## IMAGES IN NUCLEAR CARDIOLOGY

# Prolonged Fasting Preparation for over 24 Hours Before $^{18}$F-fluorodeoxyglucose PET/CT is Useful to Suppress Physiological Myocardial Uptake in Cardiac Sarcoidosis After Steroid Therapy

Azusa Shimabukuro, MD, Tadao Aikawa, MD, PhD, Yuya Matsue, MD, PhD, and Tohru Minamino, MD, PhD

Received: August 25, 2025 / Revised manuscript received: September 29, 2025/ Accepted: October 16, 2025


**Ann Nucl Cardiol 2025; 11 (1): 49–52**

A 77-year-old woman was admitted to our hospital due to progressive dyspnea. Chest X-ray showed cardiomegaly and pulmonary congestion (Figure 1A). Electrocardiography showed complete right bundle branch block (Figure 1B) Echocardiography demonstrated thinning of the basal interventricular septum and a reduced left ventricular ejection fraction (LVEF) of 26%. Coronary angiography revealed no significant coronary artery stenosis. Cardiac MRI (Figure 1C-E) demonstrated a patchy, multifocal distribution of late gadolinium enhancement (LGE) in the myocardium, indicating cardiac sarcoidosis. $^{68}$Ga SPECT/CT fusion image showed a slight uptake in the basal interventricular septum which correspond to the MRI findings (Figure 1F-G). A skin biopsy of the erythematous infiltrate on her face revealed noncaseating epithelioid cell granulomas, confirming the histological diagnosis of sarcoidosis (Figure 1H).

To further evaluate systemic sarcoidosis, the patient underwent $^{18}$F-fluorodeoxyglucose (FDG) PET/CT after 20 hours of overnight fasting and low-carbohydrate diet (LCD) preparation (Figure 2A). The FDG PET/CT demonstrated abnormal FDG uptake in the bilateral hilar and mediastinal lymphadenopathy, as well as increased myocardial FDG uptake in the basal anterior, septal, and inferior walls (maximum standardized uptake value [SUVmax] = 4.09; pretest blood glucose level [P-BGL] = 96 mg/dL). This area of increased FDG uptake corresponded with the area of LGE.

She was diagnosed with cardiac sarcoidosis and started steroid therapy with oral prednisolone 30 mg/day. The prednisolone dose was tapered by 5 mg every month until reaching 20 mg/day. Although she was asymptomatic, she underwent FDG PET/CT after 20 hours of overnight fasting and LCD preparation to monitor disease activity two months after beginning steroid therapy (Figure 2B). Compared to the initial FDG PET/CT, the abnormal FDG uptake in the lymph nodes decreased markedly, while the increased myocardial FDG uptake remained present (SUVmax=5.34; P-BGL=148 mg/dL). Increased FDG uptake was also seen in the papillary muscle (Figure 3B), suggesting a failure to suppress myocardial physiological FDG uptake (1).

After a shared decision-making process, the patient opted to continue with prednisolone at a dosage of 20 mg/day. She also received up-titration of guideline-directed medical therapies for heart failure with reduced LVEF. Her symptoms remained stable, and her LVEF increased to 45% on a maintenance dose of prednisolone 20 mg/day. Three months after the second FDG PET/CT, she underwent a third FDG PET/CT after fasting for 28 hours to further suppress physiological FDG uptake in the myocardium (Figure 2C). Interestingly, myocardial FDG uptake decreased markedly (SUVmax = 3.00; P-BGL = 126 mg/dL). Cardiac MRI after the third FDG PET/CT showed decreased myocardial LGE extent, suggesting decreased cardiac sarcoidosis disease activity. The patient did not complain about fasting for over 24 hours before the third FDG PET/CT and was pleased that her steroid dosage could be reduced.

