

# Hot-clot artifact in the lung parenchyma on $^{18}\text{F}$ -fluorodeoxyglucose positron emission tomography/computed tomography mimicking malignancy with a homolateral non-small cell lung cancer

## ABSTRACT

$^{18}\text{F}$ -fluorodeoxyglucose ( $^{18}\text{F}$ -FDG) positron emission tomography/computed tomography (CT) is an important tool widely used in the oncology to stage and restage various malignancies. Intense focal FDG uptake in the lung parenchyma associated with the absence of anatomical lesion detected on CT can be explained by a lung microembolism, known as hot-clot artifact. We report, to the best of our knowledge, the first case describing a single hot-clot artifact located in the same lung as a histologically proven non-small cell lung cancer.

**Keywords:**  $^{18}\text{F}$ -fluorodeoxyglucose, hot-clot artifact, lung cancer, positron emission tomography

## INTRODUCTION

$^{18}\text{F}$ -fluorodeoxyglucose positron emission tomography/computed tomography ( $^{18}\text{F}$ -FDG PET/CT) is widely used in the oncology to stage and restage various malignancies. Even if most of the malignant cells show a high metabolic activity, some benign diseases can display FDG uptake, which may lead to false-positive  $^{18}\text{F}$ -FDG PET/CT.<sup>[1]</sup> Hot-clot artifact, caused by a lung microembolism, is another situation in which  $^{18}\text{F}$ -FDG PET may lead to false positivity and inappropriate staging.<sup>[2]</sup> Here, we report a case of an intense FDG focal uptake, located in the same lung as a non-small cell lung cancer, shown to be a hot-clot artifact by subsequent rescanning.

## CASE REPORT

A 63-year-old man underwent  $^{18}\text{F}$ -FDG PET/CT to characterize the metabolism and to stage a lung nodule in the left upper lobe. The study showed an intense hypermetabolism in the known nodule located in the left upper lobe with a maximum standardized uptake value ( $\text{SUV}_{\text{max}}$ ) of 16.6 [Figure 1]. Furthermore, there was a focal and intense  $^{18}\text{F}$ -FDG

uptake ( $\text{SUV}_{\text{max}} = 26.1$ ) in the superior segment of the left lower lobe [Figure 2a]. The CT images disclosed no lesion at this spot. The scan was repeated 2 weeks later but this time, the  $^{18}\text{F}$ -FDG uptake, above defined, was no longer visible [Figure 2b], demonstrating the diagnosis of  $^{18}\text{F}$ -FDG hot-clot artifact and eliminating a homolateral lung metastasis. The patient underwent surgery of the hypermetabolic nodule in the left upper lobe by lobectomy, which confirmed the diagnosis of non-small cell lung cancer (adenocarcinoma).

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Figure 1: The <sup>18</sup>F-fluorodeoxyglucose positron emission tomography/computed tomography and fusion positron emission tomography/computed tomography axial slices show an intense hypermetabolism in the known nodule located in the left upper lobe with a maximum standardized uptake value of 16.6

