

# An Unusual Case of Myocardial Localization of Non-Small Cell Lung Cancer Metastasis: A Case Report and Review of Literature

## Abstract

Positron emission tomography (PET) using 18F-fluorodeoxyglucose (18F-FDG) is useful for staging non-small cell lung cancer (NSCLC), decide the appropriate initial management, and evaluate the response to therapy. Metastatic spreading is very common during the course of NSCLC and principal localization sites include: regional and mediastinal lymph nodes and organs such as the contralateral lung parenchyma, bone, brain, adrenal gland, pleura, and liver. Myocardial localizations are very rare, often asymptomatic, and difficult to diagnose. For this reason, only a few cases are reported in the literature. Here, we report a case of an asymptomatic patient affected by locally advanced NSCLC and high metabolic lesion of the interventricular septum.

**Keywords:** NSCLC, F-18 FDG PET/CT, therapy, metastasis, myocardial metastasis

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## Introduction

Lung cancer is one of the most common cancers worldwide and the leading cause of death in the United States. In 2015, approximately 221,000 new cases were estimated, and only about 17% of these patients were alive after 5 years.<sup>[1,2]</sup> Although many progresses have been recently made for lung cancer screening, diagnosis, staging, and therapy, most patients continue to die as a result of disease progression.<sup>[3,4]</sup>

The introduction of positron emission tomography/computed tomography (PET/CT) in the diagnostic work-flow of these cancers has improved not only the diagnostic accuracy but also the follow-up of this disease, mainly for long-surviving patients. As reported by Zeliadt *et al.*,<sup>[5]</sup> approximately 30% of the patients undergoing PET/CT present a distant localization contraindicating surgery. Moreover, PET/CT can be used as an useful diagnostic tool during the follow-up.

As previously reported<sup>[6]</sup> 18F-fluorodeoxyglucose (18F-FDG) PET/CT may be useful in monitoring response to therapy, and it is at least as effective as anatomic response in predicting survival. It may be an earlier prognostic factor for

survival in patients with metastatic non-small cell lung cancer (NSCLC).

Here, we describe the case of a patient affected by NSCLC with an unusual presentation of a myocardial metastasis.

## Case Report

A 67-year-old man, former light smoker, underwent right upper lobe lobectomy in November 2009 (time 0) and mediastinal lymphadenectomy for an acinar adenocarcinoma G3, pT2N2, followed by adjuvant chemoradiotherapy with cisplatin (CDDP) and gemcitabine for three cycles.

In November 2011 (time 24 months), a follow-up PET/CT demonstrated a focal uptake in the right pleura, supra-clavicularo-mo-lateral lymph nodes, and in the ventricular septum, suggesting an unusual relapse of the disease [Figure 1]. An echocardiography performed within a few days demonstrated the presence of a myocardial noncontracting nodule in the intraventricular septum [Figure 2], suggestive of metastasis. The same finding was evident on a contrast-enhanced CT, suggesting the presence of protrusion into the cavity [Figure 3].

A molecular analysis was performed with the detection of EGFR status and

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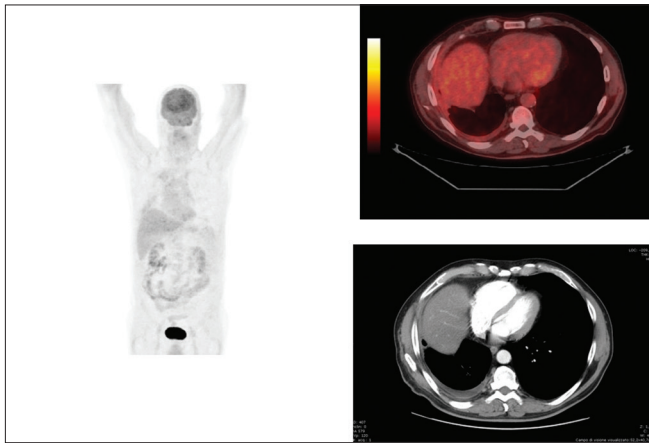


Figure 1: Follow-up PET/CT and CECT (time 27 months) after chemotherapy showing a complete metabolic and anatomic response to chemotherapy of lesions including myocardial lesion

