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**CASE REPORT**
*Cardiovascular imaging*

# Case report—right atrial mass: a very rare presentation of endometrial cancer metastasis

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**Background** We report a case of a 47-year-old woman with right atrial metastasis of endometrioid adenocarcinoma, which is an uncommon clinical presentation for patients with endometrial cancer (EC). The principal aim of this case is to demonstrate the possibility of distant metastasis, something rarely encountered among this group of patients.

**Case summary** Our patient, diagnosed with EC and receiving chemotherapy and radiotherapy after surgery, was found to have enhanced 18-fluorodeoxyglucose uptake inside the right atrium on the repeat positron emission tomography–computed tomography scan at the ninth month after initial diagnosis. Following trans-oesophageal echocardiography, cardiac magnetic resonance imaging showed a hyper-vascular mass with right atrial lateral wall involvement likely to be malignant in nature. A right atrial tumour was successfully removed by cardiovascular surgeons, and a pericardial patch was placed at the site of the excised atrium. The pathological examination showed EC metastasis. Following surgery, systemic treatment was planned for recurrent EC. The patient had an uneventful recovery after the surgery.

**Discussion** Endometrial cancer is the most common gynaecologic malignancy and the fourth most common cancer in women. The lymphatic pathway is the main metastatic behaviour of EC; however, haematogenous metastases are not uncommon, especially in patients with higher stages of the disease. Our patient did not show any signs and symptoms of cardiac involvement. Nevertheless, clinicians should be alert for symptoms of cardiac involvement like new-onset murmur, embolism, or dyspnoea. Having known the behavioural pattern of the primary tumour, timely utilization of diagnostic imaging methods in accordance with clinical suspicions in patients with rapidly growing tumours can be lifesaving.

**Keywords** Cardiac tumours • Cardiac MRI (magnetic resonance imaging) • Endometrial carcinoma • Case report

**ESC curriculum** 2.1 Imaging modalities • 2.2 Echocardiography • 2.3 Cardiac magnetic resonance • 2.5 Nuclear techniques • 6.8 Cardiac tumours



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## Learning points

- This case is educative proof of the fact that malignancies that are quite susceptible to distant metastasis, as we have witnessed, should be evaluated thoroughly.
- Susceptibility can be surmised on observing rapid growth rate, when considered alongside a locally advanced stage at the initial diagnosis. Although routine computed tomography scans might not succeed in detecting metastatic foci, a positron emission tomography–computed tomography scan could prove particularly beneficial for such diagnostic approaches.
- Distant organ malignancies might metastasize to the heart; thus, cardiac involvement should not be overlooked during the management of these patients, even when the patients are asymptomatic.
- Multi-modality imaging may help with detection and visualization of rare foci and therefore should be implemented during routine follow-up of oncology patients with certain malignancies, especially those shown to have frequent distant organ metastasis. Detection of rare metastasis sites can guide the treatment of patients.
- A multi-disciplinary approach for oncology patients is shown to be quite beneficial, and treatment and follow-up decisions should be taken by a designated team. When necessary, this group of patients should be referred to tertiary care centres where highly organized oncology groups are present.

## Introduction

Endometrial cancer (EC) is the most common gynaecologic malignancy. It is the fourth most common cancer among women in the USA after breast, lung, and colorectal cancers. Risk factors are related to excessive unopposed exposure of the endometrium to oestrogen.[1] The most frequently occurring histological sub-type is endometrioid adenocarcinoma.[2] Higher-stage endometrioid carcinoma, non-endometrioid histology, molecular factors like p53 mutation, and stage of the disease are predictors of recurrence, and adjuvant treatments are based on these prognostic variables. Lymph node metastasis is the main metastatic pathway of EC. The most common metastasis sites of EC are pelvic lymph nodes, such as common iliac, internal iliac, and external iliac lymph nodes, followed by retroperitoneal lymph nodes.[3] Studies have found that ~5% of patients suffered at least one site of distant metastases. The most common metastasis sites are the lung followed by distant lymph nodes, liver, bone, and brain.[4] In literature, the heart is one of the rare distant sites found to have metastasis from EC[5,6] (*Table 1*). Although primary cardiac tumours are extremely uncommon, the heart can have metastases due to any malignant neoplasm which is able to spread to distant sites. Cardiac metastases incidence seems to range from 2.3% to 18.3%.[14] Any type of tumour can affect the heart. The probability of cardiac involvement is multi-factorial and depends on anatomic considerations, stage of disease, individual tumour, and host biology. Primary lung cancer represents 36–39% of cardiac metastases, followed by breast cancer (10–12%) and haematologic malignancies (10–21%). The pericardium is the most frequently involved site of cardiac metastasis followed by epicardium, myocardium, endocardium, and intracavitary metastasis, respectively.[15] Here, we report a case of intracavitary metastasis of EC, which is an unusual presentation.