According to the 2018 Japanese Society of Nuclear Cardiology recommendations for FDG PET imaging to diagnose cardiac sarcoidosis, strict preparation is recom-

DOI: 10.17996/anc.25-00008

Department of Cardiovascular Biology and Medicine, Juntendo University Graduate School of Medicine, Tokyo, Japan

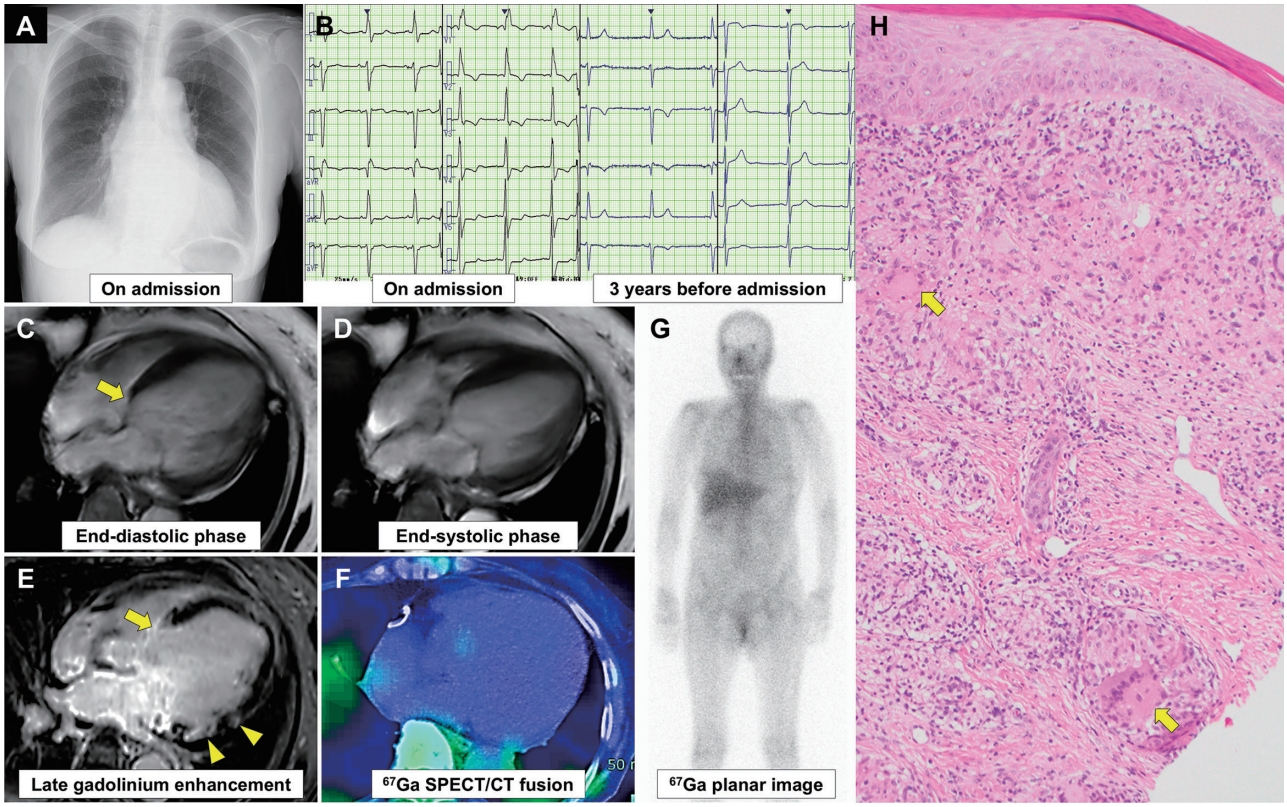


**Figure 1**　Images of a 77-year-old woman with newly diagnosed cardiac sarcoidosis.
**A**: Chest X-ray shows cardiomegaly and pulmonary congestion.
**B**: Electrocardiography on admission shows a new complete right bundle branch block that was not observed three years prior to admission.
**C-D**: Cardiac magnetic resonance imaging (CMR) shows thinning of the basal interventricular septum (*arrow*) and a reduced left ventricular ejection fraction.
**E**: Late gadolinium enhancement on CMR shows transmural hyperenhancement at the basal interventricular septum (*arrow*) and a patchy, multifocal, and subepicardial hyperenhancement in the left ventricular lateral wall (*arrowheads*).
**F-G**: $^{68}$Ga imaging shows a slight uptake in the basal interventricular septum on SPECT/CT fusion images (**F**).
**H**: Photomicrograph of the skin biopsy stained with hematoxylin and eosin shows noncaseating epithelioid cell granulomas and multinucleated giant cells (*arrows*), which are consistent with sarcoidosis.

