

# $^{18}\text{F}$ -FDG PET/CT in cyst infection in autosomal dominant polycystic kidney disease

Meghana Prabhu, Nishikant A Damle, Animesh Ray<sup>1</sup>, Devasenathipathi Kandasamy<sup>2</sup>

Department of Nuclear Medicine, <sup>1</sup>Medicine and <sup>2</sup>Radiodiagnosis, A.I.I.M.S, New Delhi, India

**Correspondence to:** Dr. Nishikant A Damle, Department of Nuclear Medicine, A.I.I.M.S, New Delhi - 110 029, India.

E-mail: nkantdamle@gmail.com

## Abstract

Infection of a cyst within an autosomal dominant polycystic kidney disease (ADPKD) is a serious complication. Diagnosis with conventional imaging techniques such as ultrasonography, computed tomography (CT), and magnetic resonance imaging can be sometimes challenging. The definite diagnosis is analysis of the cyst fluid, but cyst punctures can cause bleeding, rupture, and contamination of adjacent cysts. Recently, FDG PET/CT has been reported as a sensitive tool for detection of cyst infection. We describe a case of 63-year-old woman with infected cysts in the left kidney, in whom accurate diagnosis was made on FDG PET/CT. FDG PET/CT is an important investigation in patients with fever of uncertain etiology, where renal cyst infection is a possible cause, but other etiologies also need to be ruled out.

**Key words:** Autosomal dominant polycystic kidney disease; FDG PET/CT; renal cyst infection

## Introduction

Autosomal dominant polycystic kidney disease (ADPKD) is a genetic disorder that causes small, fluid-filled sacs called cysts to develop in the kidneys. It is one of the most common inherited disorders of kidneys and is caused by mutation of PKD1 and PKD2 genes. However, the symptoms usually present much later after around 30 years of age. The symptoms include pain in back and flanks, recurrent urinary tract infections, hematuria, associated liver and pancreatic cysts, abnormal heart valves, hypertension, renal calculi, and berry aneurysm.<sup>[1]</sup>

Diagnosis of ADPKD is challenging with conventional imaging modalities such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI). In

addition, contrast (iodinated and gadolinium) may sometimes be contraindicated in such patients. Further, the analysis of cyst fluid is accurate but is not a preferred diagnostic tool owing to the potential complications involved.<sup>[1]</sup> Recently, FDG PET/CT has been reported as a sensitive tool for detection of cyst infection. We describe the case of a 63-year-old woman with infected cysts in the left kidney, in whom accurate diagnosis was made on delayed FDG PET/CT.

## Case Report

A 63-year-old woman, known case of ADPKD was evaluated for recurrent spikes of high-grade fever.

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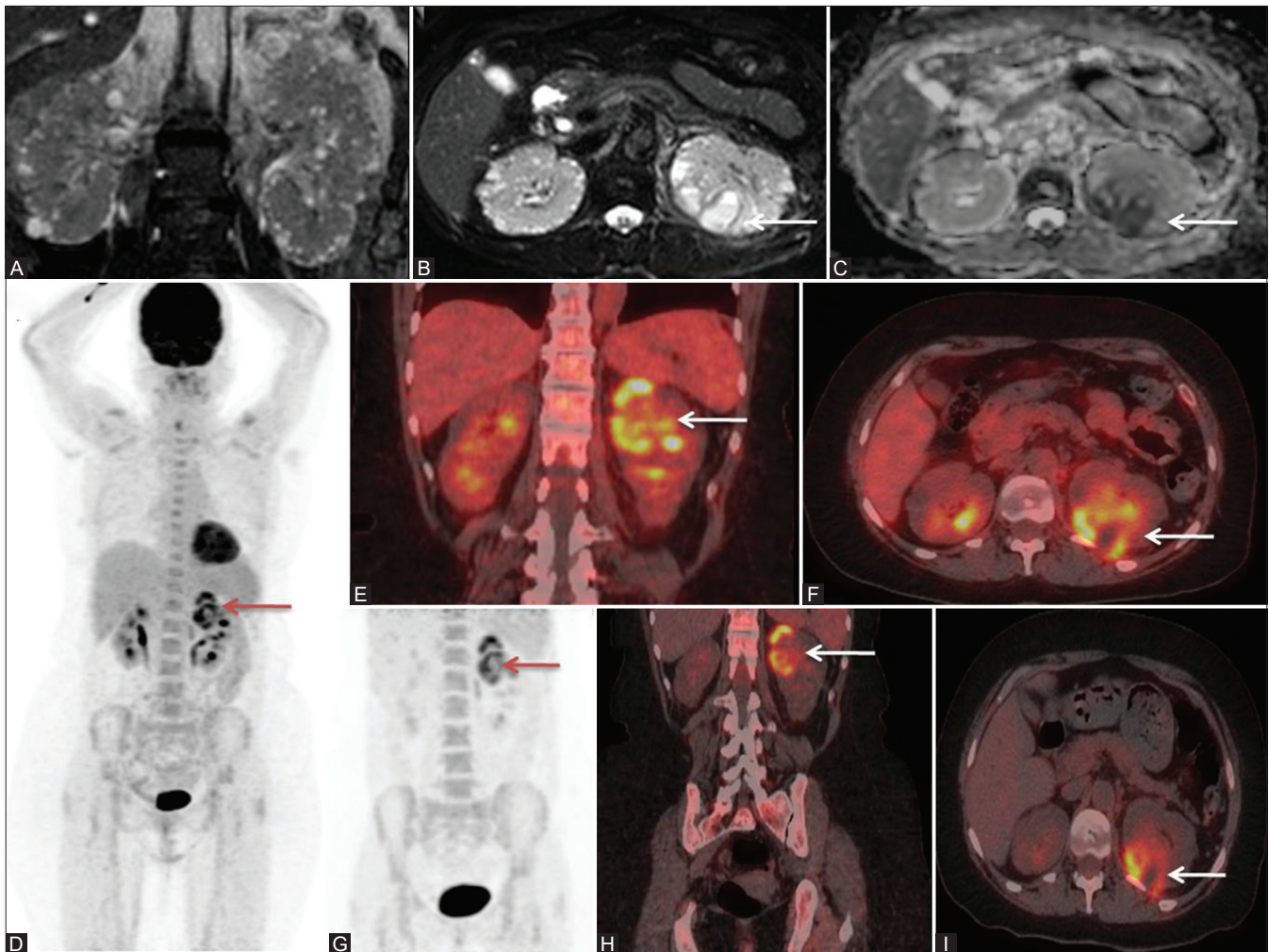


