

False-positive fluorine-18 fluorodeoxy-D-glucose positron emission tomography imaging caused by retained gauze in a woman with recurrent ovarian cancer: A case report

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Summary

We report a case of a 47-year-old woman with a false-positive [¹⁸F]fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (PET) result caused by retained gauze during resection of liver metastasis for a Stage IV ovarian cancer at primary cytoreductive surgery. She achieved complete remission and remained free of progression for seven years. Owing to elevation of CA-125, computed tomography and PET studies were performed, and both showed two potentially resectable lesions. One was located ventral to the diaphragmatic surface of the left hepatic lobe and the other was around the gauze at the right hepatorenal fossa. During surgical intervention, the left supraheptic tumor was excised and the gauze with surrounding granulation was removed. However, the former proved to be recurrent ovarian cancer with the latter proven false-positive. This case demonstrates that PET results should be interpreted with caution in differentiating a benign inflammatory process from malignant abnormalities, especially in regions with a high probability of granulomatous lesions.

Key words: PET; False positive; Ovarian neoplasms; Gauze.

Introduction

Ovarian cancer is the second most prevalent gynecologic malignancy. Since it is usually found at advanced stage, fewer than one-third of International Federation of Gynecology and Obstetrics (FIGO) Stage III or IV patients achieve a long-term disease-free period [1]. To detect recurrence, CA125 and radiographic surveillance is usually prescribed for patients with ovarian cancer after first-line platinum- and taxane-based chemotherapy. Serial serum CA125 elevation provides a strong indicator of relapse, with a positive predictive value approaching 100% [1-4]. Computed tomography (CT) or magnetic resonance imaging (MRI) is also frequently utilized for surveillance, with a sensitivity of 32%-77.7% for detecting recurrent disease [5-7] or predicting resectability [8] before secondary cytoreductive surgery.

2-[¹⁸F]fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) has gained increasing interest for the detection of recurrence in ovarian cancer patients. It demonstrates both high sensitivity and positive predictive value in identifying potentially resectable, macroscopic recurrent lesions among patients with elevated serum CA125 and negative or equivocal CT-MRI findings. Thus, PET findings may alter further management in patients with recurrent ovarian cancer [9-11]. However, the false positivity of PET in ovarian cancer patients has not been well defined yet.

We report a case of recurrent ovarian cancer with coexisting false-positive PET results caused by retained gauze

which was known to be placed at the right hepatorenal fossa during primary cytoreduction for liver metastasis, demonstrating the difficulty in assessing disease status in such situation.

Case Report

A 47-year-old woman was a victim of FIGO Stage IV, poorly differentiated serous papillary adenocarcinoma of the ovary with liver and spleen metastases. She underwent cytoreductive surgery with resection of the liver metastasis, splenectomy, high anterior resection of the rectosigmoid colon with anastomosis, hysterectomy, bilateral salpingo-oophorectomy, omentectomy, paraaortic and pelvic lymph node dissection and excision of all visible intraperitoneal tumors followed by cisplatin 75 mg/m² and paclitaxel 135 mg/m² for six cycles. She achieved complete remission after therapy and remained disease-free for seven years. After treatment, she occasionally suffered from mild right upper quadrant discomfort. Follow-up CT after primary surgery showed a 3-cm cystic lesion containing a curved linear radioopaque shadow with an irregular cyst wall lining posterior to segment 6 of the liver (hepatorenal fossa), compatible with an embedded gauze which was placed for hemostasis at the initial surgery. Only follow-up was recommended since granulomatous formation was assumed and there was no obvious clinical symptom. Her initial CA125 level was 491 U/ml, which normalized after chemotherapy, with a nadir value of 3.9 U/ml.

