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A case of non-Hodgkin's lymphoma of the ovary: Usefulness of ^{18}F-FDG PET for staging and assessment of the therapeutic response

Daisuke KOMOTO,* Yoshihiro NISHIYAMA,* Yuka YAMAMOTO,* Toshihide MONDEN,* Yasuhiro SASAKAWA,* Yoshihiro TOYAMA,* Katashi SATOH,* Masayuki OHNO,** Kenji KANENISHI** and Motoomi OHKAWA*

*Departments of *Radiology, and **Perinatology and Gynecology, Faculty of Medicine, Kagawa University*

Primary ovarian lymphoma as the initial manifestation is rare. A 27-year-old woman presented to our hospital with the symptoms of lower abdominal fullness and pollakisuria. CT scan and MRI revealed bilateral ovarian tumors, which showed heterogeneous masses. ^{18}F-FDG PET revealed strong uptake by the abdominal masses, and the maximum standardized uptake value (SUV_{max}) was 12.5. Abnormal uptake was not shown by other regions. An exploratory laparotomy was performed. Histological findings revealed diffuse large B-cell lymphoma. The clinical stage was IV according to the Ann Arbor system. International prognostic index (IPI) was 3 (high-intermediate risk). Chemotherapy was administered consisting of three courses of an R-CHOP regimen, and ^{18}F-FDG PET and CT scan revealed no signs of involvement 3 months after initiation of the chemotherapy. ^{18}F-FDG PET was a useful method for staging and assessment of the therapeutic response in primary ovarian lymphoma.

Key words: lymphoma, ovary, PET

INTRODUCTION

INVOLVEMENT of the ovary by malignant lymphoma is well known as a late manifestation of disseminated nodal disease. But primary ovarian lymphoma as the initial manifestation is unusual.[1–5] Therefore, there is no literature on the F-18-fluorodeoxyglucose (^{18}F-FDG) PET findings of primary ovarian lymphoma to our knowledge. In this article, we presented a patient who had bilateral ovarian involvement as the only manifestation of malignant lymphoma and had bilateral strong ^{18}F-FDG uptake.

CASE REPORT

A 27-year-old woman presented to our hospital with the symptoms of lower abdominal fullness and pollakisuria. The physical examination revealed a bulky central pelvic mass. Neither the liver nor spleen was palpable. No adenopathy was noted. The serum tumor markers were positive for CA125: 664 U/m*l* (normal range < 35 U/m*l*), lactic dehydrogenase (LDH): 1852 IU/*l* (180–460 IU/*l*) and serum soluble interleukin-2 receptor (sIL-2R): 1183 U/m*l* (145–520 U/m*l*), and negative for CA19-9, CA15-3 and α-fetoprotein. CT scan revealed bilateral ovarian tumors, which showed heterogeneous enhancement. The right ovarian tumor measured about 21 cm and the left about 6 cm in diameter (Fig. 1). MRI revealed lobulated heterogeneous masses, which were hypointense on T1WI and mildly hyperintense on T2WI (Fig. 2). ^{18}F-FDG PET revealed strong uptake by the abdominal masses, and the maximum standardized uptake value (SUV_{max}) was 12.5 (Fig. 3). Abnormal uptake was not shown by other regions.

An exploratory laparotomy followed by a right salpingo-oophorectomy was performed. The left ovary and the uterus were preserved in consideration of the patient's youth. Histological findings revealed diffuse large B-cell lymphoma of the right ovary. The clinical stage was IV according to the Ann Arbor system. International prognostic index (IPI) was 3 (high-intermediate risk).

Chemotherapy was administered consisting of three courses of an R-CHOP regimen (rituximab, cyclophosphamide, doxorubicin, vincristine and prednisolone), and

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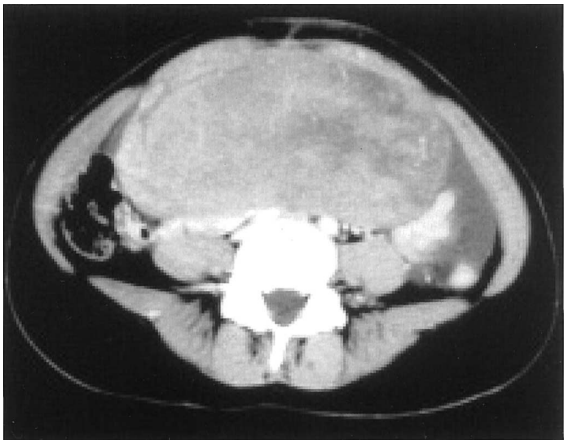
For reprint contact: Daisuke Komoto, M.D., Department of Radiology, Faculty of Medicine, Kagawa University, 1750–1 Ikenobe, Miki-cho, Kita-gun, Kagawa 761–0793, JAPAN.

E-mail: komosuke@r4.dion.ne.jp



A

B

Fig. 1 Enhanced CT scan revealed bilateral ovarian tumors, which showed heterogeneous enhancement. (A) CT scan showing a large mass of the right ovary. (B) CT scan showing a mass of the left ovary (*arrow*) smaller than the right.

^{18}F-FDG PET (Fig. 4) and CT scan revealed no signs of involvement 3 months after initiation of the chemotherapy.

