Usefulness of positron emission tomography for diagnosis of malignancy in a calcified lesion: A case report

N. Umesaki[1], *M.D., Prof. & Chairman*; **T. Tanaka**[1], *M.D., Assoc. Prof.*; **M. Miyama**[2], *M.D.*; ***S. Ogita**[2], *M.D., Prof. & Chairman*; ****H. Ochi**[3], *M.D., Prof. & Chairman*

[1]*Department of Obstetrics and Gynecology, Wakayama Medical University, Wakayama;*
[2]*Department of Obstetrics and Gynecology *and* [3]*Nuclear Medicine**, Osaka City University Medical School, Osaka (Japan)*

Summary

When calcified lesions in the liver or spleen are found during follow-up of patients who have undergone debulking surgery and chemotherapy for advanced ovarian carcinoma, it is very difficult to differentiate recurrent cancer from secondary change after chemotherapy. We present here a patient in whom calcified lesions in the liver and spleen were diagnosed as malignancy on the basis of a preoperative PET study. Malignancy was confirmed by histologic examination after surgery.

Key words: PET; Calcified lesion; Ovarian carcinoma; Serous cystadenocarcinoma; Psammoma body.

Introduction

In the USA, ovarian cancer occurs in approximately 24,000 women every year, and over half the patients die as a result [1]. Two-thirds of patients have disseminated lesions by the time they are diagnosed because subjective symptoms are few even in patients with advanced disease [2]. For these patients, several courses of chemotherapy are usually given after debulking surgery. When calcified lesions in the liver or spleen are found after primary treatments, however, it is very difficult to differentiate them from secondary histologic change due to chemotherapy from recurrent tumors. We present a case of a patient in whom calcified lesions in the liver and spleen were diagnosed as malignant on the basis of preoperative positron emission tomography (PET). The lesion was confirmed histologically after surgery to be a recurrence of serous cystadenocarcinoma of the ovary.

Case Report

In June 1998, a 35-year-old nulliparous woman visited the Gynecologic Outpatients Clinic at Osaka City University Hospital with a feeling of abdominal distension. Upon pelvic examination, her left ovary was found to be enlarged. Vaginal ultrasonography revealed a solid ovarian tumor. Magnetic resonance (MR) imaging showed a heterogeneous appearance with partial high signal intensity on T1-weighted images and a heterogeneous appearance with medium to high signal intensity on T2-weighted images. These findings were suspect for ovarian malignancy. The patient's serum CA-125 level was 860 u/ml (normal, less than 35 u/ml). Under the diagnosis of ovarian carcinoma, exploratory laparotomy was performed. An enlarged left ovary (12 x 8 x 6 cm) was adhered to the small intestine. Since histologic examination during surgery revealed serous cystadenocarcinoma, a total abdominal hysterectomy, bilateral salpingo-oophorectomy, pelvic and periaortic lymph node dissection, and partial omentectomy were performed. Multiple residual metastatic lesions approximately 3 x 3 x 3 mm were present on the diaphragm.

One month after surgery, the patient's serum CA-125 levels had decreased to 7 u/ml. Three courses of adjuvant chemotherapy with cisplatin and cyclophosphamide were given.

In March 2000, the patient complained of left epigastric pain. Computed tomography (CT) revealed calcified lesions in the liver and spleen (Figures 1 and 2). The serum CA-125 level was 11 IU/ml, however. For differential diagnosis, an 18F-fluorodeoxyglucose (FDG) PET study was performed (HEADTOME IV, 1400W-10; Shimadzu Corp., Kyoto, Japan) to assess the metabolic activity of the tumor. Tracer accumulations in elliptical regions of interest (ROIs) on PET images were determined based on standardized uptake values (SUVs), i.e. the radioactive concentration in a hot spot divided by the injected FDG dose and the patient's body weight. The cut-off SUV for pelvic malignant tumors in our hospital is 2.6 [3]. The SUV of the patient's hepatic calcified lesion was 5.2, and that of the splenic lesion was 6.9 (Figure 3). These values suggest malignancy, and thus the lesions were strongly suspected to be recurrent ovarian carcinoma. A surgeon was consulted for extirpation.

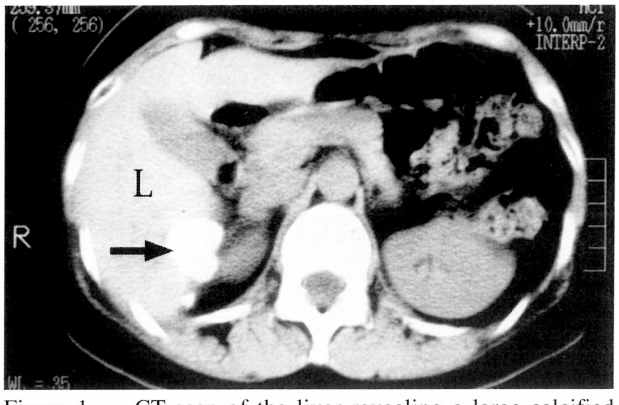

Figure 1. — CT scan of the liver revealing a large calcified lesion.
L: liver; Arrow: calcified lesion.

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Figure 2. — CT scan of the spleen revealing a large calcified lesion.
L: liver; S: spleen, Arrow: calcified lesion.

At surgery, recurrent lesions were found on the surface of the liver and spleen, and partial hepatectomy and splenectomy were performed. Histologic examination of the specimens revealed serous cystadenocarcinoma with psammoma bodies (Figure 4a, 4b). The multiple residual masses observed during the first surgery were reduced in number, and histologic study now revealed benign granulation tissue. After surgery, the patient underwent combination chemotherapy with paclitaxel and carboplatin.

