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Authors
Liu, T
Khan, S
Behr, S
et al.

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CASE REPORT

Diagnosis of Cardiac Metastasis from Endometrial Cancer by F-18 FDG-PET/CT

T. Liu · S. Khan · S. Behr · C. Mari Aparici

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Abstract We report a case of a 59-year-old woman with right ventricular metastasis of undifferentiated endometrial cancer. Cardiac metastasis from endometrial cancer is a very rare finding. The case demonstrates that undifferentiated endometrial cancer is capable of metastasizing, presumably through a hematogenous route, to unexpected distant organs. These unexpected sites should not be undermined in the restaging and surveillance of these patients.

Keywords Uterine cancer · PET/CT · Cardiac metastasis · FDG

Introduction

Endometrial cancer is a malignancy that arises from the endometrium of the uterus. It is the most common gynecologic cancer in developed countries, with over 142,200 women diagnosed each year [1]. Symptoms include vaginal bleeding, abnormal uterine bleeding, abnormal menstrual periods, and anemia. Metastatic spread to the pelvic and para-aortic nodes is common. The most common sites for distant metastasis are lung, liver, brain, and bone. We report a unique case of endometrial adenocarcinoma metastasis to the right cardiac ventricle.

T. Liu (✉) · S. Khan · S. Behr · C. M. Aparici
Department of Radiology and Biomedical Imaging, Nuclear Medicine Section, University of California San Francisco, UCSF, San Fancisco, CA, USA
e-mail: Tianye.Liu@ucsf.edu

Case Report

A 59-year-old woman was diagnosed with undifferentiated endometrial cancer after gynecological evaluation due to vaginal bleeding. The patient underwent a whole-body fluorine-18-fluorodeoxyglucose positron emission tomography/computed tomography (F-18 FDG-PET/CT) scan for staging purposes that showed a hypermetabolic primary tumor in the endometrium but no evidence of distant metastases. The patient then underwent resection of the reproductive pelvic organs and chemotherapy treatment.

An F-18 FDG-PET/CT scan 6 months later for follow-up purposes, demonstrated a new, intensely hypermetabolic, 2.5×1.9-cm mass surrounding the vagina, suspicious for tumoral extension, with a maximum standardized uptake value (SUVmax) of 9.8. At least three new hypermetabolic lesions suspicious for metastatic peritoneal implants were identified within the pelvis. Some of them were difficult to correlate with the CT findings due to multiple loops of bowel. The largest one was a hypermetabolic 1.4×0.7-cm nodule in the right lower pelvis (Fig. 1).

The patient was then started on a new chemotherapy regimen, and a follow-up F-18 FDG-PET/CT 6 months later was requested for evaluation of response to new therapy. The F-18 FDG-PET/CT showed re-demonstration of tumoral extension to the vagina and a new hypermetabolic soft tissue in the right cardiac ventricle suspicious for either metastases or thrombus (a new primary cardiac malignancy considered less likely), which posed a risk for pulmonary embolus (Fig. 2). The patient was sent to the emergency room, and subsequent cardiac magnetic resonance imaging (MRI) found a 3.2×1.5-cm mass within the right ventricular apex demonstrating signal characteristics more consistent with malignancy and less consistent with a bland thrombus.

