Iran J Nucl Med. 2026;34(2):184-188 [Serial No. 67]

Homepage: https://irjnm.tums.ac.ir/

CASE REPORT

A rare case of pericardial monophasic synovial sarcoma detected on [^{18}F]FDG PET/CT

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ARTICLE INFO

Article History:
Received: 19 November 2025
Revised: 29 January 2026
Accepted: 31 January 2026
Published Online: 27 June 2026

Keyword:
Synovial sarcoma
Cardiac tumors
[^{18}F]FDG
PET-CT

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ABSTRACT

We present a rare case of pericardial monophasic synovial sarcoma detected on fluorine-18 fluorodeoxyglucose ([^{18}F]FDG) positron emission tomography/computed tomography (PET/CT) and contrast-enhanced CT. Primary cardiac tumors are extremely rare, with an incidence of approximately 0.02%, and are about 20 times less common than secondary tumors. Cardiac synovial sarcomas are exceedingly rare, and pericardial synovial sarcoma represents one of the least common forms of primary cardiac sarcoma, with its true incidence remaining uncertain. In such cases, multimodality imaging is recommended. As illustrated in our case, contrast-enhanced CT helps delineate the tumor's dimensions, its relationship to vascular structures, and its proximity to adjacent organs, while [^{18}F]FDG PET/CT provides metabolic characterization and assessment of metastatic spread. Together, these modalities contribute substantially to treatment decision-making, surgical planning, post-treatment surveillance, and early detection of recurrence.

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How to cite this article: Tatoğlu MT, Özçevik H. A rare case of pericardial monophasic synovial sarcoma detected on [^{18}F]FDG PET/CT. Iran J Nucl Med. 2026;34(2):184-188.

https://doi.org/10.22034/irjnm.2026.130386.1726

INTRODUCTION

Primary cardiac tumors are extremely rare, occurring with an estimated incidence of 0.02% and being approximately 20 times less common than secondary cardiac neoplasms [1].

Sarcomas account for about 75% of primary malignant cardiac tumors. Among these, cardiac synovial sarcoma is exceptionally uncommon, and pericardial synovial sarcoma represents one of the rarest subtypes, with its true incidence remaining unknown [2]. Synovial sarcomas are histologically classified into biphasic, monophasic spindle cell, monophasic epithelial, and poorly differentiated variants, with the biphasic subtype reported to be more frequent in pericardial locations [3, 4].

CASE PRESENTATION

A 45-year-old woman presenting with chest pain underwent contrast-enhanced CT, which demonstrated a mass occupying the upper and lower paratracheal spaces from the thoracic inlet, extending into the right paracardiac region and encasing the ascending aorta and aortic arch (Figure 1A–G, white arrows).

The patient was referred to our department for [18F]FDG PET/CT to further evaluate the malignant potential of the mediastinal mass. On [18F]FDG PET/CT, the maximum intensity projection image (Figure 2A, black arrow) and axial fused PET/CT images demonstrated a centrally ametabolic, peripherally heterogeneous lesion with mildly increased FDG uptake (SUVmax 3.4). The mass extended anteriorly from the left side of the trachea at the thoracic inlet, encircled the aortic arch and ascending aorta, and reached the right paracardiac space (Figures 2B–E, white long arrows). Additionally, pericardial effusion was present (Figure 2F, white arrowheads). No distant metastases were identified.

Magnetic resonance imaging (MRI) demonstrated a mass in the upper mediastinum, originating at the level of the innominate artery and extending anteriorly to the trachea and the right atrial appendage. The lesion was located medial to the right-sided aortic arch and the superior vena cava and appeared to be contiguous with the right atrium.

On T1-weighted images, it showed a hyperintense peripheral rim with a hypointense central component (Figure 3A, C, E, G, I and K, white arrows), whereas T2-weighted images revealed heterogeneous hyperintensity (Figure 3B, D, F, H, J and L, white arrows). The mass displaced the trachea posteriorly, obscured the interface between the aortic arch and the pulmonary artery, and contained hemorrhagic cystic components.

The patient underwent surgical resection, and histopathological examination revealed a spindle cell/monophasic synovial sarcoma. The tumor measured 9 cm in greatest dimension, with a Ki-67 proliferation index of 20%, approximately 30% necrosis, and 22 mitoses per 10 high-power fields (HPF), consistent with a high-grade lesion without evidence of vascular invasion. No residual or recurrent disease was detected on [18F]FDG PET/CT performed on postoperative day 40 (Figure 4A). However, follow-up [18F]FDG PET/CT scans at 4 months (Figure 4B), 9 months (Figure 4C), and 23 months (Figure 4D) demonstrated a recurrent hypermetabolic mass arising from the right border of the ascending aorta and progressively enlarging over time (white arrows).

DISCUSSION

Primary cardiac tumors are extremely rare, occurring with an incidence of approximately 0.02% and being about 20 times less common than secondary cardiac tumors [1].

Sarcomas account for nearly 75% of primary malignant cardiac neoplasms. Among them, cardiac synovial sarcoma is exceptionally uncommon, and pericardial synovial sarcoma represents one of the rarest subtypes, with its true incidence remaining unknown [2].