Seven years after primary treatment her serum CA125, from the nadir, progressively rose to 18.6 U/ml. CT revealed the previous 3-cm lesion was still there without obvious change (Figures 1A & 1B); however, another new 1.5-cm lesion was noted ventral to the diaphragmatic surface of the left lobe of the liver (Figure 1C), close to the abdominal wall. CT-guided biopsy from the left supraheptic tumor confirmed it as a recurrent ovarian malignancy. To further investigate the recurrence

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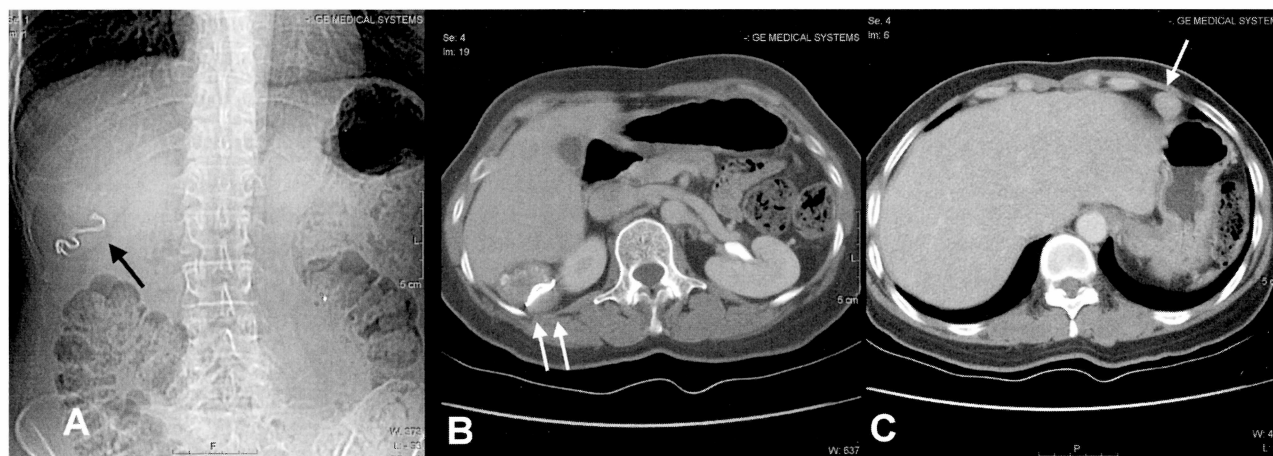


Figure 1. — (A) Plain abdominal film delineated retained gauze (black arrow) located in the right subhepatic region in the right upper abdomen. (B) Transaxial CT image at the lower level revealed a granuloma with gauze (gossypiboma, white arrows) located dorsal to segment 6 of the liver. (C) Post-contrasted abdominal CT study transaxial image disclosed a metastatic nodular lesion in the left upper abdomen (white arrow), just ventral to the hepatogastric ligament region.

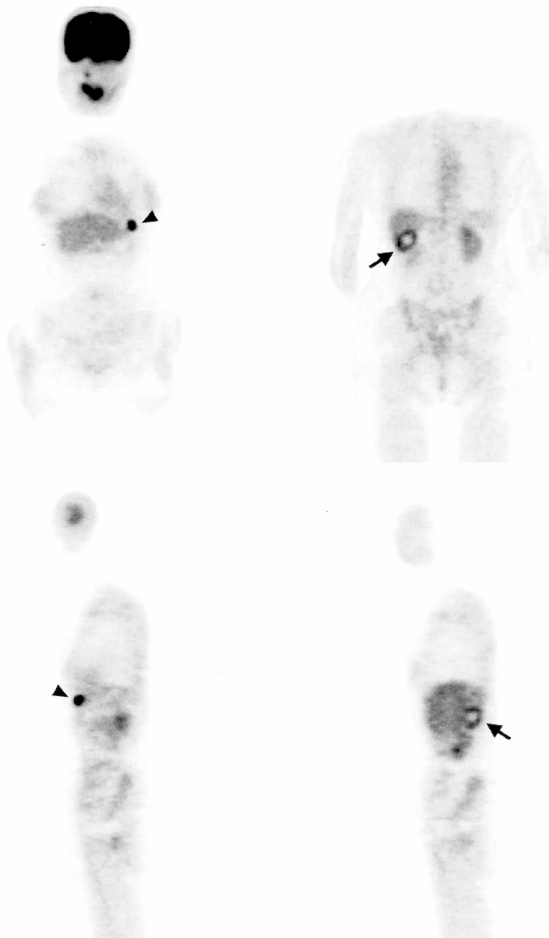


Figure 2. — A dual phase PET scan showed two focal areas with avid FDG accumulation. One was located at the left hepatic lobe (arrow heads, SUV: early, 8.80; delayed, 8.01) and the other was around the gauze (arrows, SUV: early, 5.12; delayed, 4.78).

status, a PET was undertaken and avid FDG uptake was noticed in both lesions (Figure 2).