## Case presentation

A 46-year-old-female who has been on medication for hypertension and Type 2 diabetes was admitted with ongoing abdominal pain. The patient was diagnosed with endometrial adenocarcinoma Stage III following surgical procedure and pathological assessment. Besides endometrium, left adnexal and uterine tube and para-aortic lymph node involvements were detected. Six cycles of adjuvant paclitaxel and carboplatin were administered followed by adjuvant radiotherapy (RT). After 3 months from the end of adjuvant RT, a control thoracic and abdominal computerized tomography (CT) was done. Para-aortic lymph node metastasis was detected as a result of the abdominal CT scan. Regarding surgical removal planning of the para-aortic lymph nodes, an 18-fluorodeoxyglucose (FDG) positron emission tomography CT scan was done to re-stage the disease for any other metastases on the 9th month after initial diagnosis. It revealed a mass and enhanced glucose uptake in the right atrium of the heart and also metastases at the para-aortic lymph nodes (*Figure 1*).

On initial examination, there were no distinctive cardiac exam findings. The electrocardiogram was sinus rhythm, with normal rate, PR (140 ms) , QT intervals (460 ms), and QRS (100 ms) width. Trans-thoracic echocardiography showed an irregular mass inside the right atrium, which was hyper-echoic, irregular, and attached to the lateral wall. The mobility of the mass was limited, and there was no tricuspid valve involvement with trivial tricuspid regurgitation.

Trans-oesophageal echocardiography (TOE) was planned to obtain more precise images and to establish any vascular or valvular connections with the tumour but came back with no particular involvement. The best images were obtained in bi-caval view which showed the tumour was attached to the lateral wall with a wide base. The longest diameters were 3.3 × 2.3 cm wide. Neither superior nor inferior caval veins were affected by the tumoural body. Following TOE, cardiac magnetic

## Summary figure

| Day 0 | Initial presentation covering symptoms and endometrial carcinoma diagnosis |
|---|---|
| During the first month following initial diagnosis | CT scan showing enlarged para-aortic lymph nodes followed by PET-CT scan for confirmation of metastasis. PET-CT scan showed para-aortic metastasis |
| 1st month following initial diagnosis | Surgical intervention following PET-CT scan and staging of the disease. Initiation of chemotherapy |
| 9th month following initial diagnosis | Repeat CT scan showing conglomerated para-aortic lymph nodes followed by PET-CT scan for confirmation of metastasis. PET-CT scan showed para-aortic metastasis along with right atrial involvement. |
| 9th month following initial diagnosis | TTE, TOE, and MRI for diagnosing and probing the right atrial mass further before surgery |
| 10th month following initial diagnosis | Surgical removal of right atrial mass. Pathological diagnostic confirmation |

