FDG PET-CT detection of Unusual Pattern of Metastatic Spread in High-Grade Serous Ovarian Carcinoma

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ABSTRACT

High-grade serous ovarian carcinoma (HGSOC) is the most aggressive subtype of epithelial ovarian cancer, commonly spreads within the peritoneal cavity through transcoelomic dissemination. Distant metastases, particularly isolated pulmonary involvement without pelvic recurrence, are uncommon. We report a 47-year-old hypertensive and diabetic woman with previously treated high-grade serous carcinoma of the right ovary who underwent total abdominal hysterectomy with bilateral salpingo-oophorectomy, omentectomy, and pelvic lymphadenectomy followed by six cycles of paclitaxel-carboplatin chemotherapy. Post-treatment PET-CT showed no residual disease. After one year of follow-up, imaging revealed multiple pulmonary nodules. Subsequent ^{18}F-FDG PET-CT demonstrated FDG-avid peritoneal deposits consistent with peritoneal seeding, along with pulmonary and pleural metastases and abdominal nodal involvement, without pelvic recurrence. This case highlights an unusual metastatic pattern of HGSOC and underscores the value of FDG PET-CT in detecting occult metastatic disease and assessing disease progression.

Keywords: Ovarian carcinoma, High-grade serous carcinoma, ^{18}F-FDG PET-CT, Pulmonary metastasis, Peritoneal seeding

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INTRODUCTION

Ovarian carcinoma is a major cause of cancer-related mortality among women and is frequently diagnosed at an advanced stage. The high mortality associated with ovarian cancer is largely attributable to the fact that most patients present with advanced disease at the time of diagnosis. This suggests that, in many cases, tumor dissemination has already occurred within the abdominal cavity, predominantly along the peritoneal surfaces (1). Epithelial ovarian carcinoma accounts for the majority of ovarian malignancies, with high-grade serous carcinoma representing the most common histological subtype. This type of tumor is characterized by aggressive biological behavior and a strong tendency for peritoneal dissemination. Malignant cells may detach from the ovarian surface and disseminate within the peritoneal cavity through transcoelomic spread, resulting in implantation on peritoneal surfaces, omentum, and abdominal organs. Consequently, peritoneal metastasis (peritoneal seeding or peritoneal carcinomatosis) is the most frequent metastatic pathway in ovarian cancer (2). Accurate detection of peritoneal metastases is essential for staging, treatment planning, and prognostic assessment. Imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) are commonly used to evaluate ovarian cancer; however, these techniques may have limitations in detecting small peritoneal implants or early metastatic disease (3). In recent years, ^{18}F-FDG PET-CT has emerged as an important imaging modality in oncology. PET-CT combines metabolic and anatomical imaging, enabling detection of metabolically active tumor deposits that may not be visible on conventional imaging. Several studies have demonstrated the usefulness of PET-CT in detecting recurrent ovarian carcinoma and metastatic disease, particularly in patients with rising tumor markers or inconclusive findings on CT or MRI (4). Although ovarian carcinoma typically spreads within the peritoneal cavity, distant metastases such as pulmonary or extra-abdominal lymph node involvement may occasionally occur. Recognition of these atypical metastatic patterns is important because they may significantly influence disease staging and therapeutic strategies (5). In this report, we present a case of high-grade serous ovarian carcinoma demonstrating FDG-avid peritoneal seeding with simultaneous pulmonary metastases detected on ^{18}F-FDG PET-CT, highlighting the role of metabolic imaging in identifying both intra-abdominal and distant metastatic diseases.

