



Tuberculosis Resembling Lymphoma: Case Report and ^{18}F -FDG PET/CT Findings

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Abstract

The imaging findings of TB are varied. We report the PET/CT findings of a systemic lymphoma-like TB, which were initially misdiagnosed as lymphoma with lung infiltration. TB was confirmed by cervical lymph node biopsy. Through a study of this case to further improve our understanding of systemic TB.

Keywords: Tuberculosis; Positron emission tomography; Computed tomography

Key Clinical Message

It is difficult to distinguish systemic tuberculosis from lymphoma on PET/CT, which could involve nasal mucosa, lungs, and systemic lymph nodes, including the muscle space of lower limbs. Finding the characteristic manifestations of tuberculosis, such as pulmonary miliary nodules, would be helpful for diagnosis.

Introduction

Although coronavirus disease 2019 has caused millions of deaths worldwide, Tuberculosis (TB) remains the most common cause of death [1-3]. TB treatment protocols have not changed for many years, ensuring a cure rate of >90% once diagnosed. However, due to its low detection rate, many patients with TB do not complete standardized treatment, thereby increasing the proportion of Multidrug-Resistant TB (MDR-TB) cases [4]. As such, the early and accurate diagnosis of TB is important for management.

Typical TB can be diagnosed almost accurately *via* radiography and Computed Tomography (CT). In contrast, when imaging findings are atypical or the patient has multiple disease conditions, the differential diagnosis can be difficult [5]. In this article, we describe the ^{18}F -Fluorodeoxyglucose (^{18}F -FDG) Positron Emission Tomography and Computed Tomography (PET/CT) findings in a patient with TB, who showed thickened mucosa of the nasal cavity and ethmoid sinus, as well as systemic lymph node enlargement and pulmonary TB, which resembled lymphoma. A brief overview of the differential diagnosis and presentation of relevant literature is also provided.

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Case Report

A 25-year-old male presented with a month-long history of swollen cervical and axillary lymph nodes. Chest and abdominal CT scan showed multiple small nodules with increased density in both lungs and multiple enlarged lymph nodes in the axilla, subclavian chain, mediastinum, and retroperitoneum. Lymphomatous lung infiltration was initially considered. PET/CT examination revealed mucosal thickening of the nasal cavity and ethmoid sinus, diffuse and unevenly distributed small nodules in both lungs, and multiregional lymphadenopathy in the whole body, with varying degrees of hypermetabolism (SUVmax = 10.2–18.6). Lymph node lesions without obvious necrosis were the main manifestations in this case. Furthermore, the metabolism of the respiratory nodules was not as high as that of whole-body lymph nodes. Following cervical lymph node biopsy, our initial assessment of lymphoma with pulmonary involvement was revised to TB (Figures 1A-1D and 2).

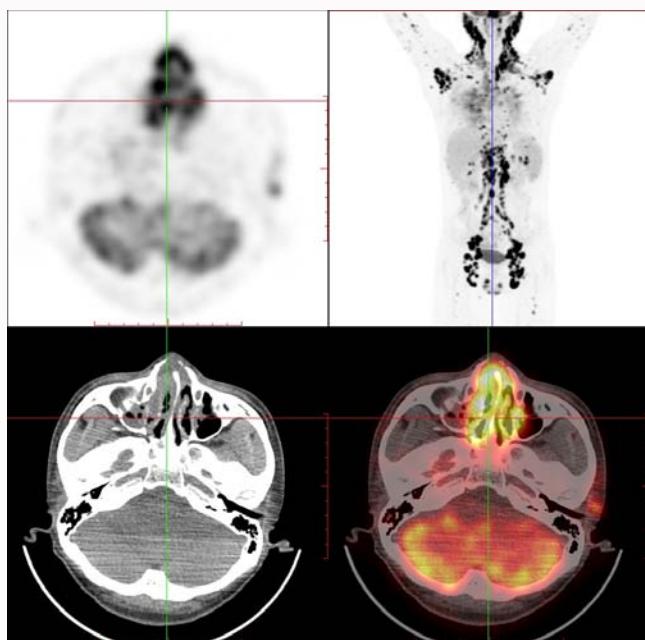


Figure 1A: ^{18}F -FDG PET/CT in a 25-year-old male with systemic TB: Hypermetabolic mucosal thickening of the nasal cavity and ethmoid sinus ($\text{SUV}_{\text{max}}=16.7$).