**Table 1 Endometrial carcinoma cases with cardiac metastasis**

| Endometrial carcinoma cases in the literature with metastasis to the heart | | | | |
|---|---|---|---|---|
| **No** | **Case** | **Author** | **Year** | **Reference no** |
| 1 | Right ventricular metastasis of undifferentiated endometrial cancer | Liu T. *et al.* | 2014 | 6 |
| 2 | Endometrial adenocarcinoma with pericardium metastasis | Liu Guang *et al.* | 2019 | 7 |
| 3 | Right ventricular metastasis of poorly differentiated mixed endometrial and clear cell carcinoma | Glenn E. Bigsby *et al.* | 2004 | 8 |
| 4 | Endometrial adenocarcinoma metastasis to the right ventricle | Mario Castillo-Sang *et al.* | 2007 | 9 |
| 5 | Right atrial metastasis of endometrial adenocarcinoma | Khalil Kanjwal *et al.* | 2010 | 10 |
| 6 | Endometrial adenocarcinoma with right ventricular metastasis | Marcos Danillo P. Oliviera *et al.* | 2019 | 5 |
| 7 | Endometrial carcinoma metastasis to the right atrium and right ventricle | Masi Javeed *et al.* | 2022 | 11 |
| 8 | Right atrial metastasis of endometrial adenocarcinoma | Cipullo I *et al.* | 2021 | 12 |
| 9 | Endometrial carcinoma metastasis to the right ventricle, mimicking acute pulmonary embolism | Rajesh Kunadharaju *et al.* | 2021 | 13 |

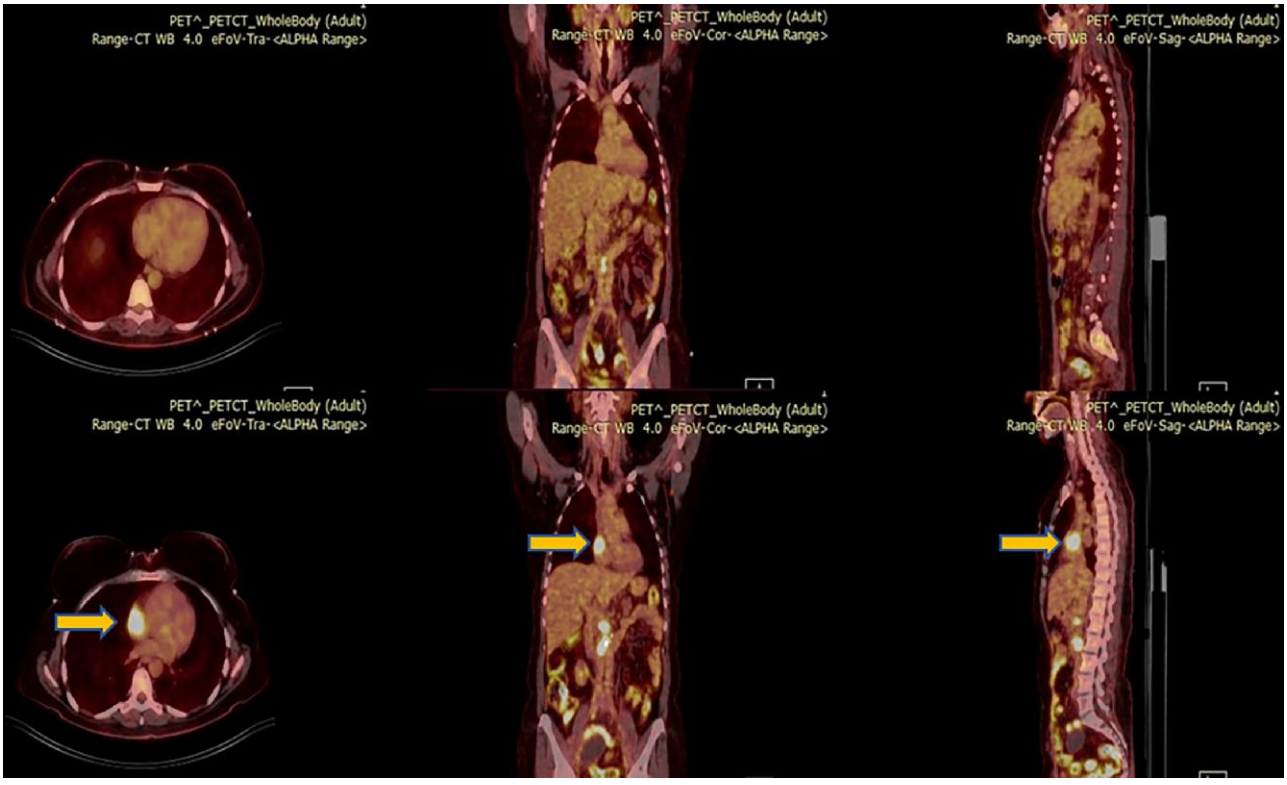


**Figure 1** Positron emission tomography–computed tomography images: upper row-1st month of diagnosis showing para-aortic lymph node involvement and no cardiac uptake, lower row-9th month of diagnosis – enhanced glucose uptake in right atrial zone (arrows). PET–CT, positron emission tomography–computed tomography.

resonance imaging (MRI) was planned to detect the nature, vascularization, and local invasion of the lesion and to guide surgery (*Figure 2*).

