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CASE REPORT

Pulmonary sclerosing pneumocytoma: Novel [^{18}F]FDG uptake pattern observed in follow-up PET/CT imaging

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ABSTRACT

A 36-year-old man with an incidentally detected right upper lobe pulmonary nodule underwent serial [^{18}F]F-Fluorodeoxyglucose ([^{18}F]FDG) positron emission tomography (PET)/computed tomography (CT) examinations over a 16-month period to assess metabolic activity and guide clinical management. Initial imaging demonstrated no increased metabolic activity in the pulmonary nodule, supporting a conservative follow-up strategy. However, subsequent [^{18}F]FDG PET/CT examinations demonstrated a gradual increase in metabolic activity, initially raising concern for malignant transformation and prompting biopsy, which ultimately confirmed pulmonary sclerosing pneumocytoma (PSP). Retrospective analysis revealed that the increased [^{18}F]FDG uptake was not localized to the pulmonary nodule itself but rather to adjacent distal vascular structures. This case highlights a pattern of [^{18}F]FDG uptake associated with vascular endothelial proliferation in PSP, emphasizing the importance of careful PET/CT interpretation and the potential to non-invasively characterize the lesion based on this uptake pattern.

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INTRODUCTION

Pulmonary sclerosing pneumocytoma (PSP) is an uncommon benign lung tumor that is frequently identified incidentally during imaging performed for unrelated indications [1]. Although typically indolent, PSP can exhibit variable radiologic features and metabolic behavior on [18F]F-Fluorodeoxyglucose ([18F]FDG) positron emission tomography (PET)/computed tomography (CT), occasionally mimicking malignant pulmonary lesions and thereby posing a diagnostic challenge [2]. We present a case of PSP demonstrating progressive [18F]FDG uptake over time, attributable to peripheral vascular proliferation rather than the primary nodule itself, highlighting an important and underrecognized imaging pitfall in PET/CT interpretation.

CASE PRESENTATION

A 36-year-old man underwent high-resolution computed tomography (HRCT) of the lungs for evaluation of a persistent cough, which incidentally identified a 7 x 11 mm nodule in the right upper lobe without associated mediastinal or hilar lymphadenopathy. He was subsequently referred for an [18F]FDG PET/CT scan to further evaluate the solitary pulmonary nodule. [18F]FDG PET/CT revealed no increased metabolic activity in the right upper lobe nodule (Figure 1A), with a maximum standardized uptake value (SUVmax) of 1.42 (concurrent blood pool SUVmax: 2.08 & liver SUVmax: 2.90), thereby obviating the need for immediate intervention and supporting a follow-up imaging approach. After 8 months, a follow-up [18F]FDG PET/CT scan demonstrated a slight increase in metabolic activity (Figure 1B), with the SUVmax rising to 1.92 (concurrent blood pool SUVmax:1.72 & liver SUVmax: 2.80) , prompting continued monitoring. Following an additional 8-month interval, repeat [18F]FDG PET/CT revealed a significant increase in metabolic activity of the nodule (Figure 1C), with the SUVmax rising to 3.32 (concurrent blood pool SUVmax=1.56 & liver SUVmax: 2.61), prompting a transthoracic core-needle biopsy. Pathological evaluation of the biopsy specimen established the diagnosis of PSP.

A retrospective evaluation of the [18F]FDG PET/CT revealed that the gradual increase in metabolic activity during follow-up was not localized to the suspected nodular lesion itself (yellow arrows); the original nodule was more clearly visualized on the upper axial slices, whereas the increased uptake was located distally and was more visible on the lower slices (red arrows).