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There was a past history of two episodes of urinary tract infections with culture positive for *E. coli* reported. Investigations in the current episode of fever revealed sterile pyuria with mild leucocytosis, raised ESR and CRP levels. Ultrasound (US) abdomen showed multiple enlarged cystic lesions in upper one-third of left kidney filled with echogenic material. In view of borderline renal impairment (eGFR of 48 mL/min/1.73 m<sup>2</sup>), non-contrast CT scan of the abdomen was done, which revealed a bulky left kidney upper pole with mild perinephric fat stranding and minimal left pleural effusion. Subsequently, MR was performed in which multiple cysts were noted in bilateral kidneys which were hyperintense on T2 weighted images [Figure 1A and B]. Apparent diffusion co-efficient (ADC) map [Figure 1C] of diffusion-weighted imaging (DWI) revealed multiple areas of restricted diffusion in left kidney upper pole (arrow) corresponding to cystic lesions reported on US abdomen, suggestive of infected cysts. The clinical diagnosis was urosepsis and the

patient was started on cefoperazone-sulbactam. Despite antibiotic treatment, fever persisted. FDG-PET/CT scan was performed to corroborate the number and size of infected cysts and also to rule out other causes of fever. Maximum intensity projection (MIP) image [Figure 1, image D] shows focal increased tracer uptake in the upper pole of left kidney (arrow). Corresponding axial and coronal images [Figure 1E and F, arrows] revealed a large cystic lesion with intense peripheral uptake in the upper one-third contiguous with the iso/hyperdense area at upper pole of left kidney. Delayed images [Figure 1, images G-I] revealed focal increased tracer uptake in infected cyst in upper one-third of left kidney (arrows), aiding accurate localization owing to decreased physiological activity in kidney. No other hypermetabolic focus was seen that could explain the recurrent febrile spikes. Patient was later switched to intravenous meropenem. After 15 days of intravenous antibiotic therapy, fever subsided and patient's general condition improved.



**Figure 1 (A-I):** MR showing multiple cysts in both kidneys, hyperintense on T2 (A and B) with ADC map (C) of DW images showing multiple areas of restricted diffusion in left kidney upper pole (arrow) suggestive of infected cysts. MIP of FDG PET/CT (D) shows focal increased tracer uptake in the same location (arrow). Axial and coronal images (E and F, arrows) showed a cystic lesion with intense peripheral uptake contiguous with the iso/hyperdense area at upper pole of left kidney. Delayed images (images G-I) showed similar finding but with improved image contrast (arrows)

## Discussion

Cyst infection accounts for 15% of all causes of hospitalizations of ADPKD patients.<sup>[2]</sup> The main diagnostic objectives in patients of ADPKD patients with suspicious cyst infection are (a) the exclusion of non-cystic infections, (b) to ascertain the location and extension of infected cysts, and (c) the identification of concomitant conditions like urinary tract obstruction.<sup>[3]</sup> The lack of specific signs frequently retards the diagnosis and subsequent treatment. The definite diagnosis requires cyst fluid analysis showing causative bacteria and neutrophils. As this is not always possible, commonly diagnosis relies on a constellation of clinical and biologic parameters. The diagnosis of cyst infection is not easy because of the non-specific clinical manifestations and the limitations of conventional imaging techniques. In addition, with the availability of cyst wall penetrating antibiotics such as levofloxacin, invasive procedures for diagnosis as well as treatment can be avoided. Various recent studies have investigated the role of FDG PET/CT in diagnosing cyst infections in ADPKD.<sup>[4-12]</sup> This case highlights the importance of FDG PET/CT in a patient with ADPKD where the etiology of fever may be cyst infection or otherwise. FDG PET/CT without I.V. contrast is a useful modality in localizing the infective focus and ruling out other causes for fever in such patients. Delayed imaging allows better delineation of the infected cysts. However, incremental clinical utility may not be always seen.

### 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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