Synovial sarcomas are histologically classified into biphasic, monophasic spindle cell, monophasic epithelial, and poorly differentiated variants, with the biphasic subtype reported to be more frequent in pericardial locations [3, 4].

The localization of the tumor and its relationship to adjacent structures are typically evaluated with multimodality imaging, including CT, MRI, and [18F]FDG PET/CT, whereas the definitive diagnosis is established by histopathological examination [4]. Multimodal imaging also plays a key role in surgical planning and post-treatment surveillance. For mediastinal lesions, delayed-phase [18F]FDG PET/CT may improve lesion-to-background contrast and facilitate lesion characterization [5]. In addition, depending on tumor morphology, contrast-enhanced [18F]FDG PET/CT can provide a more accurate assessment of treatment response [6]. Management of these aggressive and exceedingly rare tumors is challenging; although extensive surgical resection has been reported to reduce recurrence risk, overall prognosis remains uncertain [7, 8].

In line with prior reports, serial [18F]FDG PET/CT is valuable for postoperative follow-up and detection

of recurrent disease, as also illustrated in our case [9].

In the present case, [^{18}F]FDG PET/CT was performed to search for a primary focus, assess malignancy, and screen for metastatic disease.

In pericardial synovial sarcoma, multimodality imaging is recommended. As illustrated here, contrast-enhanced CT was useful for delineating the tumor's dimensions, its relationship with vascular structures, and its proximity to adjacent organs, while [^{18}F]FDG PET/CT contributed metabolic characterization and whole-body staging. Together, these complementary modalities provided valuable information for treatment decision-making, surgical planning, post-treatment follow-up, and early detection of recurrence. Notably, the primary lesion demonstrated a centrally ametabolic appearance with only mild peripheral FDG uptake, which can be explained by the substantial necrotic and cystic–hemorrhagic components demonstrated on MRI and confirmed histopathologically.

In contrast, the recurrent lesion became distinctly hypermetabolic on serial follow-up PET/CT, likely reflecting a higher viable tumor fraction, increased proliferative activity, and clonal selection of more aggressive tumor components after surgery. This case therefore underscores the value of serial [^{18}F]FDG PET/CT for postoperative surveillance, treatment response evaluation, and early detection of metabolically active recurrence.

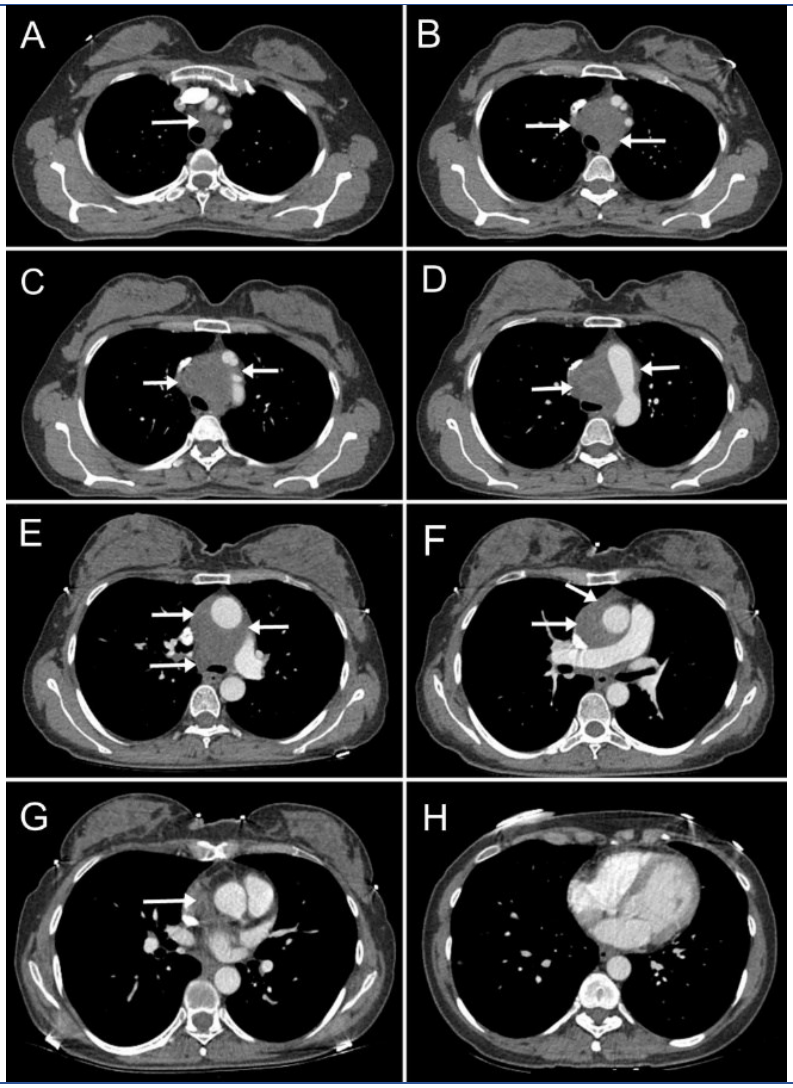

Figure 1. Axial contrast-enhanced thoracic CT images (A–H)