Discussion

Calcified lesions in tissue are usually derived from secondary changes by necrosis or granulomatous changes after infection. The calcified lesions of uterine leiomyoma are of the former type, and the latter type are found in cases of tissue tuberculosis. Calcification of a cancerous mass is usually derived from secondary necrotic or hemorrhagic changes after systemic treatment or local radiation. Primary calcified lesions are quite rare.

Thirty percent of serous cystadenocarcinomas contain histologic calcifications derived from psammoma bodies, which are thought to be degenerative in nature [4]. Metastatic calcification is radiographically detectable in approximately 12% of these cases [5]. The recurrent lesions of this most common ovarian cancer are usually found along the right hemidiaphragm and liver capsule and occur frequently [6] because cancer cells in the peritoneal cavity are absorbed by diaphragmatic stomata that drain to anterior or mediastinal nodes [6, 7].

The present case was advanced, and there were many small residual implants. Thus, calcified lesions on the surface of the spleen and liver were suspected recurrences.

Although the patient's serum CA-125 level was 860 u/ml before surgery, it returned to normal after the first

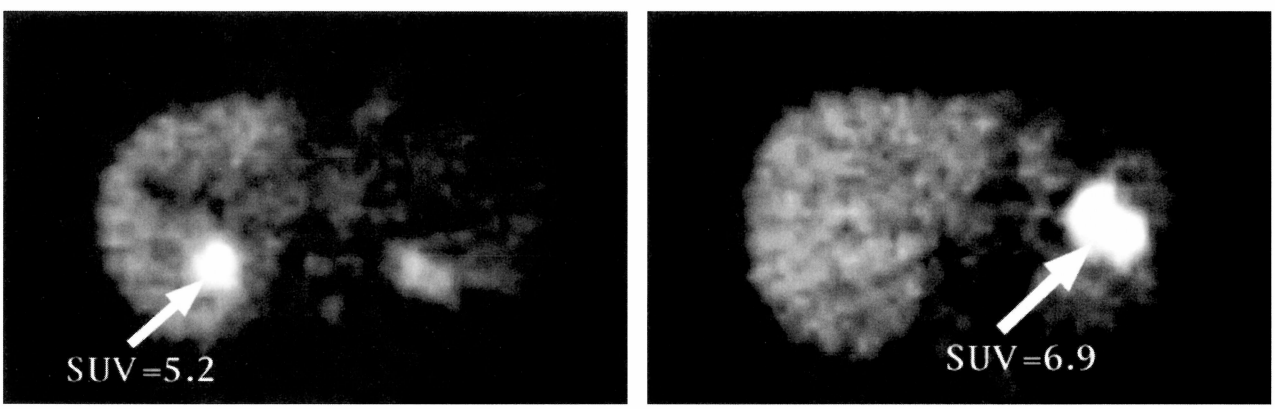

Figure 3 (a, b) — FDG-PET finding. FDG-uptake in the liver (SUV=5.2) (Figure 3a) and spleen (SUV=6.9) (Figure 3b) is observed.

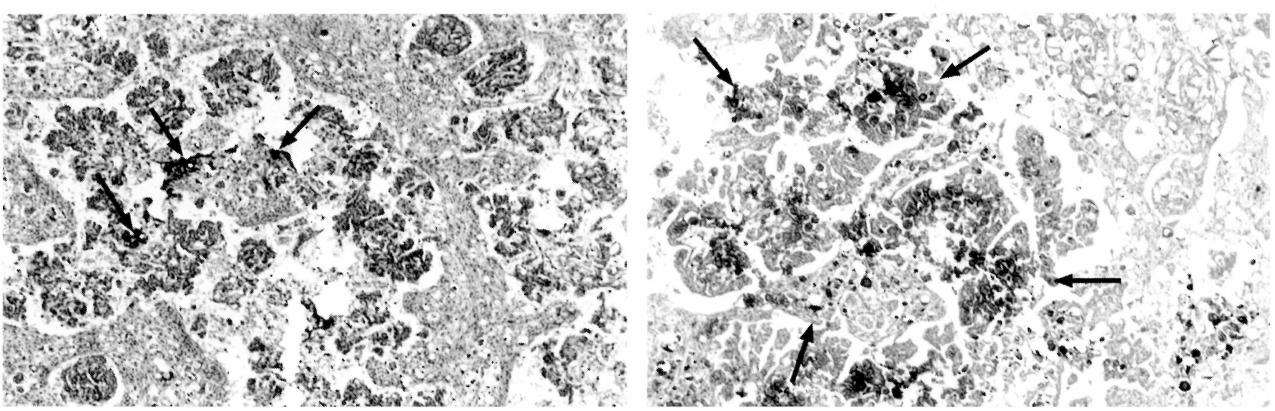

Figure 4 (a, b) — A histologic surgical specimen from the liver (Figure 4a) and spleen (Figure 4b) revealing round, darkly stained psammoma bodies with serous cystadenocarcinoma. (hematoxylin and eosin staining x100). Arrow: psammoma body.

treatment. Further, diaphragmatic calcifications are rarely found to be associated with asbestos exposure [8]. PET was performed to clarify whether the calcified lesions were malignant or not. Malignancy was confirmed by a PET study because of the high metabolic activity observed [9]. PET has been applied in the field of gynecologic oncology to diagnose ovarian cancer [10], uterine cervical cancer [11, 12], and sarcoma [3]. In the present case, PET SUVs for the liver and spleen were positive for malignancy.

We suggest that PET is a useful tool for diagnosing malignancy in calcified lesions.

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Address reprint requests to:
N. UMESAKI, M.D.
Department of Obstetrics and Gynecology
Wakayama Medical University
811-1 Kimiidera, Wakayama 641-0012
(Japan)