CASE REPORT

A 47-year-old hypertensive and diabetic woman with history of carcinoma of right ovary presented to INMAS, Suhrawardy for PET-CT scan. Malignant right ovarian tumor was diagnosed two years back and surgically treated with laparotomy followed by total abdominal hysterectomy, bilateral salpingo-oophorectomy with total omentectomy and right sided pelvic lymphadenectomy. Histopathology back then and ascitic fluid was sent for cytological examination. The tumor of right ovary shows high grade serous cystadenocarcinoma. The peritoneal fluid was positive for malignant cells. But no metastasis was seen in the omentum. BRCA 1 and BRCA 2 genetic testing revealed no pathognomonic mutations. Adjuvant 6 cycles paclitaxel-carboplatin chemotherapy was given. After completing chemotherapy, a PET-CT scan was done which revealed no residual disease or evidence of any metabolic activity elsewhere in body. For about 1yr patients were on regular follow up which was uneventful. But after 1yr, in a regular follow up, the blood tests revealed; CA-125= 32.2 U/mL, CA 19-9= 130.49 U/mL, D-dimer 1.41 mg/L Serum ALP- 109 U/L. But chest skiagram was normal. After that the patient was advised to do a spiral CT scan of whole abdomen which suggested no local recurrence but multiple 8-10 mm nodules in lower lobe of both lungs; suggesting metastasis. PET-CT scan then revealed multiple FDG avid, some are pleural based nodules scattered throughout both lung fields along with bilateral trace pleural effusion and mild FDG avid pleural thickening, suggesting pulmonary metastases. Intense FDG avid soft tissue density masses were noted in the subdiaphragmatic regions on both sides and splenic hilar regions, likely sub-diaphragmatic and splenic hilar peritoneal seeding. FDG avid abdominal lymph nodes are also seen, suggesting nodal metastasis. But no abnormal FDG uptake or recurrent mass was seen in the pelvic cavity at the operative side. Thus, the PET-CT scan revealed the disease progression in comparison to previous scan.

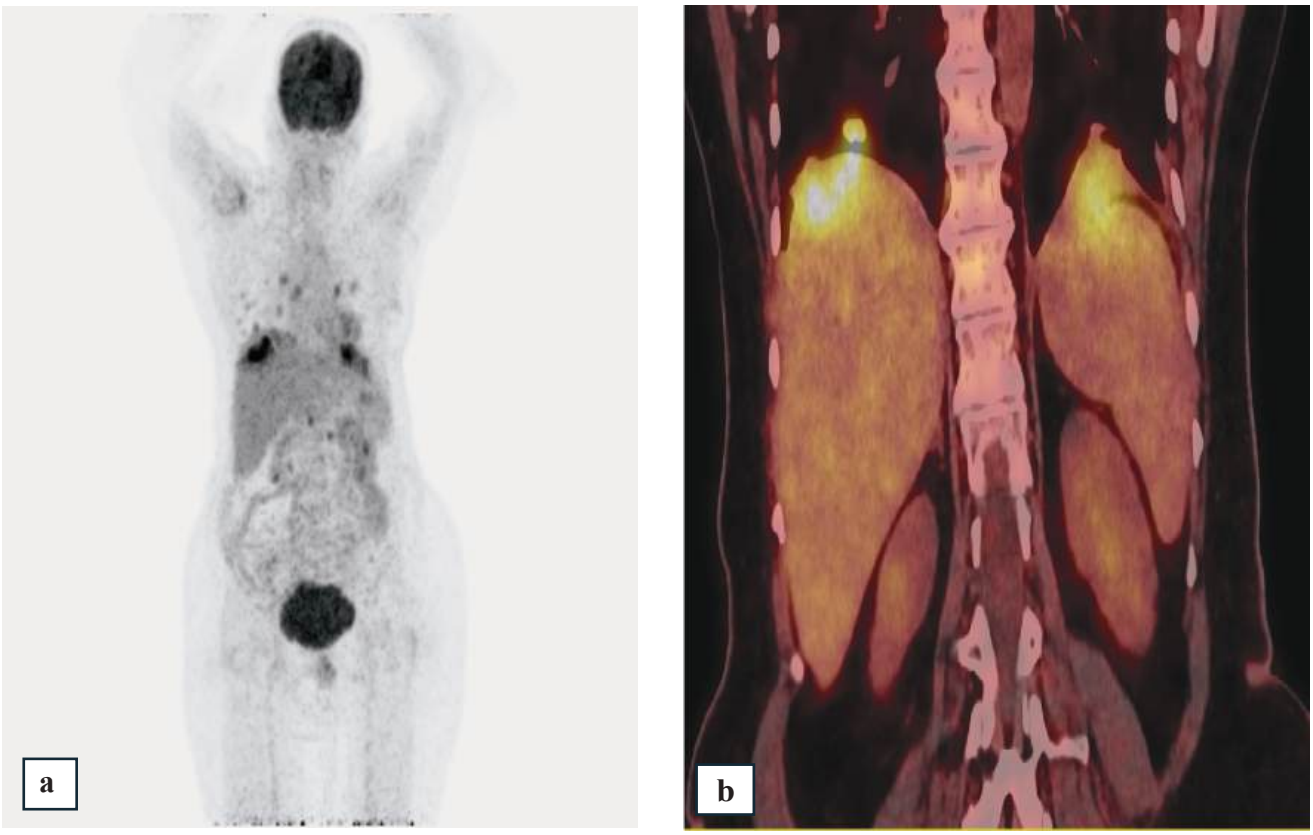

Figure 1: FDG PET-CT of 47-year-old female with ovarian carcinoma. (a) MIP image shows hypermetabolic focuses in subdiaphragmatic regions on both sides (b) coronal image, shows FDG avid soft tissue masses in subdiaphragmatic regions on both sides.