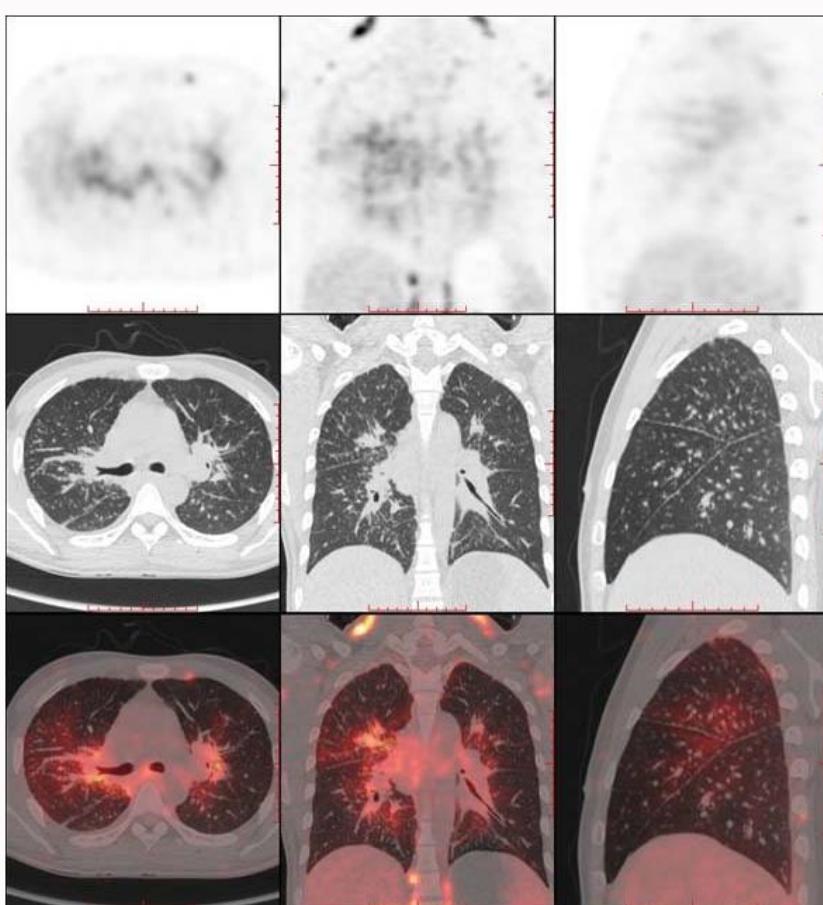


Figure 1B: ^{18}F -FDG PET/CT in a 25-year-old male with systemic TB: Miliary nodules in both lungs ($\text{SUV}_{\text{max}}=2.2-12.8$).

Discussion

Pulmonary TB and extrapulmonary TB of the brain, joints, urinary, liver, and gastrointestinal tract, among others, are known

manifestations of TB infection. Particularly, localized or systemic TB of the lungs and lymph nodes are the most common [6-14]. For the early detection of such cases, ^{18}F -FDG-PET-CT has been known to be very sensitive, but its lack of specificity is a major limitation [2].