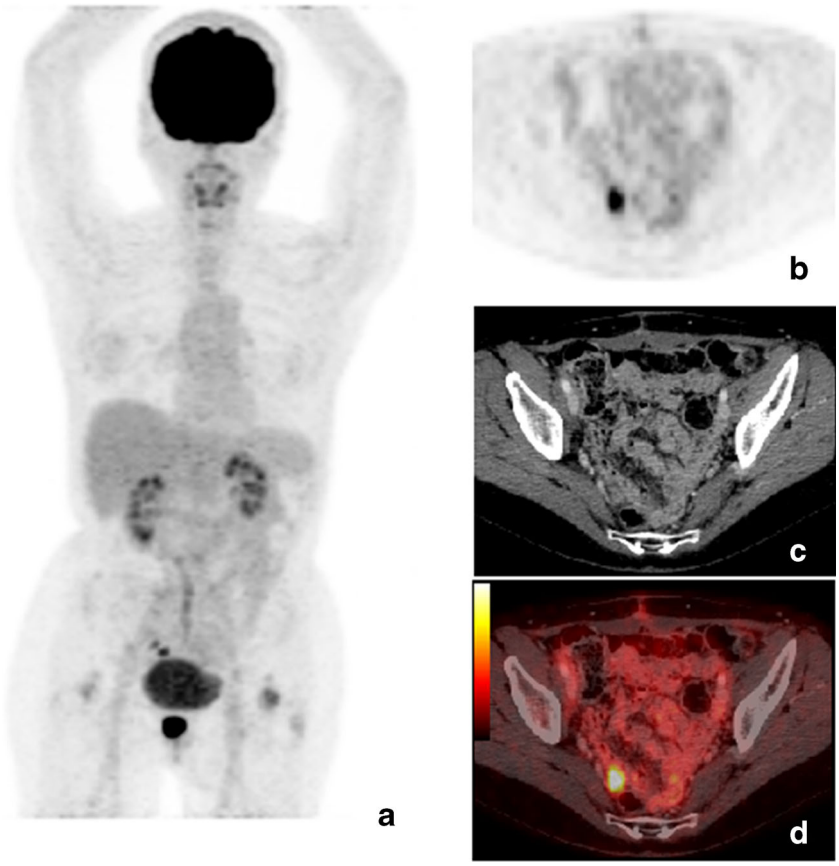

Fig. 1 **a** FDG-PET/CT MIP image showing intensely hypermetabolic malignancy in the vaginal cuff consistent with metastatic disease from known uterine cancer. Several hypermetabolic pelvic peritoneal implants are also identified. **b** FDG images, **c** CT images, and **d** fused images of a hypermetabolic metastatic peritoneal pelvic implant

A CT pulmonary angiogram at that time found bilateral segmental and subsegmental lower lobe pulmonary emboli and a soft tissue mass in the right ventricle worrisome for metastases.

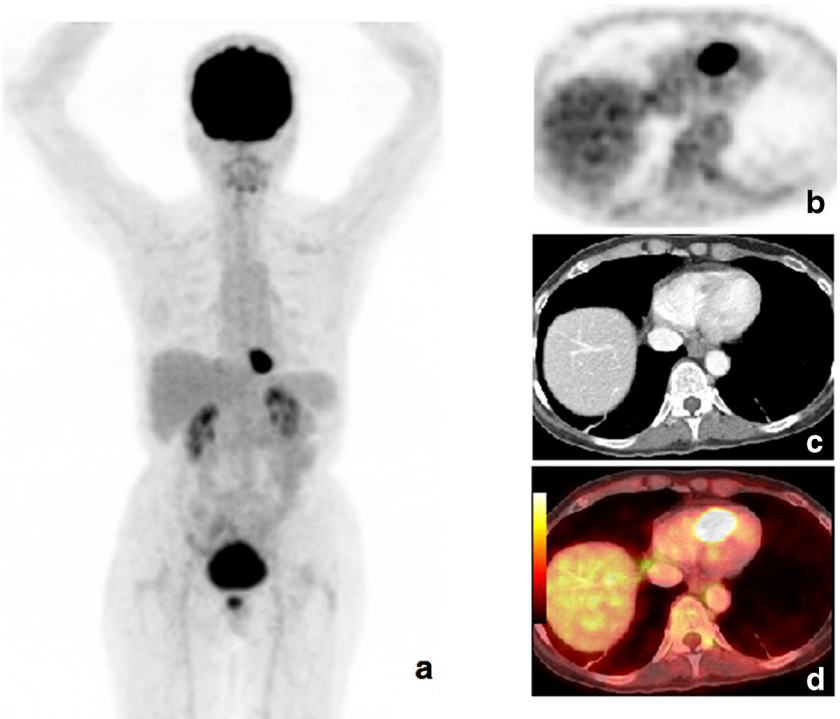

Fig. 2 **a** Follow-up FDG-PET/CT MIP image showing interval response to treatment by peritoneal implants. Interval decrease in size and activity of vaginal disease. Interval development of an intensely hypermetabolic mass in the right ventricle worrisome for metastatic disease and/or intracavitary thrombus. **b** FDG images, **c** CT images, and (**d**) fused images of a hypermetabolic soft tissue mass in the right ventricle