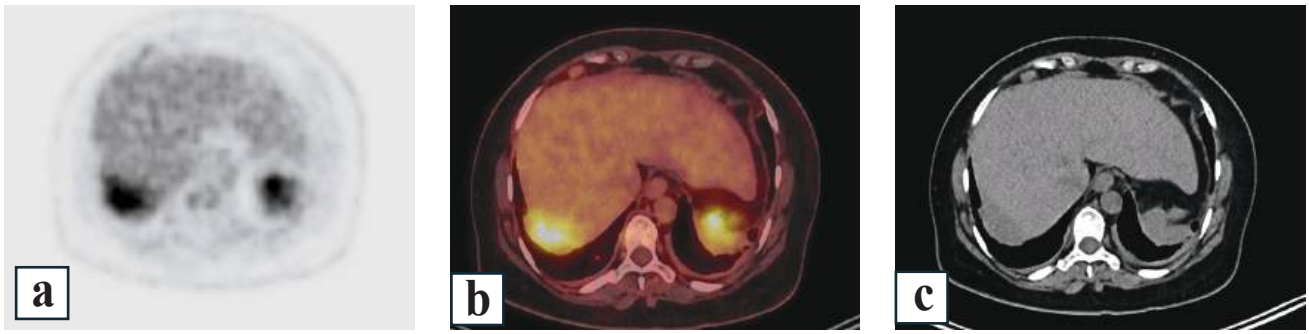

Figure 2: FDG PET-CT of 47-year-old female show (a) MIP image (b) axial and (c) CT images. Intense FDG avid SUVmax (9.7 on right & 8.5 on left) soft tissue density masses in the subdiaphragmatic regions on both sides.

