F-18 FDG PET-positive Fibrous Dysplasia in a Patient with Intestinal Non-Hodgkin's Lymphoma

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Fibrous dysplasia (FD) is a common benign bone disorder of an unclear etiology. It is known that FD can appear without an increased FDG uptake on F-18 fluorodeoxyglucose positron emission tomography/computed tomography (FDG-PET/CT). However, there are also several reports that FD showed increased FDG uptake and this mimicked malignant bone involvement on FDG-PET. Herein we describe a case of biopsy-proven FDG-PET positive FD in a patient with intestinal non-Hodgkin's lymphoma (NHL). A 45-year-old woman was diagnosed with intestinal NHL, which was removed by right hemicolectomy. After the operation, the FDG-PET/CT scan showed hypermetabolic activity in the right transverse process of the T10 vertebra. The patient then received a total of 6 cycles of R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisolone) chemotherapy every 3 weeks. After completion of the planned chemotherapy, the 2nd FDG-PET/CT showed increased FDG uptake (SUV_{max}=6.0 g/mL) of the previous bone lesion. The MR images revealed a T1-hypointense lesion with sharp borders in the same region, and this showed homogenous contrast enhancement on the fat-suppressed T1-weighted images. After the radiologic studies were carefully reviewed, the bone lesion was assumed to be benign such as FD. We performed bone biopsy and the histological examination confirmed the diagnosis of FD. In conclusion, bone lesions with FDG uptake need to be carefully interpreted when evaluating patients with known malignancy.

Key words

Fibrous dysplasia, Non-Hodgkin lymphoma, FDG-PET

Introduction

Fibrous dysplasia (FD) is a common benign bone disorder of an unclear etiology in which the normal bone marrow is replaced with fibro-osseous tissue (1). Because these patients are usually asymptomatic, FD is often incidentally detected on radiological examinations, including computed tomography (CT), magnetic resonance imaging (MRI) and bone scans. The use of F-18 fluorodeoxyglucose positron emission tomography (FDG-PET) is increasing for the staging of various malignant diseases (2). However, it is well known that FDG is not a tumor-specific agent

and an intense FDG uptake can occur in many non-malignant conditions such as infection, active inflammation, traumatic lesions and benign tumors (3). As a necessary consequence, an increased FDG uptake in benign lesion can be misinterpreted as metastasis in patients with malignant disease. With regard to FD, it has been reported that FD does not show FDG hypermetabolism (4,5). However, there are also several reports that FD showed increased FDG uptake and it mimicked malignant bone involvement on FDG-PET/CT (1,6-9).

Herein we describe a case of biopsy-proven FDG-PET-positive FD in a patient with intestinal non-Hodgkin's lymphoma (NHL).

Fig. 1. (A) The initial FDG-PET/CT examination at the time of diagnosis of the diffuse large B-cell lymphoma demonstrates moderate FDG hypermetabolism (SUVmax=3.1 g/mL) in a right transverse process of the T10 vertebra (arrow). (B) Six months later after completion of the planned systemic chemotherapy, the follow-up PET/CT scan demonstrates further increased FDG hypermetabolic activity (SUVmax=6.0 g/mL) (arrow).

Case Report

In April 2008, a 45-year-old woman was admitted to our hospital with a painful mass in the right lower quadrant (RLQ) of the abdomen. The patient had been in her usual state of health until two weeks before admission. She had no allergies or significant past medical history, and her family history was unremarkable. On physical examination, there was tenderness on palpating the RLQ mass. The vital signs were normal. The initial complete blood counts (CBC) were within normal ranges: a hemoglobin (Hb) level of 12.9 g/dL, a white blood cell count (WBC) of $6.63 \times 10^9/L$ and a platelets count of $232 \times 10^9/L$. The results of the serum electrolytes, renal function tests and liver function tests were normal. The level of lactate dehydrogenase was within the normal range. Computed tomography (CT) of the abdomen and pelvis was performed with intravenous contrast material and this revealed an about 15 cm sized mass in the RLQ of the abdomen. The colonoscopy showed a linear