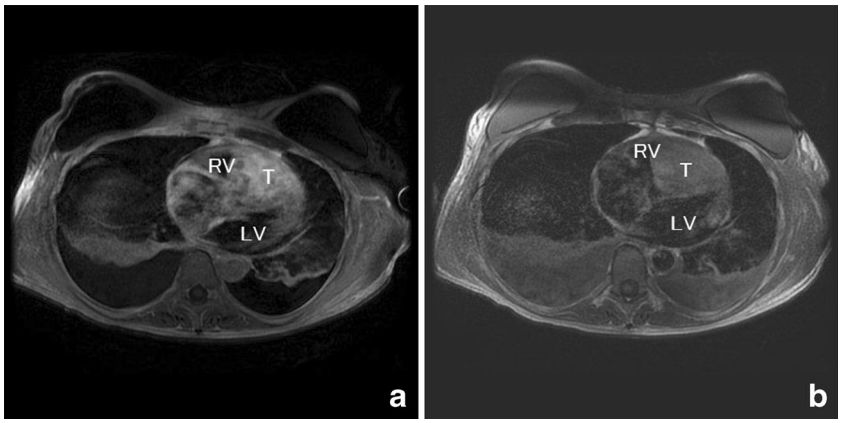

Fig. 3 Large intracardiac enhancing mass with heterogeneous intrinsic T2 (**a**) and T1 (**b**) hyperintensity centered in the apex of the right ventricle extending into the main pulmonary artery, as well as up to and possibly through the tricuspid valve, significantly increased in size compared with prior MRI and now producing mass-effect on the left ventricle. *T* tumor, *LV* left ventricle, *RV* right ventricle

The patient was placed on anticoagulants and a follow-up cardiac MRI was ordered to be performed in a month. The new MRI (Fig. 3) showed interval progression of the large intracavitary right ventricular mass extending now into the right ventricular outflow tract and main pulmonary artery as well as up to, and possibly through, the tricuspid valve. A follow-up F-18 FDG-PET/CT at this point in time also demonstrated interval increase in size of the large hypermetabolic right ventricular cardiac metastasis and interval development of a hypermetabolic right upper lobe pulmonary metastasis (may be a tumoral embolus). In spite of implementation of a new chemotherapy regimen, the patient passed away a few months later.

Discussion

Metastases may reach the heart via the lymphatic or hematogenous route. Cardiac metastases most frequently have breast, lung, lymphoma, leukemia and melanoma as primary sites. Cardiac metastases of infradiaphragmatic tumors are much less frequent. Secondary heart tumors rarely have intracavitary growth and when they do, they are usually covered by thrombotic material [2].

Endometrial malignancy is a rarely reported primary source for cardiac metastasis. A report by Greenwald et al. [3] showed 6 of 1,100 gynecological cancer cases to have metastasis to the heart, but none was endometrial in origin. We were able to find several reported cases of cardiac metastasis from endometrial cancer in the past 30 years [4–8], two of which were from endometrial sarcoma [4, 8], which are less rare than the cardiac metastasis from endometrial adenocarcinoma, like in our case [9]. As with our case, the cases we found describe metastasis in the right ventricle, two of which also involved right ventricular malignancy, causing obstruction in the right ventricular outflow tract [4, 5].

Although our patients passed away in a few months despite the chemotherapy treatment, other reports of cardiac metastasis from endometrial cancer have showed the possibility of longer survival after various possible treatments. Bigsby et al. [5] reported a case in which the patient remained disease-free through 6.5 years of follow-up after a total abdominal hysterectomy and cardiac radiation with concurrent cisplatin, followed by pegylated liposomal doxorubicin. In the case reported by Matsumoto et al. [8], the patient underwent surgery and cryoablation at the site of metastasis. She was well and free from local recurrent tumor for 33 months after the treatment.

Because pathological confirmation of the cardiac malignancy was not performed in our case, we cannot completely exclude the possibility of other pathologies, such as a very aggressive and rapid growing primary cardiac tumor or a secondary tumor from a different primary. However, in the context of aggressive primary endometrial malignancy with no response to chemotherapy and rapid progression from imaging evaluation, the cardiac mass was strongly favored to represent metastases from the endometrial malignancy.

Based on the experience from our patient and the previous reported cases, we should recognize the possibility of cardiac metastasis from endometrial cancer and advocate possible targeted treatment of these suspicious cardiac masses.

Conflict of Interest Statement Tianye Liu, Spencer Behr, Sana Khan and Carina Mari Aparici declare that they have no conflict of interest.

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