Case Report

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Disseminated candidiasis on FDG-PET/CT

FDG-PET/BT'de Yaygın Kandidiyazis

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Abstract

Disseminated candidiasis presents a significant diagnostic and therapeutic challenge in immunocompromised patients, particularly those with hematological malignancies like leukemia. ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG-PET/CT) is a crucial imaging modality in oncology and infection, outperforming conventional imaging in diagnosing and managing fungal infections, especially in cases of fever of unknown origin. We present a compelling case of a young leukemia patient with persistent fever, demonstrating FDG-avid lesions in various organs, including the liver, spleen, and left kidney, indicative of disseminated candidiasis.This highlights the critical role of ^{18}F-FDG-PET/CT in situations where invasive procedures like liver biopsy are challenging or contraindicated. Such instances underscore the paramount importance of utilizing advanced imaging techniques for accurate diagnosis and treatment, especially in the complex clinical setting of immunocompromised individuals, with hematological malignancies. This case emphasizes the significant contribution of ^{18}F-FDG-PET/CT as a non-invasive diagnostic tool, enhancing patient care and enabling more effective management strategies amidst challenging medical circumstances.

Keywords: Candidiasis, fluorodeoxyglucose, positron emission tomography/computed tomography, fever of unknown origin

Öz

Yaygın kandidiyazis, özellikle lösemi gibi hematolojik maligniteleri olan immün sistemi baskılanmış hastalarda önemli bir tanı ve tedavi zorluğu sebebidir. ^{18}F-florodeoksiglukoz pozitron emisyon tomografisi/bilgisayarlı tomografi (^{18}F-FDG-PET/BT), onkolojide ve enfeksiyon hastalıklarında önemli bir görüntüleme yöntemidir ve özellikle sebebi bilinmeyen ateş vakalarında mantar enfeksiyonlarının teşhisinde ve yönetiminde geleneksel görüntülemeyi geride bırakır. Karaciğer, dalak ve sol böbrek dahil olmak üzere çeşitli organlarda yaygın kandidiyazis ile uyumlu ^{18}FDG-avid lezyonları saptanan, inatçı ateşi olan genç bir lösemili hasta sunulmaktadır. Bu olgu, karaciğer biyopsisi gibi invaziv prosedürlerin zor veya kontrendike olduğu durumlarda F-FDGPET/BT kritik rolünü vurgulamaktadır. Bu tür durumlar, özellikle immün sistemi baskılanmış ve hematolojik maligniteleri olan hastalarda doğru tanı ve tedavi için gelişmiş görüntüleme tekniklerinin kullanılmasının son derece önemli olduğunu vurgular. Bu olgu, ^{18}F-FDG-PET/BT'nin invaziv olmayan bir tanı aracı olarak önemli katkısını, hasta bakımını geliştirmesini ve zorlu tıbbi koşullar altında daha etkili yönetim stratejilerine olanak sağlamasını vurgular.

Anahtar kelimeler: Kandidiyazis, florodeoksiglukoz, pozitron emisyon tomografisi/bilgisayarlı tomografi, sebebi bilinmeyen ateş

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Introduction

The prevalence of disseminated candidiasis has steadily increased over the last thirty years, emerging as a notable complication in neutropenic patients and those undergoing cancer treatments (1). This infection constitutes a significant contributor to morbidity and mortality among individuals at high risk (1). According to several studies, ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG-PET/CT) proves valuable in identifying sites of disseminated candidiasis and evaluating the effectiveness of antifungal treatment (2,3).

Case Report

An 18-year-old man was admitted to the hematology department with Philadelphia chromosome-negative acute lymphoblastic leukemia. He underwent chemotherapy protocol using idarubicin and aracytine. On the 16th day of treatment, the patient developed a fever along with severe neutropenia and thrombocytopenia. As a precaution, he was isolated, and we initiated treatment with broad-spectrum antibiotics targeting gram-negative bacteria. Physical examination revealed no abnormalities, except for mild hepatomegaly. Blood cultures yielded negative results. After 72 hours, the patient continued to experience fever despite antibiotic treatment and developed abdominal pain. Repeated bone marrow aspiration and immunophenotyping of bone marrow cells revealed no blasts. A CT scan revealed multiple low-density lesions in the liver. A liver biopsy was not performed due to the patient's very low platelet count and the associated risk of bleeding.

The patient underwent an ^{18}F-FDG PET/CT to identify the cause of persistent fever, revealing multiple lesions with high metabolic activity in the liver, spleen, and left kidney (Figure 1). At that time, serum beta-d-glucan (BDG) were measured at 65 pg/mL (normal range: 60 to 79 pg/mL). Despite the absence of clinical symptoms and the borderline serum BDG levels, the exceptional pattern observed on the PET/CT, characterized by intense ^{18}F-FDG avid lesions in the liver, spleen, and left kidney, suggested hepatic, splenic, and left renal candidiasis. Antifungal treatment was initiated, leading to a gradual resolution of symptoms. Unfortunately, the patient's condition deteriorated dramatically, marked by the onset of cerebral hemorrhage, and the patient succumbed.

Discussion

Fungal infections can impact mucous membranes, giving rise to conditions such as esophagitis, vulvovaginitis, or keratitis, all of which may entail significant complications.

