^{18}F-Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography in Infected Polycystic Kidney Disease

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Abstract

A positron emission tomography/computed tomography (PET/CT) study using ^{18}F-fluorodeoxyglucose (^{18}F-FDG) was performed in a 54-year-old female with polycystic kidney disease, fever, and abdominal discomfort. Cyst's infection was suspected, but CT and U/S findings were not specific to accurately depict pyocysts and guide surgical treatment. In PET/CT, both kidneys are enlarged with multiple cysts and little remaining parenchyma. There is intense focal or ring-shaped FDG uptake in cysts in the upper and lower poles of the left kidney indicative of active infection. There is also increased FDG uptake in para-aortic lymph nodes bilaterally. Hepatic and right renal cysts do not present increased FDG uptake. As this case illustrates, FDG PET/CT can be helpful for the precise localization of cyst infections in patients with polycystic kidney disease considered for surgical treatment.

Keywords: ^{18}F-fluorodeoxyglucose, autosomal dominant polycystic kidney disease, infection, positron emission tomography/computed tomography

Introduction

Autosomal dominant polycystic kidney disease (ADPKD) is one of the most common hereditary disorders affecting approximately 1 in 500-1000 individuals.[1] Infection of a cyst within a polycystic kidney is a diagnostic dilemma because of the limitations of conventional imaging procedures, especially in patients with renal failure.

Case Report

We present a positron emission tomography/computed tomography (PET/CT) study performed in a 54-year-old female patient with ADPKD and impaired renal function. The patient had a prolonged hospitalization because of fever and abdominal discomfort. Two weeks before admission, she was treated with ciprofloxacin orally because of a lower urinary tract infection with *Escherichia coli*. At admission C-reactive protein was 85 mg/L, creatinine and liver enzyme levels were normal, blood, and urine cultures were negative. Physical examination found slightly enlarged liver and enlarged kidneys with the left side tenderness. Renal cyst's infection was suspected and intravenous antibiotic therapy with ciprofloxacin was started. Conventional imaging findings from CT and ultrasound scan showed multiple hepatic and renal cysts without specific signs of infection. Fever persisted, so treatment was changed to tigecycline and meropenem. Despite treatment with antibiotics, clinical symptoms persisted.

The clinical question was the identification and exact localization of pyocysts in order to proceed with further surgical treatment.

One week later, a PET/CT scan with ^{18}F-fluorodeoxyglucose (^{18}F-FDG) was ordered. Imaging findings from ^{18}F-FDG

Access this article online

Quick Response Code:

Website: www.wjnm.org

DOI: 10.4103/1450-1147.150553

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Figure 1: Fluorodeoxyglucose positron emission tomography/computed tomography study in a 54-year-old female patient with polycystic kidney disease fever and abdominal discomfort. This figure illustrates coronal sections of the attenuation corrected PET, CT and PET/CT. Both kidneys are shown enlarged with multiple cysts and little remaining renal parenchyma. There is intense focal or ring-shaped FDG uptake in numerous cysts in the upper and lower poles of the left kidney indicative of active infection. There is also increased FDG uptake in para-aortic lymph nodes bilaterally. Multiple cysts are also present in the right kidney and in the liver that do not present increased FDG uptake. Physiologic FDG uptake by the stomach is visible on the left side

PET/CT are illustrated in Figure 1. Both kidneys are enlarged with multiple cysts and little remaining renal parenchyma. There is intense focal or ring-shaped FDG uptake in numerous cysts in the upper and lower poles of the left kidney indicative of active infection. There is also increased FDG uptake in para-aortic lymph nodes bilaterally. Multiple cysts are also present in the right kidney and in the liver, with not increased FDG uptake. Because of renal cyst's infection, left-sided nephrectomy was scheduled. The pathologic study revealed multiple pyocysts. The patient has made a complete recovery.

Discussion

Infection of a renal or hepatic cyst is a serious complication of ADPKD occurring usually in a later stage of ADPKD when renal function is already impaired. When this situation is suspected, a crucial step is to precisely locate the abscess anatomically to provide surgical treatment, especially if the causative organism or the septic focus cannot be identified or if the antibiotic therapy has failed.

Detection of infected cysts by conventional imaging (ultrasound scan, CT and magnetic resonance imaging) can be difficult because these techniques cannot reliably differentiate infected from noninfected cysts.[2,3] In our case, CT showed thickening and irregularity of the wall of multiple cysts in both kidneys and increased attenuation of the cysts' content. These findings are not specific for cyst infection because these signs may also be caused by hemorrhage into a cyst.

Fluorodeoxyglucose PET has proved valuable in diagnosing soft tissue infections, osteomyelitis, vascular infections, and fever of unknown origin, because of an increased metabolic rate by inflammatory cells.[4] Regarding renal cysts infection imaging, although clearance of FDG occurs predominantly through the kidneys, it is not reabsorbed by the kidneys in contrast to glucose. Thus, FDG may appear in the renal collecting system (especially in ectatic renal calyces), but the renal parenchyma no longer contains noticeable amounts of activity by the time PET scan is acquired. FDG therefore, represents a promising agent for detection of cyst's infection using co-registered PET and CT images. Our case study is in agreement with other reports underlining the high performance of FDG PET scan in diagnosing or excluding renal or hepatic cyst infection in patients with ADPKD.[3,5-8] As this case illustrates, FDG PET/CT can be helpful for the precise localization of cyst infections in patients with polycystic kidney disease.

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How to cite this article: Paschali AN, Georgakopoulos AT, Pianou NK, Anagnostopoulos CD. ^{18}F-Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography in Infected Polycystic Kidney Disease. World J Nucl Med 2015;14:57-9.

Source of Support: Nil, **Conflict of Interest:** None declared