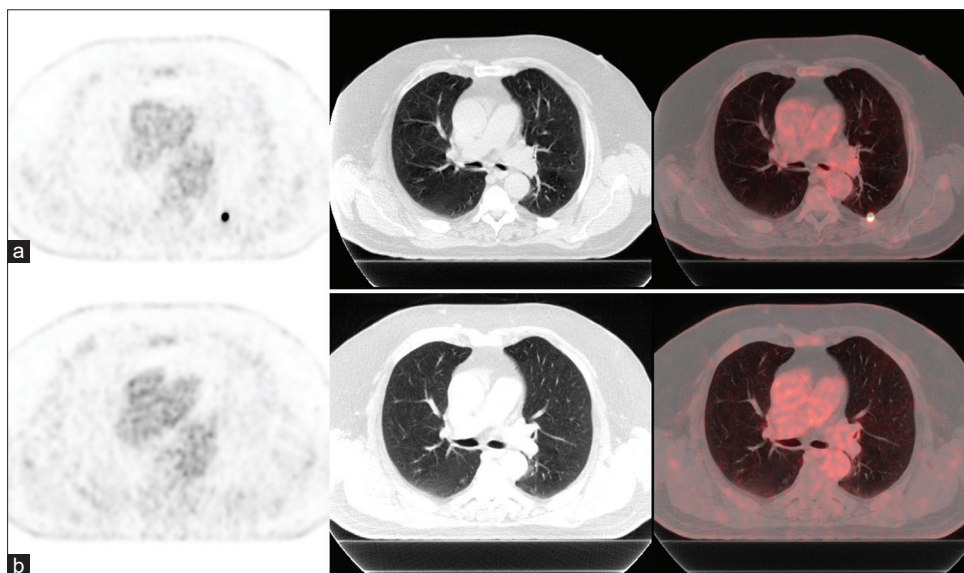


Figure 2: The <sup>18</sup>F-fluorodeoxyglucose positron emission tomography/computed tomography and fusion positron emission tomography/computed tomography axial slices show a focal and intense <sup>18</sup>F-fluorodeoxyglucose uptake ( $SUV_{max} = 26.1$ ) located in the left lower lobe without anatomical alteration on computed tomography (a). The scan was repeated 2 weeks later and focal <sup>18</sup>F-fluorodeoxyglucose uptake was resolved (b)

## DISCUSSION

The absence of <sup>18</sup>F-FDG uptake at lesions evident on CT imaging is recurrent and may be related to low FDG affinity or small nodular size (partial-volume effect). However, <sup>18</sup>F-FDG focal uptake without any anatomical correlation on CT is a rare and confusing finding. After excluding a misalignment between PET and CT image planes, focal intense hypermetabolism in the lung with no structural lesion detected on CT should lead to search a <sup>18</sup>F-FDG hot-clot artifact and if necessary, to repeat the study to find a disappearance of the uptake at rescanning.<sup>[3]</sup> In the medical literature, only few publications are available regarding a high <sup>18</sup>F-FDG uptake with no structural alteration on CT.<sup>[2,4-6]</sup> Our initial thought was that the lesion responsible for the uptake was too small to be detected on CT (<3mm), but the intense <sup>18</sup>F-FDG uptake ( $SUV_{max} = 26.1$ ) led us to reconsider our hypothesis because such a size could not be fully detected by the system which has a spatial resolution of about 6 mm. In all reported cases, there was an intense <sup>18</sup>F-FDG uptake and the <sup>18</sup>F-FDG avid lesions without CT abnormality have showed a complete

resolution in the follow-up exams. The mechanism of <sup>18</sup>F-FDG hot-clot artifact is the formation of a microcoagulation caused by vascular endothelium damage during <sup>18</sup>F-FDG injection, responsible for pulmonary microembolisms. Microemboli happen more frequently during paravenous injection, speed injection, and blood aspiration into the injector.<sup>[7-9]</sup> In the present case, the hot-clot artifact, located in left lower lobe, in the same lung as that of the tumor, could have been the cause of a diagnostic error. An exploratory thoracotomy was initially discussed to make a precise staging. This invasive exploration, first, would have been useless because it would not have revealed any other lesion, but, especially, would have delayed the curative surgery. To the best of our knowledge, this is the first case describing a single hot-clot artifact located in the same lung as a histologically proven non-small cell lung cancer.

## CONCLUSION

Recognizing <sup>18</sup>F-FDG hot-clot artifacts in <sup>18</sup>F-FDG PET/CT imaging is crucial because an erroneous staging may be

the cause of an inadequate treatment in patients treated for oncological diseases. In case of suspicion of a hot-clot artifact, rescanning may be necessary to avoid false positivity.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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#### Conflicts of interest

There are no conflicts of interest.

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