Cardiac MRI showed a hyper-vascular mass with right atrial lateral wall involvement which was more likely to be malignant in nature (*Figure 3*).

A three-stage treatment was planned for the patient. Firstly, surgical removal of the cardiac metastasis was conducted. Systemic treatment (chemotherapy) was planned after the surgery, and a second surgery was planned for the para-aortic lymph node metastasis after systemic treatment. The tumour inside the right atrium was successfully removed by cardiovascular surgeons, and a pericardial patch was placed at the site of the excised atrium (*Figure 4*). The patient had no complications and had an uneventful recovery and was discharged home on the seventh day following the surgery.

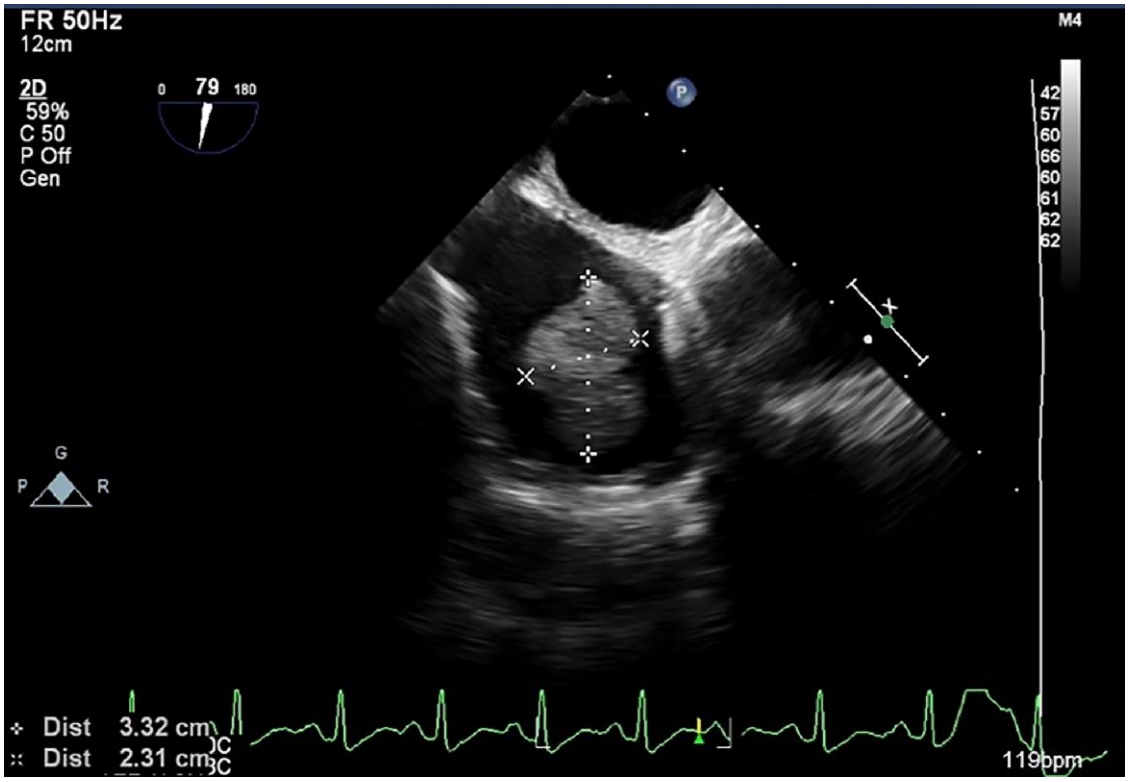


**Figure 2** Trans-oesophageal echocardiography showing inter-atrial septum and the mass in the right atrium. This is a modified bi-caval view showing the tumour has no relationship with inter-atrial septum and inferior and superior caval veins. It is an irregularly shaped, dense tumour which is 3.3 × 2.3 cm in size.