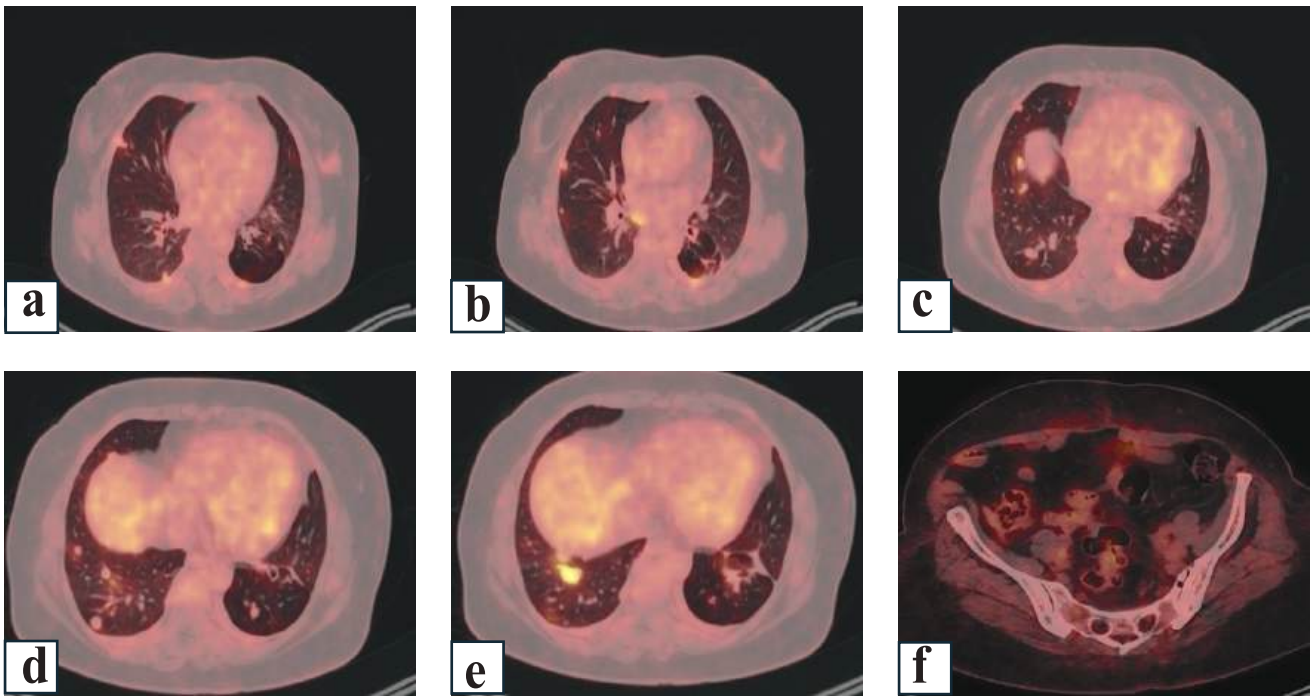

Figure 3: FDG PET-CT showing multiple FDG avid (SUVmax: 4.4) pleural based & pulmonary nodules throughout both lungs (a,b,c,d,e). No abnormal FDG uptake or recurrent mass lesion in pelvic cavity(f).

DISCUSSION

Ovarian carcinoma most commonly spreads through transcoelomic dissemination, resulting in implantation of tumor cells along the peritoneal surfaces, omentum, and abdominal organs. This characteristic pathway explains why peritoneal metastases represent the most frequent manifestation of advanced ovarian cancer and play a critical role in determining prognosis and treatment strategy (2,3). Accurate assessment of peritoneal tumor burden is therefore essential for evaluating the feasibility of optimal cytoreductive surgery and guiding therapeutic decision-making. Conventional imaging modalities such as CT are widely used for evaluating metastatic spread in ovarian cancer; however, they may underestimate the extent of peritoneal disease, particularly when metastatic implants are small or located in anatomically complex regions such as the mesentery or small bowel serosa (1,2,3). Hybrid imaging using ^{18}F-FDG PET-CT provides additional metabolic information that improves lesion detection and allows identification of metabolically active tumor deposits even when structural abnormalities are subtle (4,10).

Previous studies have demonstrated the diagnostic value of PET-CT in ovarian carcinoma. Iagaru et al. reported high sensitivity and specificity for detecting residual or recurrent disease, particularly in patients with elevated tumor markers (4). Similarly, Feng et al. found that PET-CT could accurately predict peritoneal metastases in advanced ovarian cancer when correlated with surgical findings (5). Meta-analytical evidence further supports these findings, with pooled sensitivity and specificity of approximately 87% and 92% for detecting peritoneal carcinomatosis (6). Earlier investigations have also described characteristic FDG uptake patterns corresponding to nodular or diffuse peritoneal disease, indicating the usefulness of metabolic imaging in identifying peritoneal tumor deposits (7). In the present case, PET-CT demonstrated FDG-avid peritoneal deposits in the subdiaphragmatic and splenic hilar regions, consistent with metabolically active peritoneal seeding. These findings highlight the advantage of PET-CT in detecting peritoneal metastases that may be missed on conventional imaging techniques and support previous reports emphasizing its role in accurate disease staging (4,5,10). Although peritoneal dissemination represents the dominant metastatic pathway in ovarian carcinoma, distant metastases may occasionally occur through hematogenous spread. Pulmonary metastases are relatively uncommon but have been described in several case reports. Sonvane reported a patient with high-grade serous ovarian carcinoma who developed lung metastasis several years after the initial treatment (8). In contrast, our case demonstrated simultaneous pulmonary metastases and peritoneal seeding, suggesting a more extensive pattern of disease dissemination. Similarly, Tanriverdi et al. reported that PET-CT detected metastatic lymph node involvement in unusual locations not identified by conventional imaging modalities, highlighting the importance of metabolic imaging in evaluating suspected recurrence (9). Previous reviews have also emphasized that PET-CT contributes significantly to clinical decision-making by improving the detection of occult metastatic lesions and providing whole-body assessment of disease burden (4,10).

Overall, this case highlights the important role of FDG PET-CT in detecting peritoneal seeding and identifying atypical metastatic patterns in ovarian cancer, supporting its value as a comprehensive imaging modality for staging and evaluation of disease progression.

CONCLUSION

This case highlights an unusual metastatic pattern of ovarian carcinoma, characterized by FDG-avid peritoneal seeding with concurrent pulmonary metastases detected on 18F-FDG PET-CT. The findings demonstrate the value of PET-CT in identifying metabolically active peritoneal and extra-abdominal metastases, allowing more comprehensive disease assessment. Recognition of such atypical metastatic patterns may improve staging accuracy and assist in appropriate management of advanced ovarian cancer.

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