mended prior to FDG PET/CT to suppress physiological myocardial FDG uptake (2). This preparation includes fasting for at least 18 hours and LCD preparation the day before FDG PET/CT. Baseline CMR in this case demonstrated minor LGE in the papillary muscle (Figure 3D), indicating active inflammation corresponding to the papillary muscle showing FDG uptake in the initial FDG PET/CT (Figure 3A). However, the second FDG PET/CT failed to suppress physiological myocardial FDG uptake (Figure 3B). Steroid therapy alters glucose metabolism, increases insulin resistance, and may affect myocardial FDG uptake. Although further studies are needed, our case suggests that prolonged fasting for over 24 hours before FDG PET/CT may help further suppress physiological myocardial FDG uptake in patients with cardiac sarcoidosis who are treated with steroid therapy.

## List of Abbreviations

CMR = cardiac magnetic resonance imaging
FDG = $^{18}$F-fluorodeoxyglucose
LCD = low-carbohydrate diet
LGE = late gadolinium enhancement
LVEF = left ventricular ejection fraction
MRI = magnetic resonance imaging
PET/CT = positron emission tomography/computed tomography
SPECT = single photon emission computed tomography
SUVmax = maximum standardized uptake value

## Authorship

The first draft of the manuscript was written by A.S and T. A. T. A contributed to the conception, design, collection, analysis, and interpretation of the data. All authors read and critically revised the manuscript and approved the final manuscript.