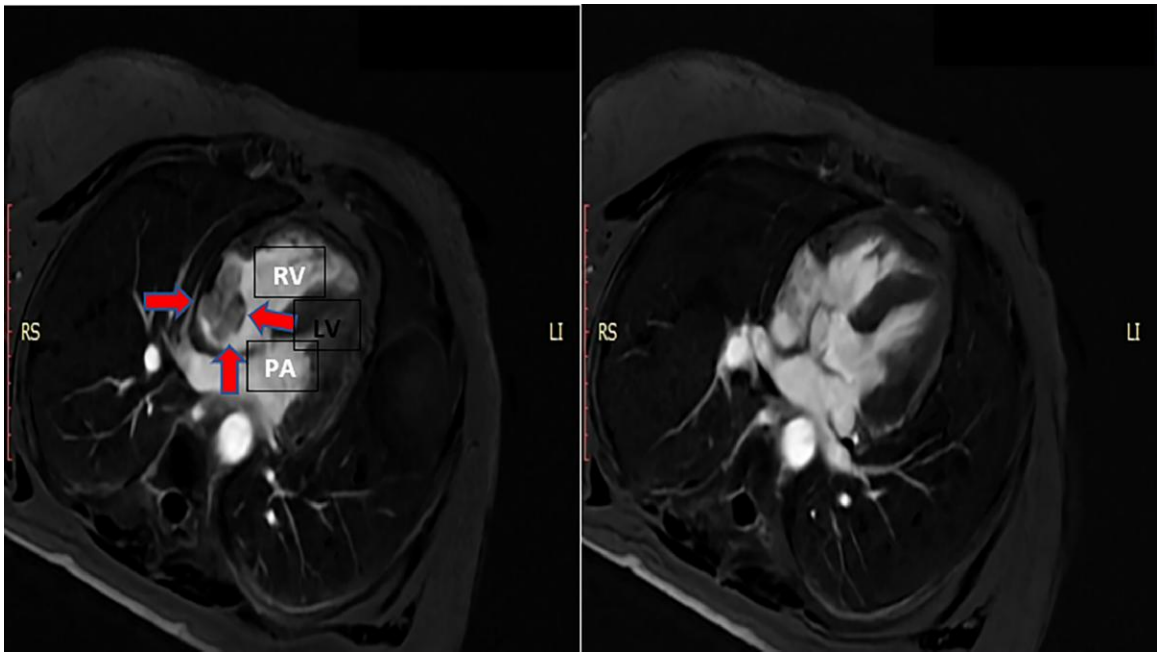


**Figure 3** Cardiac magnetic resonance imaging showing right atrial mass (arrows). Contrast uptake on the second image is an indicator of hypervascularity of tumour tissue. RV, right ventricle; LV, left ventricle; PA, pulmonary artery.