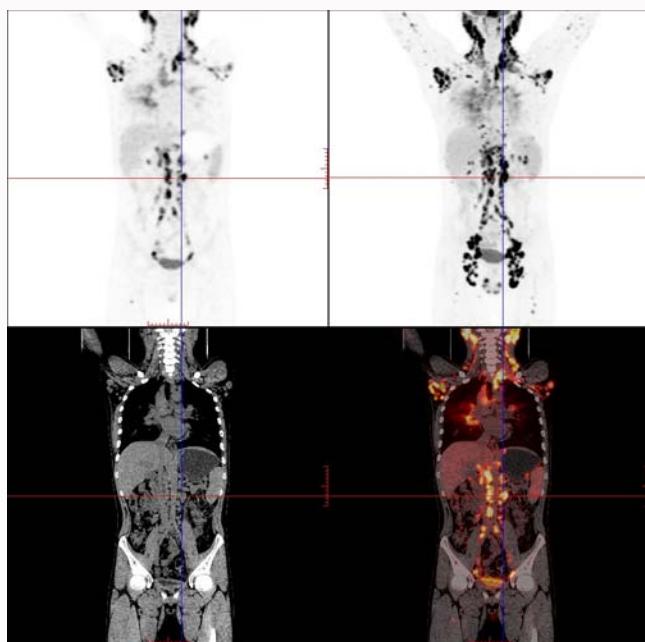


Figure 1C: ^{18}F -FDG PET/CT in a 25-year-old male with systemic TB: Systemic lymph node enlargement ($\text{SUV}_{\text{max}}=16.8$).

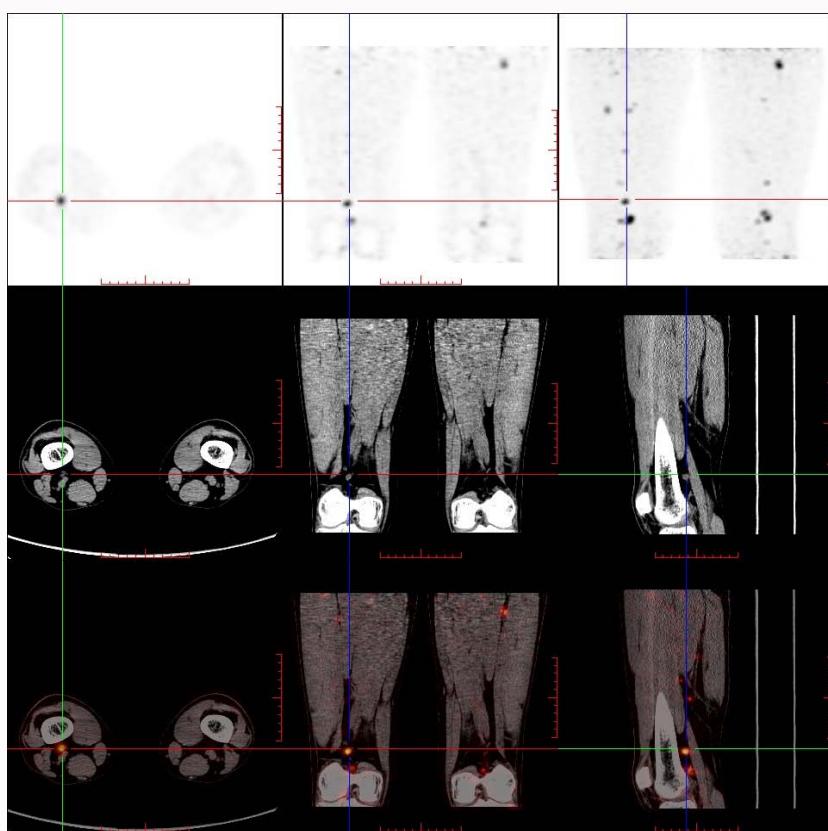


Figure 1D: ^{18}F -FDG PET/CT in a 25-year-old male with systemic TB: Intermuscular lymph nodes of the lower extremities ($\text{SUV}_{\text{max}}=13.9$).

Extra Nodal NK/T-Cell Lymphoma, Nasal Type (ENKTCL-NT), is another common condition that often manifests as nasal mucosal thickening and increased metabolism; local lymph node enlargement may be associated. PET/CT is the gold standard for the diagnosis and clinical staging of ENKTCL-NT and plays a role in prognostication [15]. In comparison, although *Mycobacterium tuberculosis* could

adhere to the extracellular matrix in areas of mucosal damage [16], primary TB of the head and neck mucosa is rare [17]. Moreover, the localized inflammation is often observed with inflammation in cervical lymph nodes [18]. The case we described was very similar to lymphoma; however, cervical lymph node biopsy confirmed the diagnosis of TB. In retrospect, nasal lymphoma generally does not

