

# Disseminated Skeletal Muscle and Cardiac Metastasis from Squamous Cell Carcinoma of the Lung Detected with FDG and FLT PET/CT

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## Abstract

Lung cancer is one of the leading cancers all over the world. Positron emission tomography (PET) using 18F fluorodeoxyglucose (18F FDG) is useful for staging of the disease and decide the appropriate management. 3'-deoxy-3'-18 F-fluorothymidine (18F FLT) is a tracer being extensively evaluated currently and is said to represent tumor proliferation. Common sites of metastases from lung cancer include adrenal glands, bone, and brain. Muscle metastasis and cardiac metastasis are uncommon findings. We report a case of squamous cell carcinoma of the lung with metastases to multiple skeletal muscles and myocardium detected with both FDG and FLT PET/computed tomography (CT).

**Keywords:** Cardiac metastasis, 18F fluorodeoxyglucose Positron emission tomography/computed tomography, 3'-deoxy-3'-18 F-fluorothymidine PET/CT, muscle metastases, nonsmall-cell lung cancer

## Introduction

Isolated muscle and cardiac metastases from primary lung cancer is rare findings. F-18 fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) is a beneficial imaging modality to identify the metabolically active tumoral lesion. Due to variable FDG uptake in cardiac muscles, make limitation in cardiac metastasis. 3'-deoxy-3'-18 F-fluorothymidine (18F FLT) PET tracer, based on cell proliferation is a better choice to confirm the metastatic lesion in the myocardium. We describe a case of squamous cell lung carcinoma of the lung with metastases to multiple skeletal muscles and

myocardium detected with both FDG and FLT PET/computed tomography (CT).

## Case Report

A 72-year-old female patient presented with a history of painful swelling over the head in the right temporal region for 5 months, and fine-needle aspiration cytology (FNAC) from the swelling revealed necrotic material. Contrast-enhanced computed tomography (CECT) thorax showed mass in the upper lobe of right lung. Sputum test for acid-fast bacilli was negative. For characterization of lesions, the patient was subjected to contrast-enhanced whole body 18F fluorodeoxyglucose (18F FDG) Positron emission tomography/computed tomography (PET/CT) that showed a soft tissue mass in the upper lobe of the right lung [Figure 1]. Necrosis was noted in most of the volume with increased FDG uptake only in the periphery. FDG avid enhancing lesions with central hypo-attenuation were also noted in multiple skeletal muscles and the left ventricle [Figure 2]. Increased FDG uptake was noted in the right temporalis

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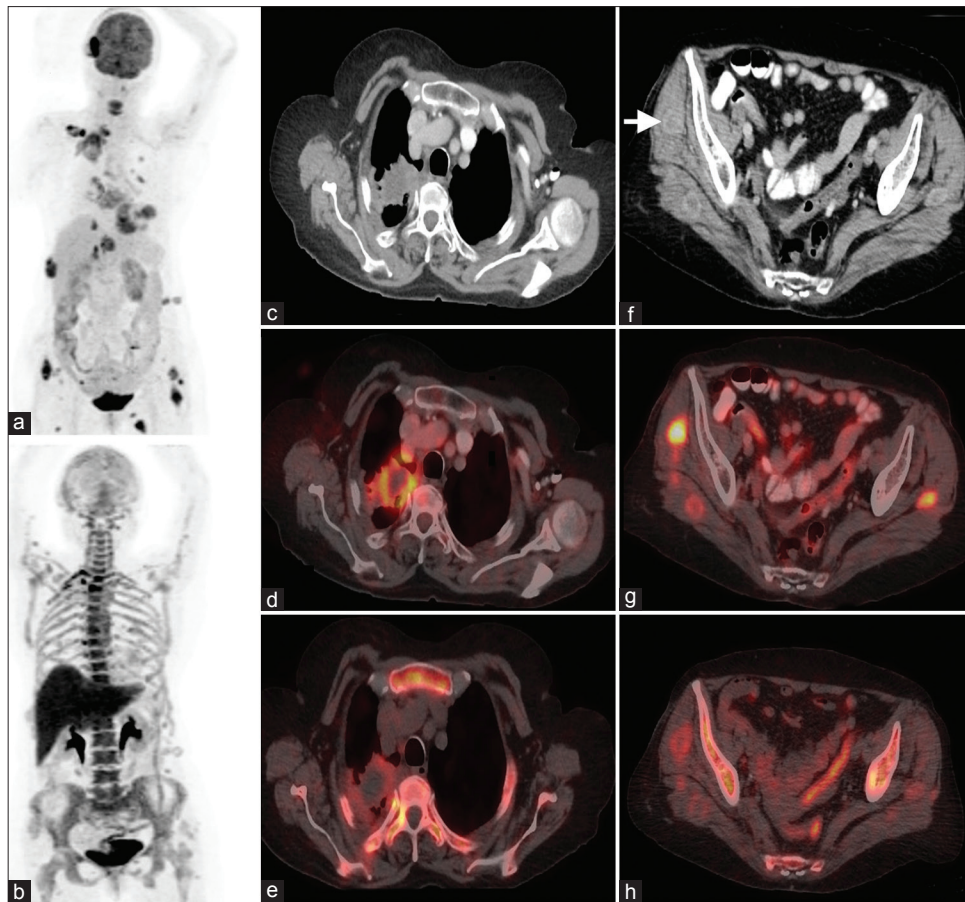