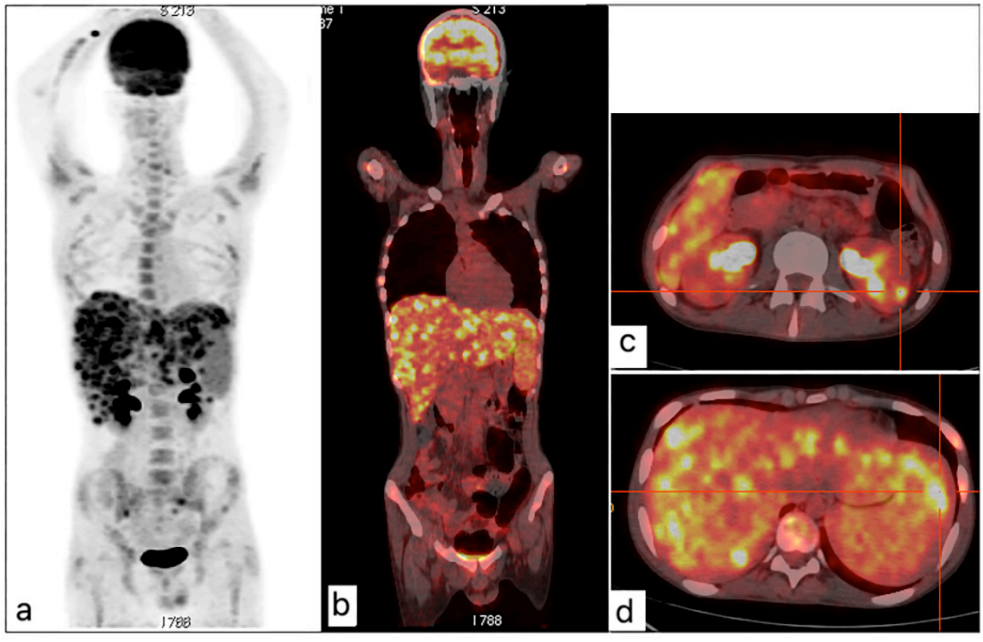

Figure 1. FDG-PET/CT images (a: MIP Maximum intensity projection, b: coronal, c, d: the transaxial) revealed intense FDG avid foci disseminated in the liver, spleen, and cortex of the upper pole of the left kidney, this activity is distinct from the normal tracer activity observed in the medulla and collecting system
FDG: Fluorodeoxyglucose, PET/CT: Positron emission tomography/computed tomography, MIP: Maximum intensity projection

If the fungal infection advances into the deeper tissues of the body, it can result in invasive fungal disease, posing a substantial risk of morbidity and mortality (4). Disseminated candidiasis is a severe and feared invasive fungal disease, often seen in patients undergoing intensive chemotherapy for acute leukemia (5). The liver is the organ most frequently affected given its exposure to the largest inoculum through the portal system (6). The primary clinical manifestation of disseminated candidiasis in neutropenic patients is an isolated fever that does not respond to broad-spectrum antibacterial therapy (7). The diagnostic challenge arises from the atypical clinical presentation, often marked by fever of unknown origin and a decline in general condition in immunocompromised patients. These conditions contraindicate certain invasive explorations, notably biopsies, as was the case with our patient. In such scenarios, FDG-PET/CT proves valuable as a whole-body imaging modality, playing a crucial role in the initial diagnosis. It provides comprehensive information from various body sites, allowing for a metabolic map that accurately delineates the disease burden and identifies concealed lesions of invasive fungal disease (8). Studies have shown that FDG-PET/CT has the capability to detect all infectious sites, particularly deep-seated ones, with a sensitivity superior to that of other conventional imaging modalities (9,10). It is also valuable in therapeutic assessment, aiding in the identification of the most effective antifungal treatment. In this context, FDG-PET/CT for monitoring therapy probably represents the most potent use of PET/CT, acting as a non-invasive marker of disease. It utilizes standard uptake value and other metabolic indices to offer a semi-quantitative assessment of disease activity within lesions (8). In disseminated candidiasis, FDG-PET/CT typically reveals FDG-avid focal and small lesions in the liver and spleen, and exceptionally in the kidneys (11), as observed in our case. Indeed, FDG-PET/CT lacks specificity and has its limitations, particularly due to the physiological accumulation of tracer in certain anatomical sites (such as the brain, heart, and FDG excretion by the kidneys). Nontheless, it remains a valuable whole-body examination, facilitating the identification of suitable biopsy sites in cases of diagnostic uncertainty or avoiding it when contraindicated, as seen in this patient's case. The diagnosis of disseminated candidiasis was established by evaluating the appearance on the PET-FDG scan, the hypodense lesions in the liver observed on the CT scan, and the blood level of D-glucan.

Conclusion

This particular case is noteworthy, illustrating the use of ^{18}F-FDG PET/CT in the diagnosis of fungal infection to identify the sites of disseminated Candida infection. Additionally, it highlights its utility in guiding subsequent patient management, particularly in situations where a biopsy may not be feasible. However, further studies are needed to assess its precise role in the management algorithm.

Ethics

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Y.B., A.H., K.D., A.D., Concept: Y.B., A.D., Design: Y.B., A.D., Data Collection or Processing: Y.B., A.D., Analysis or Interpretation: Y.B., A.D., Literature Search: Y.B., Writing: Y.B.

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