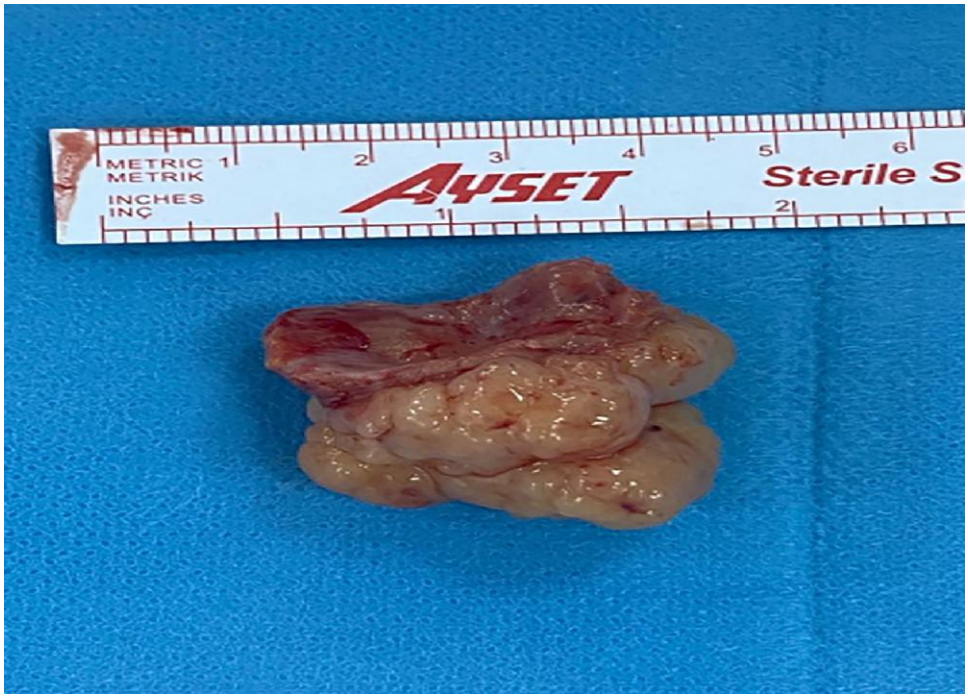


**Figure 4** Tumour tissue removed from the right atrium.

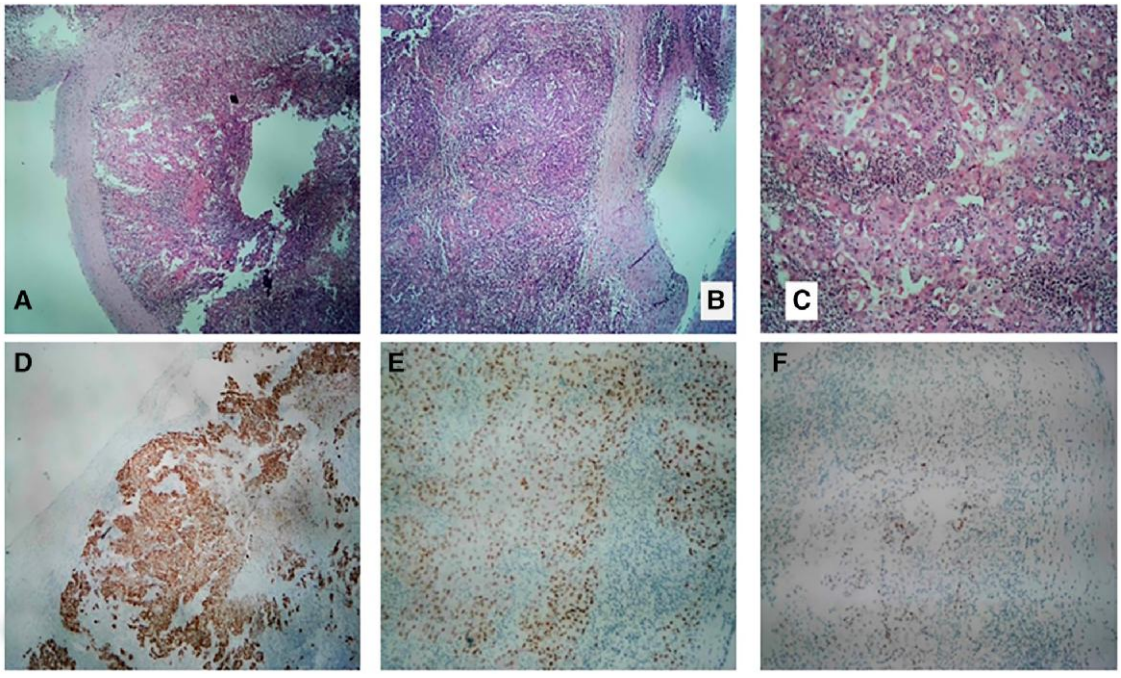


**Figure 5** (*A*) Adenocarcinoma metastasis to endocardium (HE [hematoxylin and eosin] ×40), (*B*) adenocarcinoma infiltration to endocardium, predominantly lymphoid cells (HE ×40), (*C*) poorly differentiated adenocarcinoma containing lymphoid cell-rich stroma (HE ×100), (*D*) pancytokeratin positive tumour cells (DAB ×40), (*E*) Pax8 nuclear positive tumour cells (DAB ×100), and (*F*) focal and weak ER positive tumour cells (DAB ×100).

