Case Report

Fluorodeoxyglucose PET-CT Findings Following Bone Marrow Harvesting

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Abstract

Two patients demonstrated an unusual pattern of intense bone and surrounding soft tissue hypermetabolic uptake in the posterior pelvis on fluorodeoxyglucose positron emission tomography with computed tomography PET-CT scans. After further investigation, we found that both patients underwent uncomplicated autologous bone marrow harvesting several weeks before imaging. These two cases illustrate a distinctive PET-CT appearance following bone marrow harvesting that the radiologist needs to recognize to not confuse the findings with metastatic disease.

Keywords: Bone marrow harvesting, FDG PET-CT, lymphoma

Introduction

Autologous bone marrow transplantation has become an important procedure in the management of lymphoma, leukemia, and other malignancies to protect against the myeloablative effects of therapy. Before chemotherapy and radiation therapy, hematopoietic stem cells are directly harvested from bone marrow, stored, and subsequently reintroduced after therapy has finished. In this report, we present two patients with non-Hodgkin's lymphoma that underwent fluorodeoxyglucose (FDG) positron emission tomography with computed tomography (PET-CT) which demonstrated an unusual pattern of intense bone and surrounding soft tissue uptake in the sacrum and bilateral iliac regions that was not characteristic of malignant involvement. After further investigation, we found that both patients underwent uncomplicated autologous bone marrow harvesting several weeks before PET-CT imaging. These two interesting cases illustrate a distinctive PET-CT appearance following bone marrow harvesting not described in the literature that the nuclear medicine physician needs to recognize in order not to confuse the findings with metastatic disease.

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Case Report

The first patient is a 67-year-old female who presented for a FDG PET-CT scan for relapsed refractory non-Hodgkin's follicular B-cell lymphoma. Transaxial PET images at the level of the pelvis (Figure 1, bottom image) demonstrated moderate hypermetabolic activity in the right posterior iliac bone and right sacrum with mild increased activity in the left posterior iliac bone and left sacrum. The maximum standard uptake value (SUV) was 6.6. PET-CT fusion images at the same level (Figure 1, middle image) showed hypermetabolic activity extending beyond the sacral and iliac bones, predominantly in the gluteal muscles and subcutaneous tissues, but additionally anterior to the right sacrum. CT images (Figure 1, top image) showed parallel linear osseous defects involving both the cortex and medulla tilted medially on both sides through the posterior iliac bones and sacrum causing a "sergeant stripes" appearance on CT. In addition, subcutaneous stranding was noted on CT.

After further investigation, we discovered that the patient underwent bilateral iliac crest bone marrow

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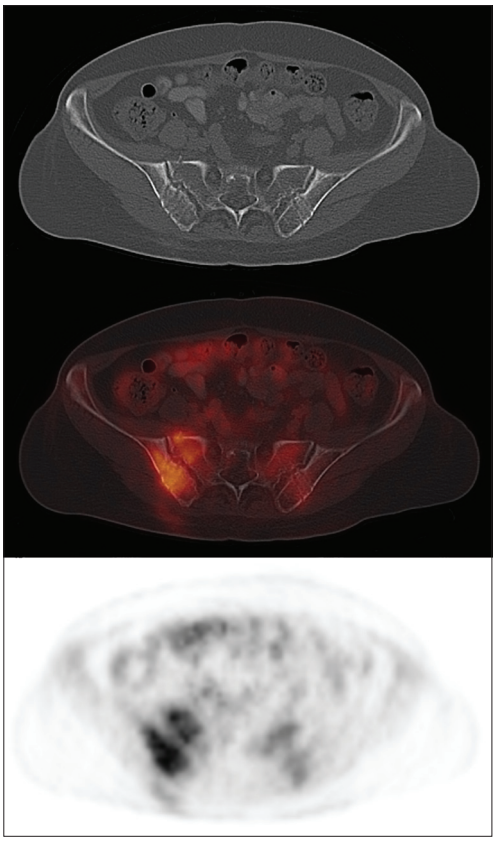

Figure 1: FDG PET-CT transaxial images showing moderate hypermetabolic activity in the posterior pelvis bone and soft tissue with linear needle tracts on CT

aspiration under general anesthesia for autologous bone marrow transplantation, 14 days before PET-CT imaging. At the time of bone marrow harvesting, analysis of bone marrow aspirate showed absence of malignancy and absence of infectious agents. Blood culture showed no bacterial growth.

