Granulocytic sarcoma of the pancreas on $^{18}$F-FDG PET/CT

A case report

Akira Ishii, MD, Tadakazu Kondo, MD, PhD, Tomomi Oka, MD, Yuji Nakamoto, MD, PhD, Akifumi Takaori-Kondo, MD, PhD

Abstract

Rationale: Granulocytic sarcoma (GS) is defined as leukemia infiltration in any organ other than the bone marrow. GS rarely occurs in the pancreas. Here, we present the first report of GS in the pancreas on $^{18}$F-fluorodeoxyglucose positron emission tomography/computed tomography ($^{18}$F-FDG PET/CT).

Patient concerns: A 19-year-old male patient with acute myeloid leukemia received a human leukocyte antigen-haploidentical stem cell transplant as a second transplant while in second complete remission.

Interventions: After a second stem cell transplant, obstructive pancreatitis accompanied by a mass in the pancreatic head was observed. FDG-PET/CT revealed abnormal activity in the head of the pancreas and the skin in the patient’s left breast area.

Diagnoses: Pathological demonstration confirmed relapsed acute myeloid leukemia in both the lesions.

Outcomes: This is the first report showing the $^{18}$F-FDG PET/CT findings of GS in the pancreas.

Lessons: $^{18}$F-FDG PET/CT may help determine the stage of GS.

Abbreviations: $^{18}$F-FDG PET/CT = $^{18}$F-fluorodeoxyglucose positron emission tomography/computed tomography; CT = computed tomography; GS = granulocytic sarcoma; SUV = standardized uptake value maximum.

Keywords: $^{18}$F-FDG PET/CT, granulocytic sarcoma, pancreas

1. Introduction

Granulocytic sarcoma (GS) is defined as leukemia infiltration in any organ other than the bone marrow. GS of the pancreas is rare presentation of acute myeloid leukemia relapse. Sometimes, it occurs after allogeneic transplantation, presumably reflecting weaknesses of graft-versus-leukemia effect in the extramedullary tissues. Here, we present the first report of GS in the pancreas on $^{18}$F-fluorodeoxyglucose positron emission tomography/computed tomography ($^{18}$F-FDG PET/CT).

2. Case report

A 19-year-old male patient with acute myeloid leukemia received a human leukocyte antigen-haploidentical stem cell transplant as a second transplant while in second complete remission.

The conditioning regimen consisted of total body irradiation, melphalan, fludarabine, and cytarabine.

Five months after the transplant, he developed epigastric and back pain, and a skin tumor appeared on the abdomen. Laboratory analyses showed elevated amylase (935 U/L) and lipase (2547 U/L) levels. CT revealed distension of the Wirsung duct and swelling of the pancreas. Diffusion-weighted magnetic resonance imaging demonstrated restricted diffusion in a portion of the pancreatic head, corresponding to a pancreatic mass. Abdominal skin biopsy and endoscopic ultrasound-guided fine needle aspiration of the pancreatic mass revealed tumor cells positive for the myeloid marker myeloperoxidase and CD34, as determined by immunohistological examination. Furthermore, $^{18}$F-FDG PET/CT was also performed. Although the blood glucose level was not measured before the examination, in spite of his steroid diabetes, 3 focal lesions (Fig. 1A) with moderate metabolic activity were observed in the pancreatic head (standardized uptake value maximum [SUV max], 3.5) (Fig. 1B, CT; C, PET; D, fusion), in the skin in his left breast area (SUV max, 2.6) (Fig. 1E, CT; F, PET; G, fusion), and in the abdominal skin (SUV max, 1.5). A diagnosis of relapsed acute myeloid leukemia involving the pancreas and the skin was made, and salvage chemotherapy was consequently initiated.

3. Discussion

This is the first report showing the $^{18}$F-FDG PET/CT findings of a GS in the pancreas. The differential diagnosis between pancreatic GS and other diseases using $^{18}$F-FDG PET/CT is limited when the tumor is accompanied by obstructive pancreatitis. GS is defined as leukemia infiltration in any organ other than the bone marrow. GS develops in 9% of patients with acute myeloid leukemia[1] and
occurs in 5% to 7% of patients undergoing allogeneic hematopoietic stem cell transplantation as a relapse. Only approximately 20 cases of pancreatic GS have been reported. In almost all cases, CT and/or magnetic resonance imaging were performed, whereas the 18F-FDG PET/CT findings remain unknown. The reported 18F-FDG PET uptake of GS ranges between SUVmax 2.6 and 9.7, which may overlap with that in other pancreatic cancers and inflammatory responses. Because of these overlaps, it may be difficult to distinguish GS from other diseases if uptake is detected in the pancreas. In our case, obstructive pancreatitis accompanied GS, possibly making it more difficult to distinguish malignancy from an inflammatory response. Moreover, the uptake in the pancreas might have been decreased by steroid diabetes in our case. Thus, while 18F-FDG PET/CT may be useful to detect GS in the early stage, determine the stage, and evaluate the treatment response, if GS develops in the pancreas, especially when accompanied by pancreatitis, 18F-FDG PET/CT shows limited usefulness for the diagnosis. Accordingly, it is necessary to perform biopsy to confirm the diagnosis, similar to that performed in our case.