ulcer in the terminal ileum and a submucosal tumor on the appendiceal orifice. Because of easy bleeding, we failed to obtain adequate specimens for tissue diagnosis. For diagnostic and therapeutic purposes, the patient underwent right hemicolectomy. The removed primary mass originated from the cecum and it had infiltrated into the terminal ileum. Histological examination showed diffuse large B-cell lymphoma (DLBL). When the patient recovered from the surgery, we began the staging work-up for NHL. CT of the chest revealed no lymphadenopathy and the result of bone marrow exam was normal finding. The FDG-PET/CT scan showed increased FDG uptake in the right transverse process of the T10 vertebra (SUVmax=3.1 g/mL), suggesting bone involvement of intestinal NHL (Fig. 1). The patient received a total of 6 cycles of R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine and prednisolone) chemotherapy every 3 weeks. At 3 months later, we performed the 2nd FDG-PET/CT scan, which showed increased FDG uptake (SUVmax=6.0 g/mL) of the previous bone lesion without any newly developed lesion. The bone lesion was further

Fig. 1. Continued.

evaluated by means of magnetic resonance imaging (MRI), which presented a T1-hypointense lesion with sharp borders in the same region. On the fat-suppressed T1-weighted images, it showed homogenous contrast enhancement (Fig. 2). After the radiologic studies were carefully reviewed, the bone lesion was assumed to be benign such as FD. We performed bone biopsy and the histological examination confirmed the diagnosis of FD (Fig. 3).

Discussion

FD is a dysplastic disease of the bone-forming mesenchymal cells, and this results in replacement of trabecular bone by abnormal fibrous and immature osseous tissue. It is known to be difficult to make the radiologic differential diagnosis between FD and malignant neoplasm. The MR signal intensity of FD is low to intermediate on the T1 images and it is variable on the T2-weighted sequences (10). Histopathologic examination of the T2-hyperintense cases revealed fewer bony trabeculae, less cellularity and fewer collagen fibers than that of the T2-hypointense cases (10). FD usually shows increased uptake on radioscinigraphy, but less frequently FD shows no uptake (11). CT is still the best technique

for demonstrating the typical radiographic descriptions of FD, which are the “ground-glass” pattern of the bone and the lesion being surrounded by a distinct rim of reactive bone (1). Therefore, thorough interpretation of the CT information from PET/CT study is helpful to make a correct diagnosis (12).

Yet in this case, we initially considered the bone lesion with FDG hypermetabolic activity as the involvement of lymphoma in a patient with intestinal NHL because the bone lesion was too small to get enough information from the CT image of PET/CT, which didn't show the characteristic “ground-glass” appearance. Given that R-CHOP chemotherapy is very effective for DLBL, the fact that the bone lesion on FDG-PET/CT showed increased uptake after the chemotherapy raised a doubt about the possibility of the bone lesion being lymphoma involvement, which resulted in further evaluation, including MRI and bone biopsy.

With regard to FDG-PET/CT, it is known that there is large variability in the FDG avidity of FD (13). There are several reports that FD showed increased FDG uptake and this mimicked malignant bone involvement (1,6-9). However, the discrimination between FD and malignant bone tumor is not well defined because of a large SUVmax overlap (13-15). The SUVmax values of FD have ranged from 3.8 to 7.2 in the previous case reports. There are several possible explanations for the different degree of FDG

Fig. 2. The axial T1 weighted MR image shows a hypo-intense lesion (A, arrow) and the axial contrast-enhanced, fat-suppressed MR image shows homogeneous contrast enhancement of the well-defined lesion (B, arrow).

Fig. 3. Hematoxyline and eosin staining of the surgical biopsy specimen of the right transverse process of the T10 vertebra demonstrates bone trabeculae without osteoblastic rimming and there is bland spindle-cell proliferation. The bone trabeculae are composed of immature and disorganized osteoid (H & E, $\times 40$).

hypermetabolism. Histiocytic and giant cell-containing benign bone lesions in particular can show FDG hypermetabolic activity (13), and the turnover of the remodeling process may have various rates in different patients who have different stages of this disease (1). In addition, fibroblasts predominately proliferate in FD lesions, and the difference in the amount of proliferating fibroblasts or their metabolic turnover may result in a discrepancy of FDG uptake among FD lesions (1). This hypothesis concerning proliferating fibroblasts may also explain the change in FDG uptake on the serially performed PETs in our patient.

In conclusion, we report here on a case of biopsy-proven FDG-PET-positive FD in a patient with intestinal NHL. Bone lesions with increased FDG uptake need to be carefully interpreted when evaluating patients with known malignancy, and if possible, a tissue biopsy should be considered to confirm the diagnosis.

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