DISCUSSION

Malignant lymphomas frequently involve the ovaries at necropsy or autopsy with a frequency at 7–26%.[1] But primary ovarian lymphoma is extremely rare, accounting for 0.5% of all non-Hodgkin's lymphomas (NHL) and 1.5% of all ovarian neoplasms.[4] Primary ovarian lymphomas present more often with pelvic complaints and are usually larger than secondary tumors. Burkitt's lymphoma and diffuse large B-cell lymphoma are the most common histologic types in NHL.[6] The differential diagnosis of solid ovarian tumors includes rhabdomyosarcoma, extragonadal teratoma, neurogenic tumor, glanulosa cell tumor and dysgerminoma.[7] An exact diagnosis can only be confirmed by histological examination of the tumor tissue.[1,7,8]

Ferrozzi et al. reported five patients with ovarian NHL

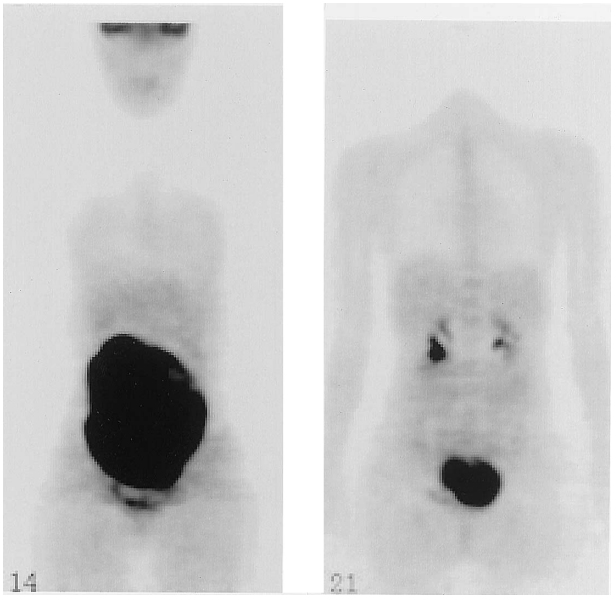
A

B

Fig. 2 MRI of the right ovary showed a lobulated heterogeneous mass. (A) The mass showed hypointensity on T1WI. (B) The mass showed mild hyperintensity on T2WI.

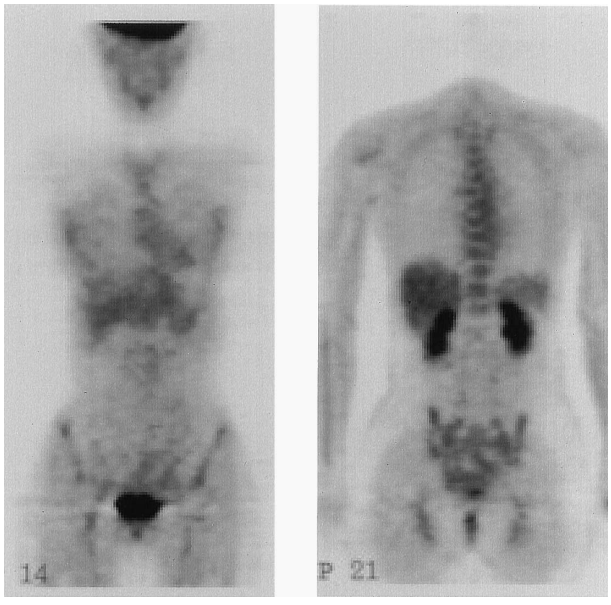
(one primary lymphoma and four systemic NHL) and determined their most typical imaging pattern on MRI.[9] They reported that primary ovarian lymphoma must be considered when large bilateral ovarian masses showed a lobulated and homogeneous appearance (low signal intensity on T1WI and mildly high intensity on T2WI).[9] However, in our case, the findings of MRI showed heterogeneous signal intensity on both T1WI and T2WI. Weingertner et al. reported that MRI showed a heterogeneous mass reshaped by several necrotic centers in the patient with primary ovarian lymphoma.[10] These findings were similar to those of our case.

In the patient with malignant lymphoma, several reports have proved the usefulness of ^{18}F-FDG PET for the diagnosis and evaluation of the post-therapeutic re-



A B

Fig. 3 ^{18}F-FDG PET before operation and chemotherapy revealed strong uptake in abdominal masses. (A) The mass of the right ovary showed strong uptake. (B) The mass of the left ovary showed strong uptake.



A B

Fig. 4 ^{18}F-FDG PET after chemotherapy revealed no abnormal uptake. (A) The abnormal uptake had disappeared in the region of the right ovary. (B) The abnormal uptake had disappeared in the region of the left ovary.

sponse.[11,12] But there is no literature on the ^{18}F-FDG PET findings of primary ovarian lymphoma to our knowledge. In our case, ^{18}F-FDG PET revealed strong uptake by the abdominal masses, and SUV_{max} was 12.5. Lapela et al. reported that SUV_{max} in ^{18}F-FDG PET in untreated 22 NHL ranged from 3.5 to 31.0 (median 8.5).[13] Yamane et al. examined changes in ^{18}F-FDG PET results on day 1 after the initiation of chemotherapy for malignant lymphoma.[14] The SUV_{max} at day 1 after chemotherapy was significantly lower than that before chemotherapy.[14] In our case, ^{18}F-FDG PET revealed that the abnormal uptakes had disappeared 3 months after initiation of the chemotherapy, and no abnormality was noted on CT scan. ^{18}F-FDG PET was a useful method for staging and assessment of the therapeutic response in primary ovarian lymphoma.

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