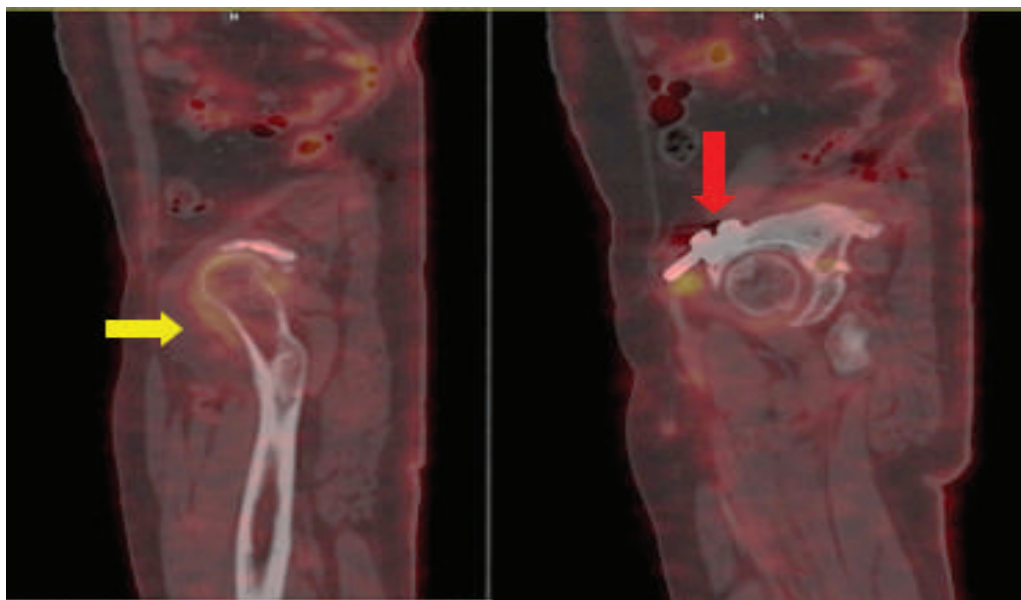


Figure 3: FDG PET/CT sagittal view showing the reconstructive hardware (red arrow) with surrounding low-grade FDG uptake (yellow arrow), indicating chronic post-surgical inflammatory response.

DISCUSSION

Ewing’s sarcoma is a rare, aggressive malignant tumor of bone and soft tissue, most frequently arising in the long bones of the extremities and pelvis, though the ribs and vertebrae may also be affected. It predominantly occurs in children and adolescents, with a slight male predominance (1). The subject of this case report matches the demographic profile of a typical Ewing’s sarcoma.

For initial diagnosis, radiographs usually demonstrate a permeative lesion with layered periosteal reaction, while MRI is invaluable for delineating local extent and soft tissue involvement (3). In the postoperative setting, patients with Ewing’s sarcoma are closely monitored using both clinical evaluation and imaging techniques including advanced nuclear medicine tools. Bone scintigraphy remains a valuable modality for detecting skeletal recurrence or new metastatic deposits, offering whole-body coverage with high

sensitivity. However, FDG PET/CT has emerged as a cornerstone in follow-up, providing comprehensive assessment of metabolic activity at the surgical site, early detection of residual or recurrent disease, and evaluation of systemic spread (4). This case illustrates the diagnostic pitfall of relying solely on bone scintigraphy for patients with complex pelvic reconstructions.

Bone scans detect hydroxyapatite deposition (osteoblastic activity), which remains elevated for years following major surgery due to altered weight-bearing and the presence of foreign bodies like bone cement (2). In such clinical context, PET/CT demonstrates clear superiority over bone scintigraphy. Bone scans, though sensitive for skeletal involvement, often yield nonspecific uptake and are limited in distinguishing postoperative changes from true recurrence. In contrast, PET/CT integrates metabolic and anatomical data, enabling precise characterization of residual or recurrent disease within complex reconstructed pelvic anatomy. Moreover, its ability to detect extra-skeletal metastases and provide whole-body staging in a single examination makes PET/CT the preferred modality for comprehensive follow-up (5-7).

Pelvic reconstruction following Ewing's sarcoma is clinically challenging, as observed in previous case reports (8). Albano et al. observed the prognostic role of F-18 FDG PET/CT in 17 Ewing's sarcoma patients and reported its superiority over conventional imaging (9). The current case report also corroborates this observation.

CONCLUSION

In patients with Ewing's sarcoma who undergo pelvic reconstruction, postoperative surveillance is critical to ensure early detection of recurrence and metastatic spread. While bone scintigraphy provides sensitive whole-body screening for skeletal lesions, its limited specificity in complex postoperative anatomy reduces its utility. PET/CT offers superior accuracy in distinguishing postoperative

changes from true disease recurrence and simultaneously evaluates extra-skeletal involvement. This comprehensive capability underscores PET/CT as the preferred modality for long-term follow-up.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

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