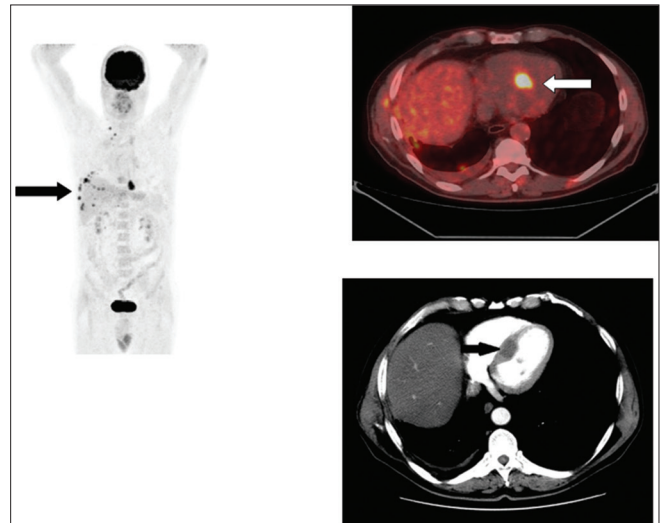


Figure 2: Restaging PET/CT and CECT (time 24 months) showing a pathologic uptake in myocardial septum (white arrow) in correspondence to an ipodense lesion on CECT and many right pleura focal pathologic uptakes (black arrow)

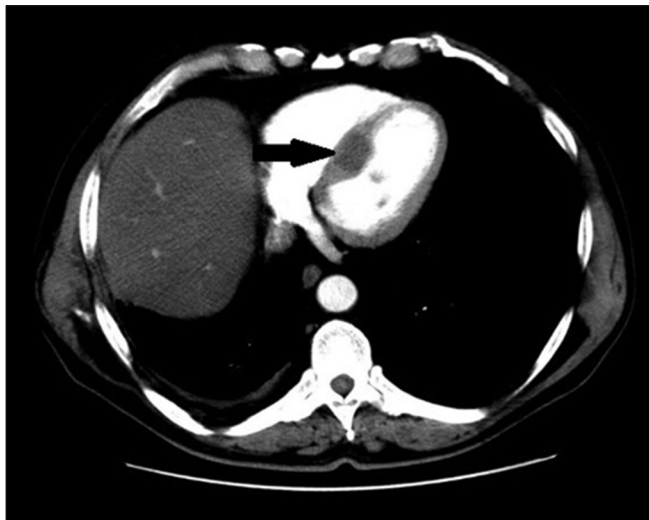


Figure 3: CECT (time 24 months) showing an ipodense, not enhancing spherical lesion in the intraventricular septum, "bulging" into the cavity; (black arrow)

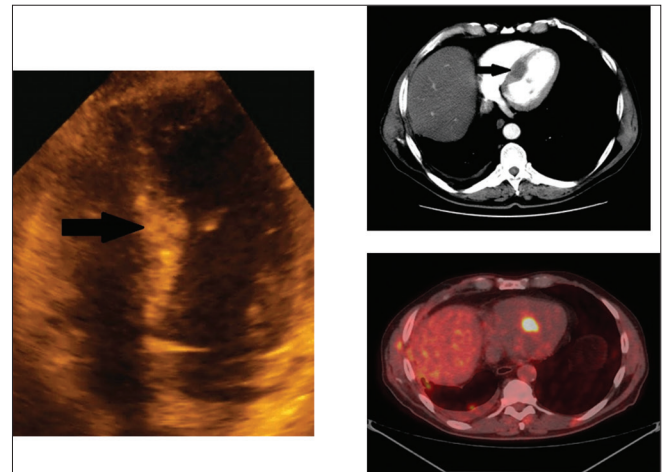


Figure 4: Cardiac echography (time 24 months) showing the presence of an intraventricular septal "bulging" (black arrow) corresponding to anatomic and metabolic findings (black arrow)