A whole body PET scan was performed at 40 minutes and at three hours after injection [12] of 9.71 mCi of ^{18}F -FDG, which revealed increased FDG accumulation in the right hepatorenal region (standardized uptake values (SUVs) = 5.12 and 4.78, 40 minutes and 3 hours, respectively), and the left anterior surface of the liver (SUVs = 8.80 and 8.01, at 40 minutes and 3 hours) as well. There was no abnormal FDG accumulation in other regions.

After surgical intervention, the left suprahepatic tumor was excised and the gauze with surrounding granulation was removed. No other lesion was noted. Final pathology proved a true-positive recurrence of the left suprahepatic portion yet the false-positive FDG-PET finding resulted from foreign-body reaction which showed gauze and suture material surrounded by multinuclear giant cell, foamy histiocytes, and granulation tissue encapsulated.

Discussion

The role of secondary cytoreductive surgery for recurrent ovarian cancer is still controversial. However there is a trend towards improved survival when all macroscopic disease can be resected [1, 11, 13, 14]. Therefore, detection of an additional occult lesion after a diagnosis of intraabdominal recurrence by conventional image studies in a patient experiencing long-term remission of advanced epithelial ovarian cancer is important for the decision to perform secondary cytoreductive surgery.

PET imaging using ^{18}F -FDG evaluates the physiologic characteristics of tumors, and generates a radiographic picture of metabolic tumor activity unattainable with CT or MRI [9-11, 15]. However the diagnostic accuracy of PET imaging might be impaired by granulomas and other inflammatory processes [16-23]. Experimental studies suggest that granulation tissue may cause an increased FDG uptake exceeding that of malignant tissues [16, 18]. Reviewing the literature, granulation leading to such FDG uptake has been reported to be induced by infectious etiology such as pulmonary cryptococcosis [19],

tuberculosis [19, 20], aspergillosis and cholesterolin in the head and neck [21], or some iatrogenic changes in head and neck cancers [23, 24].

Stokkel *et al.* reported two cases of increased FDG uptake due to iatrogenic changes in their series [22]. One was the implantation of synthetic materials in the neck giving rise to oropharyngeal or tracheal wall damage with accompanying granulocyte infiltration of the surrounding mucosa. The other was irritation to local mucosa after placement of a drip feed catheter associated with local increased glucose use. Lorenzen *et al.* also reported a case of a persistent mass after chemotherapy for an abdominal non-Hodgkin's lymphoma. The margin of the persistent mass showed increased uptake of glucose. Histology documented a necrotic center surrounded by granulation tissue [23].

However, little is known about ¹⁸F-FDG accumulation in foreign body granulomas *in vivo*. The present case showed that foreign-body granulomas resulting from embedded gauze several years before may have been responsible for a high FDG uptake mimicking malignancy, which has never been reported in the literature.

Although these reports are generally isolated case reports and the performance of FDG-PET in infectious disease is still not fully elucidated, the heterogenous uptake of FDG in metabolically active granulation tissue may be a limitation of adequate detection and grading of cancer with FDG-PET.

In conclusion, false-positive findings on ¹⁸F-FDG-PET imaging may result from foreign body induced granulomatous changes. As with conventional imaging, FDG-PET scanning may not be specific for identifying recurrent disease in women with ovarian cancer. Therefore, clinical information on previous surgical interventions and optimal patient preparation are necessary for adequate interpretation. At this time, the best choices for accurately determining disease status in asymptomatic patients are either a less practical approach using multiple biopsies of suspected lesions or close clinical follow-up with frequent radiographic studies looking for changes in the size of enlarging masses suggestive of recurrent disease.

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