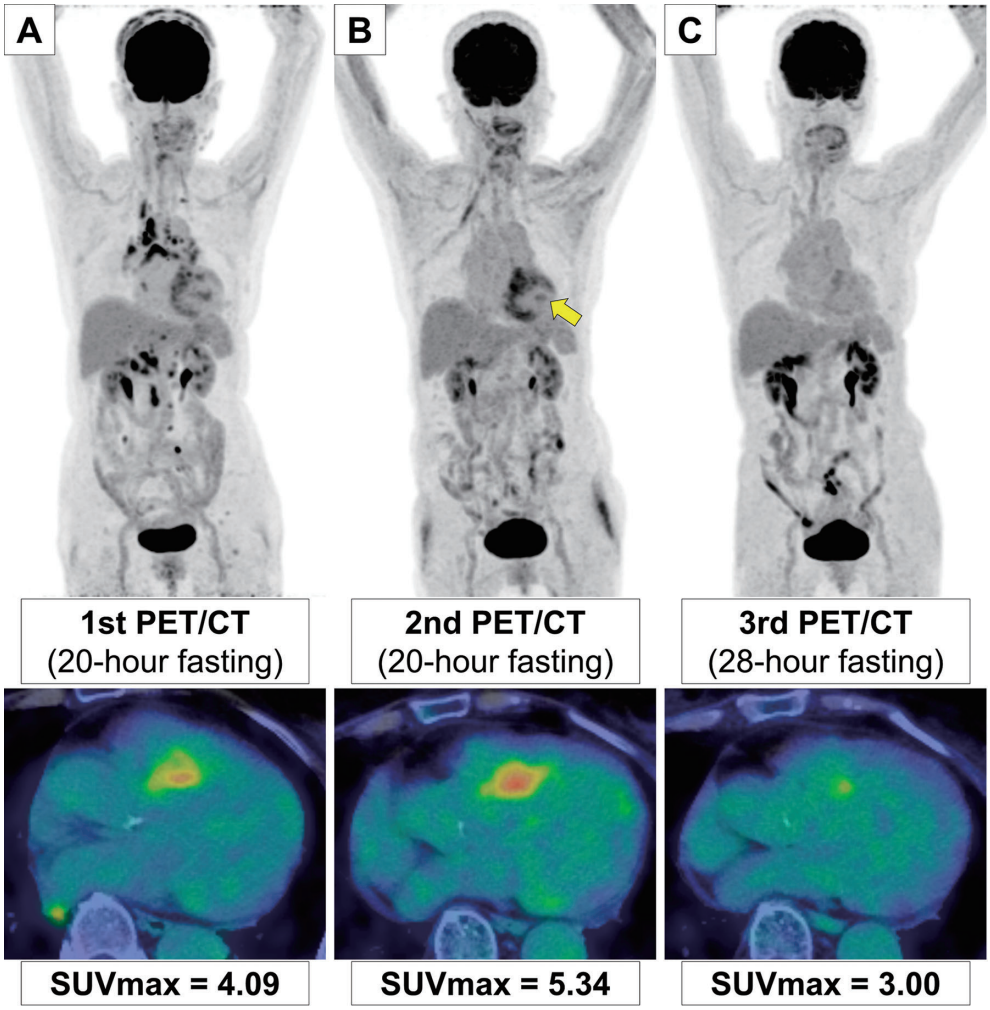


**Figure 2** FDG PET/CT images before and after steroid therapy in cardiac sarcoidosis.

**A**: At diagnosis, FDG PET/CT performed after 20 hours of overnight fasting and low-carbohydrate diet (LCD) preparation shows abnormal FDG uptake in the bilateral hilar and mediastinal lymph nodes, as well as increased myocardial FDG uptake (maximum standardized uptake value [SUVmax], 4. 09). These findings are consistent with systemic sarcoidosis with cardiac involvement.

**B**: A second FDG PET/CT after 20 hours of overnight fasting and LCD preparation was performed to monitor disease activity two months after initiating steroid therapy. The abnormal FDG uptake in the lymph nodes has decreased markedly, while the increased myocardial FDG uptake remains present (SUVmax=5. 34). Increased FDG uptake is also seen in the papillary muscle (*arrow*), suggesting a failure to suppress physiological myocardial FDG uptake. The patient continued on the same dose of steroid therapy after the second FDG PET/CT.

**C**: A third FDG PET/CT after fasting for 28 hours was conducted to further suppress physiological FDG uptake in the myocardium three months after the second FDG PET/CT. Myocardial FDG uptake is markedly decreased (SUVmax=3.00).

**Acknowledgments**

The authors thank Dr. Yuki Kitada from the Department of Dermatology at Juntendo University Hospital for his help in performing and evaluating the skin biopsy.

**Sources of funding**

This work was supported by a Grant-in-Aid for Scientific Research (C) (grant number 25K10897) from the Japan Society for the Promotion of Science (JSPS); and by the Nakatani Foundation (to T.A).

**Conflicts of interest**

Dr. Matsue received honoraria from Otsuka Pharmaceutical Co., EN Otsuka Pharmaceutical Co., Ltd., Novartis Pharma K. K., Bayer Inc., and AstraZeneca, and a collaborative research grant from Pfizer Japan Inc., Otsuka Pharmaceutical Co., EN Otsuka Pharmaceutical Co., Ltd., Nippon Boehringer Ingelheim Co., Ltd., Roche Diagnostics International Ltd., and Roche Diagnostics K.K. The other authors have no conflicts of interest to declare.