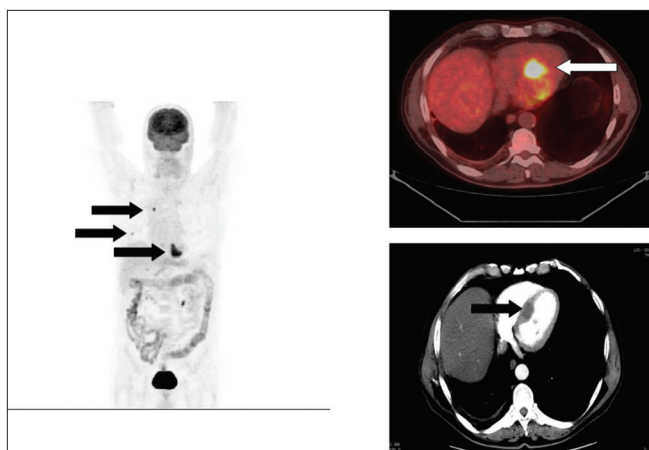


Figure 5: Follow-up PET/CT and CECT (time 42 months) showing a relapse of the tumor in the myocardium (white arrow on PET image and black arrow on CECT image) and pleura (black arrows)

ALK rearrangement (EGFR status: wild type, ALK rearrangement: not rearranged).

The patient was then considered having a progressive disease and underwent a first line chemotherapy with CDDP-pemetrexed, followed by a complete metabolic response, in the myocardium obtained in March 2012 (time 27 months) [Figure 4].

The complete metabolic response was sustained till June 2013 (time 42 months) when a follow-up PET/CT showed a myocardial relapse of the disease and the onset of a nodules at the right diaphragmatic and mediastinal pleura [Figure 5]; due to the time frame since the end of the last chemotherapy, the patient underwent a re-challenge with CDDP-pemetrexed.

A new PET/CT (time 48 months) showed disease progression, and the patient was switched to Crizotinib with no response. He died thereafter due to multiorgan failure in September 2014 (time 58 months).

## Discussion

Cardiac localization of NSCLC is a rare event. Because of its intrinsic anatomic and functional features, myocardium is not prone to metastatic involvement. Moreover, when asymptomatic, these lesions are difficult to be discovered, mainly in the pre-PET/CT era.

Although with the increasing use of F-18DG PET/CT in the management of NSCLC, to our knowledge, only few cases of myocardial metastasis detected by FDG PET/CT are reported in the literature.<sup>[7,8]</sup> When myocardial metastasis occurs, the interatrial and interventricular septum seems to be the region involved, as reported by Sato *et al.*<sup>[7]</sup> who described a NSCLC metastasis of the right side of interatrial septum. In our plurimetastatic (pleura, supraclavicular omolateral lymph-nodes) NSCLC patient, we found two ipodense, ipoechoic, highly metabolic lesions in the interventricular septum suggestive of metastasis without specific symptoms.

Although dynamic MRI is considered to be an important tool in the diagnosis of myocardial metastatic lesions, as reported by Pozzoli *et al.*<sup>[9]</sup> and myocardial transcatheter biopsy is considered the gold standard, as reported by Kim *et al.*,<sup>[10]</sup> in our claustrophobic and critically ill patient, neither MRI nor biopsy was considered mandatory for the management of the disease because of the presence of metastasis outside the heart hearth. Moreover in this long-survivor patient, many follow-ups with PET/CT were available, and we could observe the response, at least to second line therapy, of cardiac hypermetabolic lesions and subsequent relapse.

This case presented another point of interest – the use of PET/CT “stand-alone” in a plurimetastatic patient diagnosed with NSCLC undergoing chemoradiotherapeutic approach. How to follow these patients remains a debated and relatively little investigated topic. With the improvement of treatment options and the availability of many and substantially different chemoradiotherapeutic regimens, the standardization of patients’ follow-up strategies seems to be crucial to spare unnecessary toxicities and saving resources.

Following most guidelines,<sup>[11]</sup> for long-survivors asymptomatic patients, a periodic (6-12 months) contrast-enhanced CT and clinical visit seem to be appropriate, however, pluritreated, symptomatic patients need a more complex approach, and PET/CT can offer an advantage related to its ability to

discover, as in this case, response to therapy and progression of disease, monitoring metabolic activity of the tumor.

## Conclusion

F18FDG PET/CT has shown an unexpected localization of NSCLC metastasis and its utilization during follow up of this NSCLC patients was useful in monitoring response to therapy.

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## Conflicts of interest

The authors declare no conflicts of interest.

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