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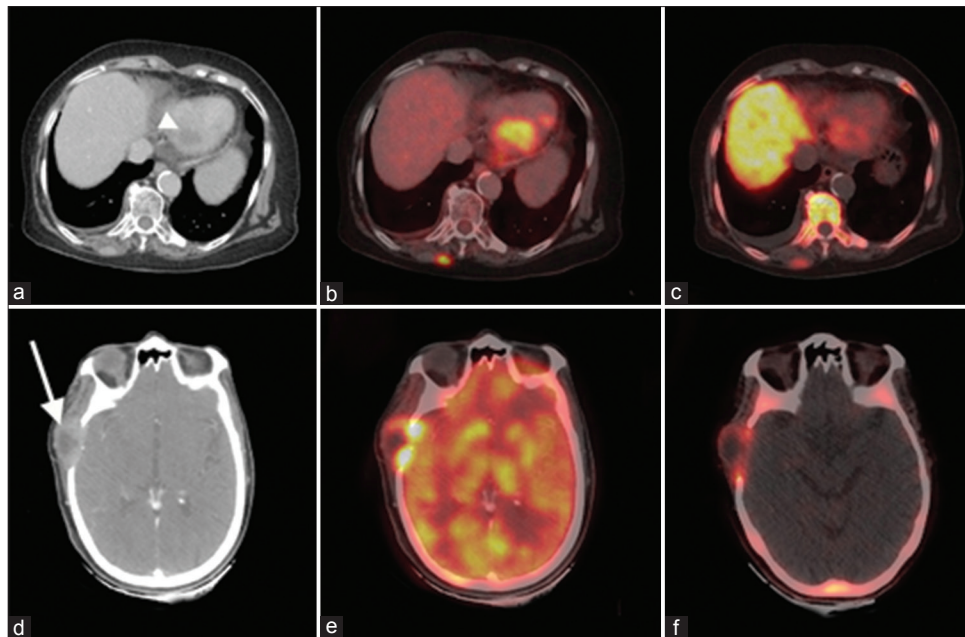
**Figure 1:** A whole body  $^{18}\text{F}$  FDG PET/CT maximum intensity projection image of a 72-year-old female: (a) Shows abnormal foci of tracer uptake in skull, mediastinum, abdomen, pelvic, and bilateral thigh region; however, no additional abnormal foci of tracer avidity are noted in  $^{18}\text{F}$  FLT PET/CT maximum intensity projection image (b) Transaxial CT, fused FDG PET/CT, and FLT PET/CT images (c–e) show a soft tissue mass in the right lung upper lobe. Most of the mass shows necrosis with increased tracer uptake in the periphery. Ring-enhancing lesions with central hypo-attenuation were also noted in multiple skeletal muscles (F-transaxial CT, short arrow) that showed increased tracer uptake (G, H-transaxial fused FDG PET/CT and FLT PET/CT)

muscle with underlying bone destruction.  $^{18}\text{F}$  FLT PET/CT was also done to characterize the lung lesion that showed increased tracer uptake corresponding to the FDG uptake suggestive of active proliferation. FLT uptake was also noted in the FDG avid myocardial and skeletal muscle lesions. Subsequently, fine-needle aspiration (FNA) was done from the tracer avid periphery of the right temporal soft tissue swelling that showed metastatic well-differentiated squamous cell carcinoma. A PET-guided biopsy from the lung mass was planned, but unfortunately the patient expired after 8 days of stay in the hospital due to ventricular fibrillation, despite the resuscitative efforts. A diagnosis of primary squamous cell carcinoma of the right lung with widespread metastases was made.

## Discussion

Although rare, metastasis to skeletal muscles is well documented in nonsmall cell lung cancer (NSCLC).<sup>[1,2]</sup>

Further, skeletal muscle metastasis (SMM) reflects an aggressive disease and patients with multiple muscle metastases have bad overall survival rates as compared to solitary muscle metastasis.<sup>[3]</sup> Lung carcinoma is a common cause of cardiac metastasis.<sup>[4]</sup>  $^{18}\text{F}$  FDG PET/CT is a highly sensitive investigation in detection of cardiac metastasis.<sup>[5]</sup> Metastasis to the myocardium might be completely asymptomatic or even cause sudden death due to arrhythmias.<sup>[6]</sup>  $^{18}\text{F}$  FLT is a surrogate marker of tumor cell proliferation,<sup>[7]</sup> and recently it has been shown to be more sensitive than  $^{18}\text{F}$  FDG PET/CT for early treatment response after chemoradiation in NSCLC.<sup>[8]</sup> The presented case highlights how  $^{18}\text{F}$  FLT PET/CT like FDG PET/CT can detect the primary site as well as rare metastatic sites, thus helping in accurate staging of NSCLC. Also, as shown in our study, FLT PET/CT identifies regions of active proliferation within the primary tumor as well as in the metastatic sites and, therefore, helps to guide FNA cytology (FNAC) to increase the diagnostic yield.



**Figure 2:** Transaxial CT, fused FDG PET/CT, and FLT PET/CT images at mediastinal level show (a–c) tracer avid hypodense lesion in the left ventricle. Other transaxial CT, fused FDG PET/CT, and FLT PET/CT images at cranium level (d–f) show tracer avid lesion in the right temporalis muscle with underlying temporal bone destruction, and, subsequently, FNA was done from the periphery of the right temporal soft tissue swelling that showed metastatic well-differentiated squamous cell carcinoma

## Conclusion

18F FDG PET/CT is an established imaging modality for detection of secondaries in various malignancies including lung cancer. However, due to variable FDG avidity in myocardium makes difficulty in detection of cardiac metastasis. 18F FLT is the marker of tumor cell proliferation that provide accurate information about proliferative viable tissue. We concluded that FDG and FLT PET/CT could be complimentary in inconclusive FDG image findings.

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