The second patient is a 73-year-old female with a history of relapsed follicular non-Hodgkin's lymphoma. Twenty-five days before the PET-CT, she also had bone marrow harvesting performed under general anesthesia. Bone marrow aspirate did not reveal evidence of malignancy or infection, and cultures did not grow pathogens. Maximum intensity projections of the PET images [Figure 2] demonstrated prominent increased uptake in the bilateral sacroiliac regions with maximum SUV 10.8. Although FDG PET-CT has good sensitivity and accuracy in the detection of bone marrow involvement with lymphoma and other malignancies, the localized FDG uptake only in the sacroiliac regions with absence of other areas of abnormal uptake was suspicious for nonmalignant pathology.[1]

Transaxial PET images at the level of the pelvis [Figure 3, bottom image] showed intense increased FDG

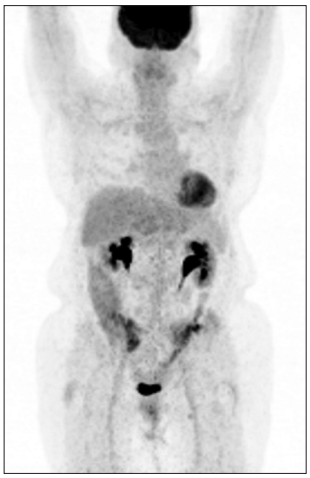

Figure 2: Maximum intensity projections of the PET images demonstrating prominent increased FDG uptake in the bilateral sacroiliac regions

uptake in the bilateral iliac bones and sacrum. Fusion images [Figure 3, middle image] showed prominent hypermetabolic activity extending beyond the borders of the bone, in particular, involving the left iliacus muscle where the harvesting needle penetrated the left iliac wing. On CT [Figure 3, top image], needle tracts are again seen angled medially and there was destruction of the right posterior iliac bone from repeated bone marrow aspirations. Prominent inflammatory changes were also seen on both CT and PET images in the posterior musculature and subcutaneous tissues.

Discussion

Autologous bone marrow transplantation has become a valuable addition to the treatment plan in relapsed Hodgkin's and non-Hodgkin's lymphoma, as well as leukemia and other malignancies. Before the myeloablative effects of chemotherapy and radiation therapy, bone marrow is directly harvested from the iliac bones or other flat bones to be stored until later reintroduction.[2] Both FDG PET and PET-CT have developed an increasing role in the monitoring of lymphoma and other malignancies of patients receiving autologous bone marrow transplantation. FDG PET and PET-CT can be used to predict outcome before and after treatment of lymphoma patients with autologous stem cell transplantation.[3,4]

Increased FDG uptake within bone marrow on PET scan is described in a variety of benign and malignant pathologies. Patterns of diffuse bone marrow uptake are seen with treatment from colony-stimulating factor, erythropoietin, anemia, inflammation, and other hematopoietic disorders. Focal increased marrow uptake may be seen with malignant involvement including metastases and multiple myeloma, external beam

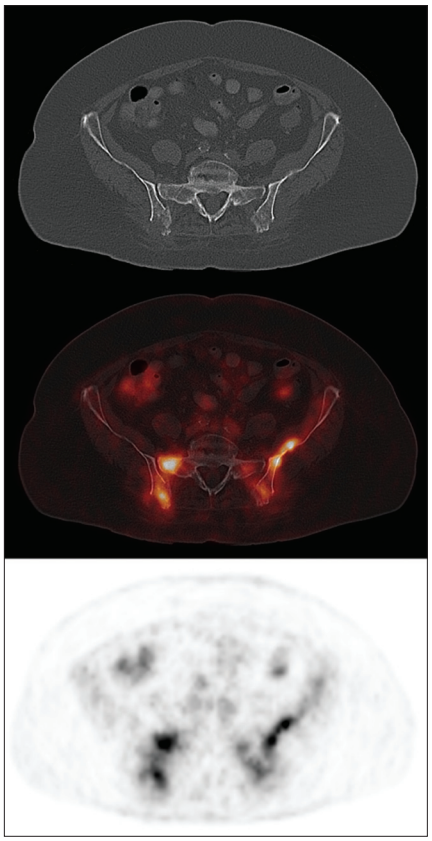

Figure 3: FDG PET-CT transaxial images showing increased FDG uptake in the bilateral iliac bones and sacrum with prominent hypermetabolic activity extending beyond the borders of the bone in the musculature and subcutaneous tissues

radiation therapy, granulomatous inflammation, and infectious sacroiliitis, among other etiologies.[5-8] In these illustrated cases, the patients' histories and distinct CT and PET findings allowed the radiologist to arrive at the correct diagnoses and not be confused with neoplastic recurrence or other pathology.

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