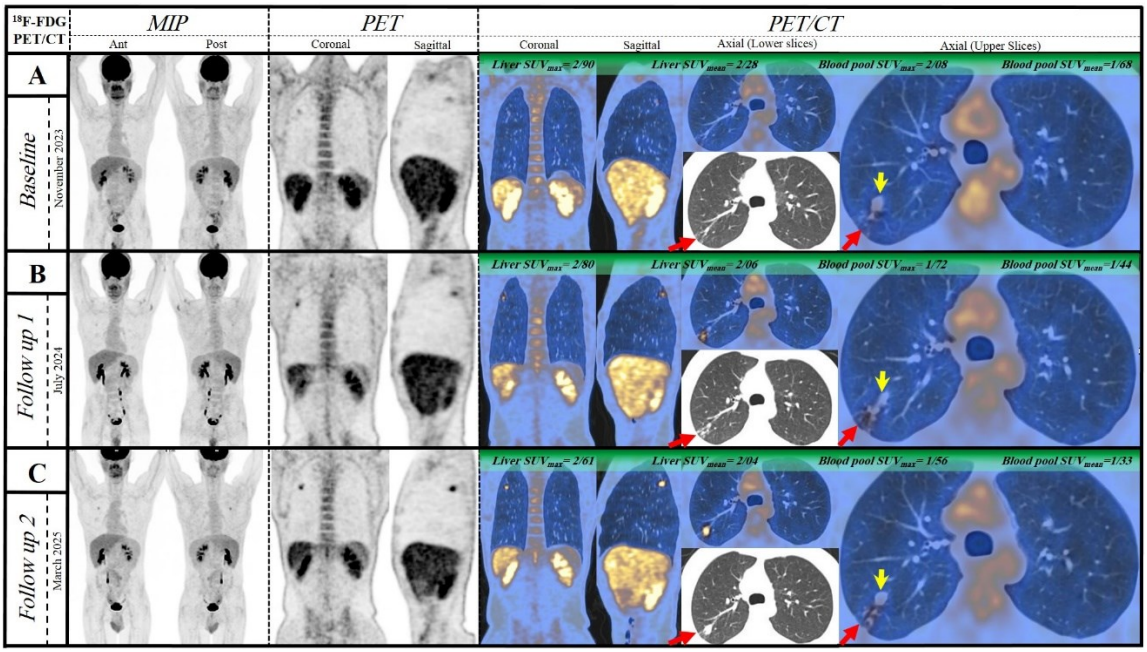

Figure 1. Serial [18F]FDG PET/CT images (A–C) of a right upper lobe pulmonary nodule incidentally detected on HRCT. Initial PET/CT (A) shows no significant [18F]FDG uptake (SUVmax 1.42). Follow-up scans at 8 and 16 months (B and C) demonstrate a gradual increase in [18F]FDG activity (SUVmax 1.92 and 3.32, respectively) which prompted biopsy and confirmed the diagnosis of PSP. Retrospective analysis indicates that increasing [18F]FDG uptake is localized to progressively enlarging distal vascular structures (red arrows) rather than the original nodule itself (yellow arrows), which remains metabolically inactive. This pattern is demonstrated across serial axial images at different slice levels, where the vascular structures become more prominent over time and at last simulate a new nodular configuration. Arrows of the same color consistently correspond to the same anatomical structures across all subfigures and time points

Specifically, the increased uptake was most likely localized to progressively enlarging distal vascular structures (red arrows), extending peripherally along the presumed direction of tumor growth. This pattern became increasingly conspicuous over time, particularly on axial slices inferior to the level of the original nodule, where the enlarging vascular structures eventually assumed a nodular appearance. Importantly, the original nodule remained metabolically inactive throughout the follow-up period, despite minor apparent size variation, including a slight interim decrease. This size fluctuation is most likely attributable to measurement variability, subtle differences in CT slice positioning between studies, and/or internal histologic changes within PSP (e.g., hemorrhagic or sclerotic components), rather than true regression. In fact, the metabolic change was initially attributed to the suspected nodular lesion—which, despite showing no significant increase in size and even an apparent decrease in size during the interim period, led to biopsy— however, detailed reassessment indicates that the increased metabolism corresponds to distally expanding vascular structures rather than the primary lesion itself (Figures 1A-C, red arrows).

DISCUSSION

PSP, also known as pulmonary sclerosing hemangioma, is a rare benign pulmonary neoplasm with low malignant potential, most commonly affecting non-smoking women in their fifth decade of life. PSP is often discovered incidentally on imaging as a solitary pulmonary nodule or mass, as it typically remains asymptomatic. When symptoms do occur, they are generally non-specific and may include cough, dyspnea, or chest discomfort [1]. On CT imaging, PSP characteristically presents as a solitary, well-defined, round or oval-shaped nodule or mass with smooth margins, typically situated in a peripheral location. It may occasionally exhibit features such as the air meniscus sign, halo sign, or marked contrast enhancement [3, 4]. However, atypical presentations, which are more commonly seen in men, may include cavitary lesions and nodules with irregular borders characterized by coarse margins, lobulations, and spiculations [5, 6]. On [^{18}F]FDG PET/CT, PSP typically can show mild to moderate uptake but it can also exhibit intense [^{18}F]FDG uptake. The SUVmax of the PSP demonstrates a positive correlation with the tumor's maximum diameter [2, 5, 7]. Surgical excision is the definitive treatment for PSP; although rare, the tumor may metastasize to regional lymph nodes or, in exceptional cases, to bone [6, 8, 9]. An important consideration with PSP is that it can be incidentally misinterpreted as a false-positive finding in patients with malignancies, as it has demonstrated avidity for various radiopharmaceuticals, including [^{68}Ga]Ga-DOTATATE [10, 11], [^{111}In]-pentetreotide [12], [^{68}Ga]Ga-Fibroblast activation protein inhibitor (FAPI) [13], [^{68}Ga]Ga-Prostate-specific membrane antigen (PSMA) [14], [^{99m}Tc]Tc-methylene diphosphonate (MDP)[15] and [^{99m}Tc]Tc-methoxy isobutyl isonitrile (MIBI) [16]. While a wide range of radiotracers can accumulate in PSP, the lesion's highly vascular nature is likely the primary contributor to the mild to moderate [^{18}F]FDG uptake observed. However, our case demonstrates that increased [^{18}F]FDG uptake may occur preferentially in peripheral vascular structures rather than within the primary lesion itself, suggesting that vascular endothelial proliferation and associated metabolic activity may play a more significant role than previously appreciated.

This spatial dissociation between metabolic activity and the anatomical nodule represents a potential diagnostic pitfall, as progressive [^{18}F]FDG uptake—especially when discordant with lesion size—may be misinterpreted as malignancy [17, 18].

Furthermore, the absence of contrast-enhanced CT in this case limited confirmation of the vascular nature of these structures. Recognition of this uptake pattern could prompt additional imaging, such as contrast-enhanced CT, potentially avoiding premature invasive intervention [17]. Although, this uptake pattern may also suggest a higher growth rate of the PSP and, given reports of metastasis in this entity, underscores the importance of surgical resection in such cases [17]. This observation, while providing novel insight, should be interpreted with caution and not overgeneralized. [^{18}F]FDG uptake in PSP is variable, and its interpretation should always be integrated with morphologic imaging findings and the clinical context.

CONCLUSION

The growth pattern observed in our case is an underrecognized concept in [^{18}F]FDG PET/CT imaging of PSP. Specifically, progressive [^{18}F]FDG uptake localized to peripheral vascular structures-rather than the primary lesion-may mimic tumor progression and lead to diagnostic misinterpretation. Awareness of this pattern, along with careful assessment of uptake distribution in addition to SUV values, may improve diagnostic accuracy and help avoid unnecessary invasive procedures.

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