G-CSF induces focal intense bone marrow FDG uptake mimicking multiple bone metastases from uterine cervical cancer: a case report and review of the literature

S. Mabuchi[1], A. Morimoto[1], M. Fujita[1], K. Isohashi[2], T. Kimura[1]

[1]Department of Obstetrics and Gynecology, [2]Department of Radiology, Osaka University Graduate School of Medicine, Osaka (Japan)

Summary

We describe a case of FIGO Stage IB2 uterine cervical cancer which showed focal intense bone marrow FDG uptake mimicking bone metastases after the administration of G-CSF. This case highlights the importance of avoiding the administration of G-CSF prior to PET imaging.

Key words: G-CSF; FDG PET/CT; Cervical cancer; Bone metastasis.

Introduction

It is known that F-18-fluorodeoxyglucose (FDG) accumulates in the bone marrow of healthy subjects [1, 2]. It was also reported that granulocyte colony-stimulating factor (G-CSF) administraion induces increased bone marrow FDG uptake [1, 2]. According to previous reports, the increased bone marrow FDG uptake induced by G-CSF treatment is generally homogenous rather than focal [1, 2]. We describe a case of FIGO Stage IB2 uterine cervical cancer which showed focal intense bone marrow FDG uptake mimicking bone metastases after the administration of G-CSF. This case highlights the importance of avoiding the administration of G-CSF prior to positron emission tomography/computed tomography (PET/CT) imaging.

Case Report

A 50-year-old woman presented with postmenopausal vaginal bleeding. Biopsies from the 4.5 cm cervical lesion demonstrated a non-keratinizing type squamous cell carcinoma. A pretreatment work-up including magnetic resonance imaging (MRI) and FDG PET/CT revealed no evidence of adenopathy or metastatic disease. The patient was diagnosed with FIGO Stage IB2 cervical cancer and treated with concurrent chemoradiotherapy.

As serious pancytopenia developed during the course of external beam radiotherapy (EBRT), both concurrent chemotherapy and EBRT were discontinued (day 23) and treatment with blood transfusion (both red blood cells and platelets) and daily subcutaneous injection of 100 μg of G-CSF was initiated. As her pancytopenia persisted, FDG PET/CT was performed to investigate whether systemic metastases including bone marrow were present (day 36). FDG PET/CT showed diffusely intense FDG uptake in the bone marrow with multiple focal lesions in the vertebrae, which were highly suspicious of metastases (Figure 1A). However, a bone marrow biopsy revealed no evidence of malignant cell infiltration (day 39). As none of the other clinical and radiologic findings indicated progressive disease, we concluded that the first PET findings of intense FDG uptake in bone marrow and vertebrae had been caused by a physiological response to the G-CSF administration. On another FDG PET/CT conducted four weeks after the last G-CSF administration, the abnormal focal uptake demonstrated in the first examination completely disappeared (Figure 1B). The patient's hematological condition gradually recovered, and she completed her radiotherapy without concurrent chemotherapy. She is currently free of disease.

Discussion

FDG PET/CT is reported to be effective for the detection of bone or bone marrow metastases from human malignancies [3]. Some investigators have observed an intense FDG uptake in normal bone marrow after the administration of G-CSF [1, 2]. This increased FDG uptake in normal bone marrow after G-CSF administration could be explained by increased bone marrow metabolism and cellularity due to G-CSF treatment.

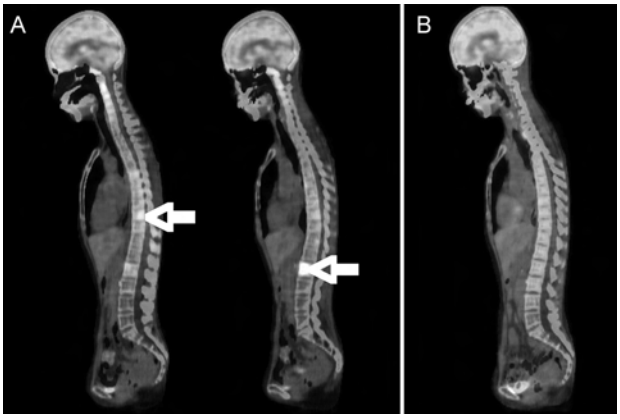

Figure 1. — Sagittal positron emission tomography (PET) images. A) obtained just after G-CSF administration. B) obtained 4 weeks after the cessation of G-CSF therapy.

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According to previous reports, the increased bone marrow FDG uptake induced by G-CSF treatment is generally homogenous rather than focal [1, 2]. However, two cases showing multiple bone marrow FDG uptake foci after G-CSF administration have been reported [4, 5]. Of these, one was a patient with primary peritoneal carcinoma [4], and the other was a patient with aplastic anemia [5]. In both cases, multiple bone metastases were initially suspected, but the FDG uptake was later found to have been due to the stimulatory effect of G-CSF on the bone marrow [4, 5]. Therefore, in patients receiving G-CSF treatment, the timing of FDG PET/CT study is critical for differentiating between metastatic disease and stimulated bone marrow. In the previous reports, the increased bone marrow FDG uptake was induced immediately after the administration of G-CSF, and sustained for up to four weeks after the cessation of G-CSF therapy [1, 2]. Therefore, it is suggested that FDG PET/CT should be delayed for at least four weeks after completion of G-CSF therapy to avoid the misinterpretation of increased FDG uptake as bone or bone marrow metastases.

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Address reprint requests to:
S. MABUCHI, M.D., Ph.D.
Department of Obstetrics and Gynecology
Osaka University Graduate
School of Medicine
2-2 Yamadaoka, Suita
Osaka 565-0871 (Japan)
e-mail: smabuchi@gyne.med.osaka-u.ac.jp