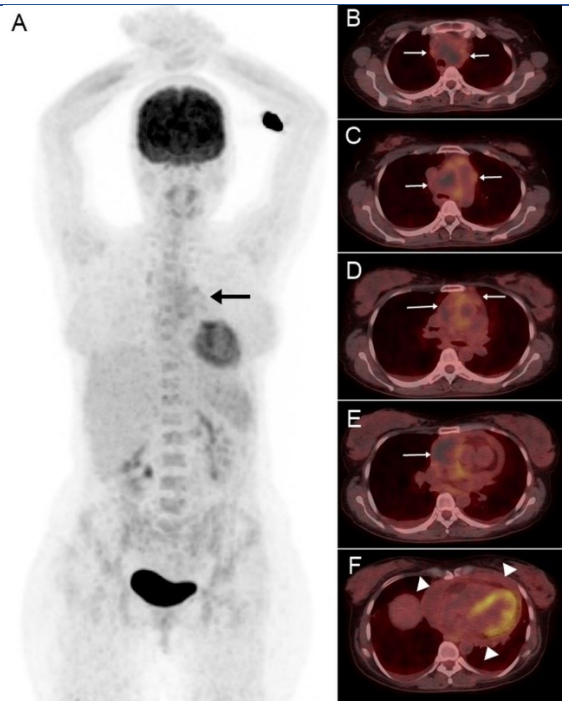

Figure 2. Maximum intensity projection (MIP) image (A) and axial fused [18F]FDG PET/CT images (B–F)

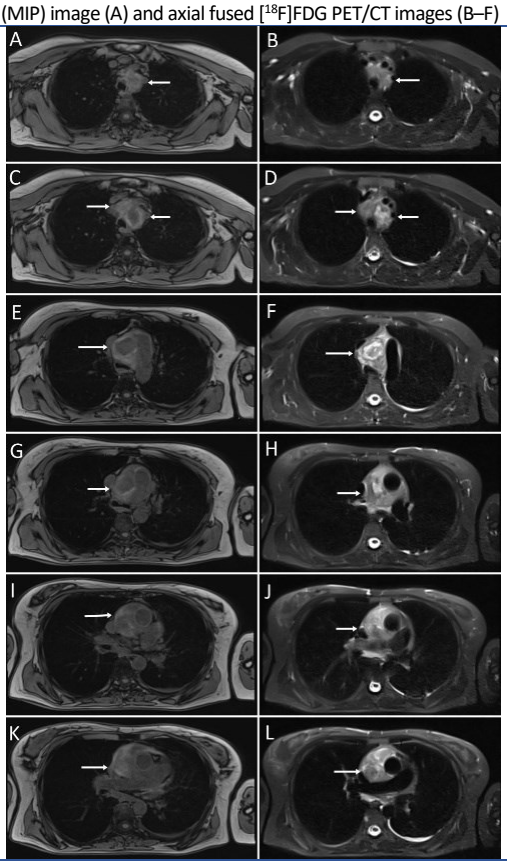

Figure 3. Axial T1-weighted images (A, C, E, G, I, K) and axial T2-weighted images (B, D, F, H, J, L) from the thoracic MRI

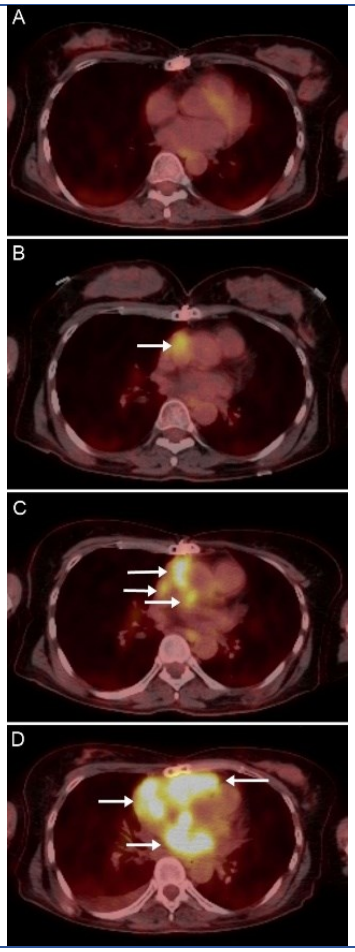

Figure 4. Axial fused [^{18}F]FDG PET/CT images obtained on postoperative day 40 (A), and at 4 months (B), 9 months (C), and 23 months (D)

CONCLUSION

In this case, [^{18}F]FDG PET/CT was used to search for a primary focus, assess malignancy, and screen for metastatic disease. Pericardial synovial sarcomas should be evaluated with multimodality imaging. As illustrated here, contrast-enhanced CT helps define the tumor's size and its relationship with vascular structures and adjacent organs, while [^{18}F]FDG PET/CT provides metabolic characterization and whole-body staging. Together, these complementary modalities support treatment planning, surgical decision-making, post-treatment follow-up, and early detection of recurrence.

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