In conclusion, this is the first report showing the 18F-FDG PET/CT findings of GS in the pancreas; 18F-FDG PET/CT may help determine the stage of GS.

4. Consent
Informed consent was signed by the patient for the publication of this report and related images.

References
[1] Ohanian M, Faderl S, Ravandi F, et al. Is acute myeloid leukemia a liquid tumor? Int J Cancer 2013;133:534–43.
[2] Gunduz E, Akay MO, Karagülle M, et al. Isolated granulocytic sarcoma of the breast after allogeneic stem cell transplantation: a rare involvement also detected by 18FDG-PET/CT. Turk J Haematol 2014; 31:88–91.
[3] Onuki K, Morishita Y, Sakai D, et al. Relapse of acute myeloid leukemia mimicking autoimmune pancreatitis after bone marrow transplantation. Intern Med 2014;53:247–51.
[4] Kawamura M, Kaku H, Funata N, et al. FLT3-internal tandem duplication in a pediatric patient with t(8;21) acute myeloid leukemia. Cancer Genet Cytogenet 2010;203:292–6.
[5] Kamada Y, Suzukiwa K, Taoka K, et al. Relapse of acute myeloid leukemia with t(16;21)(p11;q22) mimicking autoimmune pancreatitis after second allogeneic bone marrow transplantation. ISRN Hematol 2011;2011:285487.
[6] Messager M, Amielh D, Chevallier C, et al. Isolated granulocytic sarcoma of the pancreas: a tricky diagnostic for primary pancreatic extramedullary acute myeloid leukemia. World J Surg Oncol 2012; 10:13.
[7] Li XP, Liu WF, Ji SR, et al. Isolated pancreatic granulocytic sarcoma: a case report and review of the literature. World J Gastroenterol 2011; 17:540–2.
[8] Rong Y, Wang D, Lou W, et al. Granulocytic sarcoma of the pancreas: a case report and review of the literatures. BMC Gastroenterol 2010; 10:80.
[9] Schäfer HS, Becker IH, Schmitt-Gräff H, et al. Granulocytic sarcoma of core-binding factor (CBF) acute myeloid leukemia mimicking pancreatic cancer. Leuk Res 2008;32:1472–5.
[10] Breccia M, D’Andrea M, Mengarelli A, et al. Granulocytic sarcoma of the pancreas successfully treated with intensive chemotherapy and stem cell transplantation. Eur J Haematol 2003;70:190–2.
[11] Servin-Abad L, Caldera H, Cardenas R, et al. Granulocytic sarcoma of the pancreas: A report of one case and review of the literature. Acta Haematol 2003;110:188–92.
[12] Ravandi-Kashani F, Esley E, Corles J, et al. Granulocytic sarcoma of the pancreas: a report of two cases and literature review. Clin Lab Haematol 1999;21:219–24.
[13] Marcos HB, Semelka RC, Woosley JT. Abdominal granulocytic sarcomas: demonstration by MRI. Magn Reson Imaging 1997;15:873–6.
[14] Moreau P, Milpied N, Thomas O, et al. Primary granulocytic sarcoma of the pancreas: efficacy of early treatment with intensive chemotherapy. Rev Med Interne 1996;17:877–9.
[15] King DJ, Ewen SW, Sewell HF, et al. Obstructive jaundice. An unusual presentation of granulocytic sarcoma. Cancer 1987;60:114–7.
[16] Ueda K, Ichikawa M, Takahashi M, et al. FDG-PET is effective in the detection of granulocytic sarcoma in patients with myeloid malignancy. Leuk Res 2010;34:1239–41.
[17] Santhosh S, Mittal BR, Rana SS, et al. Metabolic signatures of malignant and non-malignant mass-forming lesions in the periampulla and pancreas in FDG PET/CT scan: an atlas with pathologic correlation. Abdom Imaging 2015;40:1285–315.
[18] Cunningham I, Kohno B. (18) FDG-PET/CT: 21st century approach to leukemic tumors in 124 cases. Am J Hematol 2016;91:379–84.