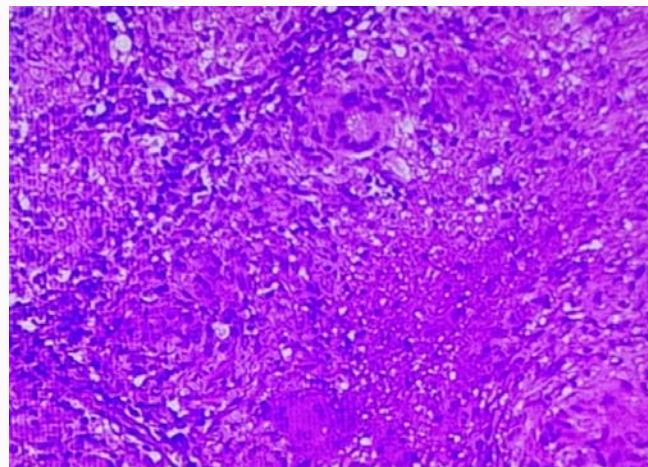


Figure 2: Microscopically, the granulomatous lesion showed caseous necrosis in the center, which is surrounded by more epithelioid cells and a few multinucleated giant cells. The outermost area shows fibrous hyperplasia and lymphocyte infiltration (hematoxylin and eosin stain, H&E, x100).

present with diffusely enlarged lymph nodes throughout the body and miliary nodules in the lungs. Therefore, the possibility of TB should also be considered when nasal polyps are found.

Most cases of primary pulmonary TB present as consolidations, miliary nodules, lymphadenopathies, and pleural effusions. Meanwhile, miliary TB may present with acute or chronic lung nodules, and may involve multiple organs [19]. Although PET/CT has certain advantages in assessing TB activity and guiding biopsy localization [20], malignant lymphoma may mimic miliary TB due to diffuse micronodular radiographic findings [14]. However, it should be noted that miliary nodules are still characteristic of pulmonary TB. In this case, bilateral pulmonary nodules were not typical of acute or chronic miliary nodules, systemic diffuse enlarged lymphadenopathy, thickened nasal mucosa, and hypermetabolism. As such, we mistook these findings as lymphoma with pulmonary infiltration. Thus, pulmonary miliary nodules should be the main diagnostic basis of this disease.

Systemic lymph node enlargement is typical of lymphoma and should be distinguished from TB lymphadenitis and necrotizing lymphadenitis [21,22]. In addition, imaging findings in TB vary at different stages of the disease. For example, the images of granulomatous formation are mostly solid nodules or masses without obvious necrosis and calcification, which may involve multiple parts. Granulomas may appear hypermetabolic due to the presence of many active macrophages that take up ¹⁸F-FDG, making these lesions indistinguishable from tumors. In this case, lymph nodes showed increased FDG uptake without signs of significant necrosis, representing the acute active phase of TB. Because of these factors, we misdiagnosed the case as lymphoma with pulmonary involvement.

Given these findings, radiologists and nuclear medicine physicians should be familiar with the imaging findings of pulmonary TB [19], especially since the differential diagnosis mainly relies on the morphological features of CT combined with metabolic character assessment and clinical data.

Conclusion

Imaging findings in TB are variable. ¹⁸F-FDG-PET/CT is sensitive for the early detection of TB but lacks specificity in distinguishing TB from lymphoma. However, ¹⁸F-FDG PET/CT played an important

role in assessment of systemic lesions and guiding the treatment of this patient. For similar cases in the future, TB should be included in the differential diagnosis, and the final diagnosis should still be based on pathological examination. For this case, the patient was treated for TB and is now considered cured and TB-free.

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Author Contributions

Yongjun Luo: collection of patient data and writing-original draft preparation, Yuping Han and Xie yijing: manuscript modification, Furong Wang: image data processing; Junlin Zhou: manuscript proofreading; All the authors individually did final proofreading of the manuscript before submission.

Ethical Approval

This paper does not contain any research on animals by any of the authors. All procedures performed in studies involving human participants comply with institutional and/or national Research Council ethical standards and comply with the principles of the 1964 Declaration of Helsinki and its subsequent revisions or similar ethical standards.

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