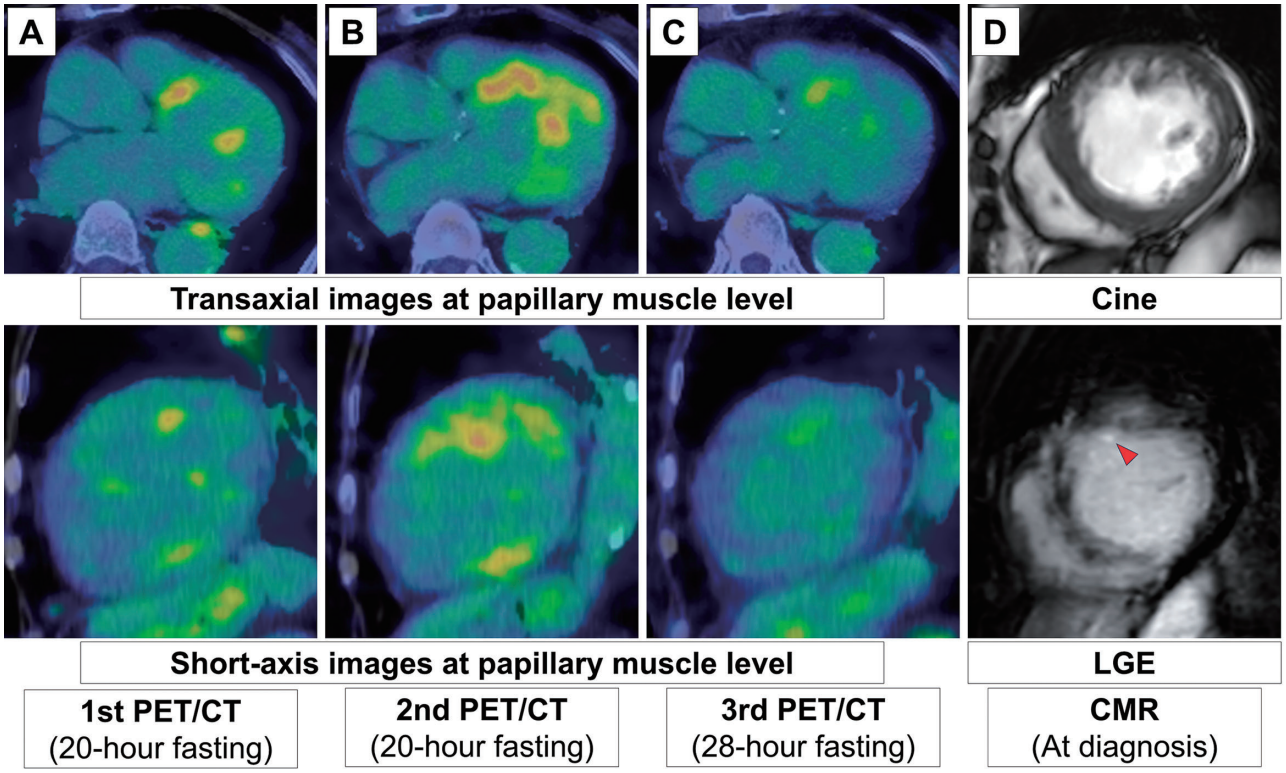


**Figure 3**　FDG PET/CT images of the papillary muscle before and after steroid therapy (**A-C**) and baseline cardiac magnetic resonance imaging (**D**).

**A**: At diagnosis, FDG PET/CT performed after 20 hours of overnight fasting and low-carbohydrate diet (LCD) preparation shows an increased FDG uptake in the papillary muscle.

**B**: A second FDG PET/CT after 20 hours of overnight fasting and LCD preparation was performed to monitor disease activity two months after initiating steroid therapy. Increased FDG uptake is still present in the papillary muscle, suggesting a failure to suppress physiological myocardial FDG uptake.

**C**: A third FDG PET/CT after fasting for 28 hours was conducted to further suppress physiological FDG uptake in the myocardium three months after the second FDG PET/CT. FDG uptake in the papillary muscle decreased markedly, indicating successful suppression of physiological myocardial FDG uptake.

**D**: Baseline CMR shows minor LGE in the papillary muscle (*arrowhead*), indicating active inflammation corresponding to the papillary muscle showing FDG uptake at diagnosis (A).

**Ethics approval statement**

Research Ethics Committee approval is not required for case report at our institution.

**Consent for publication**

The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with CARE guidelines.

Reprint requests and correspondence:
Tadao Aikawa, MD, PhD, FACC, FESC
Department of Cardiovascular Biology and Medicine, Juntendo University Graduate School of Medicine, 2-1-1 Hongo, Bunkyo-ku, Tokyo 113-8421, Japan
E-mail: tadao.aikawa@juntendo.ac.jp

## References

1. Özütemiz C, Koksel Y, Froelich JW, et al. The active papillary muscle sign in $^{18}$F-FDG PET/CT cardiac sarcoidosis exams and its relationship with myocardial suppression. Ann Nucl Med 2024; 38: 391–9.
2. Kumita S, Yoshinaga K, Miyagawa M, et al. Recommendations for $^{18}$F-fluorodeoxyglucose positron emission tomography imaging for diagnosis of cardiac sarcoidosis-2018 update: Japanese Society of Nuclear Cardiology recommendations. J Nucl Cardiol 2019; 26: 1414–33.