The pathological examination showed EC metastasis. Diaminobenzidine (3,3′-DAB)-staining revealed pancytokeratin and Pax8 nuclear positive cells with focal and weak oestrogen receptor positivity (*Figure 5*). Following surgery, the patient was put on paclitaxel and carboplatin plus pembrolizumab treatment, while tumour tissue was positive for programmed cell death ligand 1 (PDL-1) staining. The patient will be planned for surgical resection of para-aortic lymph nodes if they are found to be resectable following the fourth cycle of systemic treatment.

## Discussion

Endometrial cancer is the most common gynaecologic malignancy and the fourth most common cancer in women. Studies have shown that cardiac metastasis from EC is a very rare condition. Metastatic endometrial carcinoma cases in the literature, which include the heart, are shown in *Table 1*. Right ventricular metastasis has been the most common cardiac metastasis site. We reported a case of intracavitary metastasis of EC, which is an unusual presentation and should be taken into consideration for patients with malignancies displaying rapid growth rate and higher metastatic potential.

Our patient had an intracavitary cardiac metastasis, which is, by any means, an extremely rare spreading pattern of EC to a distant organ. If the 18-FDG positron emission tomography–computed tomography (PET–CT) had not been done, cardiac metastasis would have been missed, and an inadequate treatment would have been carried out.

Recent cardio-oncology guideline by European Society of Cardiology (ESC) underscored the importance of serial evaluation of oncology patients on certain treatment protocols. The primary cardiovascular concern with patients undergoing chemotherapy protocols is myocardial dysfunction which can be induced by both agents given to our patient (paclitaxel and carboplatin). Cisplatin was also found to be correlated with coronary artery disease, hypertension, and thrombosis. However, carboplatin has less cardiovascular toxicity. Cardiovascular risk factor monitoring is recommended during and after therapy for such patients.[16] However, even in the most recent documents such as this guideline, there is no definitive recommendation regarding the optimal timing for routine metastasis checks for patient sub-groups.

This case is a crucial demonstration of timely utilization of diagnostic imaging methods in accordance with clinical suspicion in patients with rapidly growing tumours. The management of this patient might raise the question of the necessity of having every single oncology patient meticulously checked for distant metastasis. Although the literature and experience do not provide a precise answer to the issue of meticulously checking every single oncology patient for distant metastasis, certain characteristics of individual patients and malignancies should be used for decision-making. Haematogenous spreading to unexpected organs and the possibility of rare metastatic foci should always be taken into account when assessing and staging these malignancies and giving treatment decisions. In our case, findings on the initial PET CT scan indicated the rapid spreading rate and high possibility of metastasis which necessitated more frequent follow-up and subsequently another PET–CT scan at 9 months, the diagnosis being made upon these complementary imaging techniques. Considering the growth rate of the tumour tissue, our patient would likely have been symptomatic due to the gradual cessation of blood flow through the right atrium or embolic events unless it was diagnosed. The multi-disciplinary approach along with multimodality imaging methods has been quite beneficial in the management of this rare case. Incorporating such patients to the literature may invoke awareness on the intensity of investigations that should be implemented on the care of patients with certain disease characteristics.

## Lead author biography

Emre Erturk, MD, who is affiliated with IEU Medicalpoint Hospital and specializes in the Department of Cardiology, completed his medical school education at Dokuz Eylul University Faculty of Medicine and pursued his residency at Cerrahpasa Medical School in the Department of Cardiology. His primary areas of expertise include interventional cardiology, heart failure, and cardiac imaging. Dr. Erturk is an active member of several professional organizations, including the European Society of Cardiology, European Heart Failure Association, EAPCI, and Turkish Society of Cardiology.

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**Consent:** The authors confirm that written consent for the submission and publication of this case, including images, has been obtained from the patient and his parents in line with COPE guidance.

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## Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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