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Letter to the Editor

LETTER TO THE EDITOR

Value of FDG-PET/CT in monitoring cyst infections in patients with autosomal dominant polycystic renal disease

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^{18}F-fluorodeoxyglucose positron emission tomography–computed tomography (FDG-PET/CT) allows prompt cyst infection (CI) diagnosis in patients with autosomal dominant polycystic kidney disease (ADPKD) [1–4]. Assuming a close correlation between ^{18}F-FDG uptake and the clinical outcome, it has been proposed to repeat FDG-PET/CT: a negative image would indicate complete recovery, while persistent hypermetabolism would mean active infection, that is, treatment failure requiring resumption of antibiotic therapy or performance of an invasive procedure [5]. To evaluate the value of FDG-PET/CT in monitoring CI, we conducted a retrospective study reporting the experience of a referral centre in Western France between 2009 and 2019. Definition of liver/kidney CI as definite or probable was based on criteria established by Sallée *et al.* [1] and treatment failure/recurrence definition on criteria established by Lantinga *et al.* [6] FDG-PET/CT images were reviewed using a standardized approach consisting of a visual four-point scoring scale (Supplementary data, Figure S1) [7]. We identified 44 CI episodes occurring in 38 patients, 7 had 9 CI episodes with initial and follow-up FDG-PET/CT, whose characteristics are detailed in Table 1. In all cases, initial FDG-PET/CT imaging showed evident ^{18}F-FDG uptake of the infected cyst. A microorganism, mostly *Escherichia coli*, was identified in half of the cases. In all cases, initial therapy consisted only of antibiotics with a median duration of 42 (21–43) days. FDG-PET/CT was repeated after antibiotics discontinuation in all patients, after a median time of 13 (1–64) days [55 (43–90) days from the start of antibiotic]. At this moment, all patients were asymptomatic with a clear decrease in C-reactive protein (CRP) concentration [5 (<5–66) mg/L]. Differential analysis of both FDG-PET/CT found persistence, slight improvement and disappearance of cyst wall hypermetabolism score in, respectively, 4 (44%), 2 (22%) and 3 (33%) cases (Table 1 and Supplementary data, Table S1). There was no correlation between the evolution of ^{18}F-FDG uptake scoring and CRP concentration at the time of the follow-up FDG-PET/CT ($r = 0.03$). Otherwise, antibiotic duration ($r = 0.02$), delay between antibiotic discontinuation and follow-up FDG-PET/CT ($r = 0.13$) and time from antibiotic initiation to follow-up FDG-PET/CT ($r = 0.19$) were not correlated with FDG-PET/CT scoring kinetic (Figure 1). Review of medical records revealed that persistent ^{18}F-FDG uptake was not interpreted as treatment failure by physicians in charge (i.e. leading to a modification of therapy consisting of resuming antimicrobials and/or considering an invasive procedure) except in one case, as detailed below. No CI relapse was observed in the study period, including in cases with persistent ^{18}F-FDG uptake on follow-up. In Patient 2, a persistent ^{18}F-FDG uptake on FDG-PET/CT performed 17 days after antibiotic discontinuation led to percutaneous cyst aspiration (CA). Bacterial culture remained sterile and FDG-PET/CT results were interpreted as false positive. No antimicrobials were resumed, and no CI relapse developed.

Until now, only a single retrospective study reported four CI cases with follow-up FDG-PET/CT imaging performed 3–6 weeks

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Table 1. Characteristics and outcome of ADPKD patients with CI and the FDG-PET/CT results at the time of diagnosis and during follow-up

Patients features		Time of diagnosis						Follow-up				Outcomes	
	Age/sex CKD stage	Diagnosis Bacterial identification	Site of cyst infection	WBC, g/L	CRP, mg/L	FDG-PET/CT scoring	Duration of antibiotic therapy (days)	Time between antibiotic therapy discontinuation and FDG-PET/CT (days)	WBC, g/L	CRP, mg/L	FDG-PET/CT scoring	Therapeutic impact of second FDG-PET/CT result	Failure/ recurrence
P1	45/F 2	Probable *E. coli* (blood)	Liver	8.8	230	3	42	1	NA	NA	1	None	No/No
	48/F 3A	Probable Undocumented	Liver	22	252	4	42	20	7	<5	4	None	No/No
	49/F 3A	Probable *E. coli* (blood)	Liver	10.2	178	4	42	11	4.8	<5	1	None	No/No
P2	57/F 3B	Definite *E. coli* (CA)	Kidney	11	240	4	42	17	2.7	<5	4	CA with sterile culture	Yes/No
P3	69/F 3A	Probable Undocumented	Liver	12	120	4	21	34	8.9	66	4	None	No/No
P4	74/F 5T	Probable Undocumented	Liver	3.4	179	4	28	62	5.5	20	1	None	No/No
P5	50/M 2	Definitive *E. coli* + *Bacteroides caccae* (CA)	Kidney	22.7	252	4	42	13	9	<5	4	None	No/No
P6	64/M 5T	Probable *E. coli* (blood/urine)	Kidney	1.6	270	4	42	11	8	10	3	None	No/No
P7	53/M 5D	Probable *Raoutella platicola* (blood)	Kidney + liver	2	460	4	43	1	NA	61	2	None	No/No

CIs were considered as definite in the presence of a CA showing evidence of infection (neutrophils debris and/or microorganism), or probable in the presence of all of the following features: fever (temperature 38.5°C for 3 days), abdominal pain (particularly a palpable area of renal or liver tenderness), increased CRP (50 mg/L) and the absence of any significant recent intracystic bleeding (based on the results of the abdominal CT scan) or other causes of fever. Treatment failure was defined by modification of therapy (i.e. switching or adding antimicrobials, or switching between treatment categories antimicrobial, percutaneous or surgical therapy). Treatment recurrence was defined as re-appearance of symptoms and restart of treatment within 3 months, after a treatment and asymptom-free interval of >1 week. Visual scoring (four-point scale) of cyst hypermetabolism was used on the most hypermetabolic cyst: accumulation of ^{18}F-FDG in or around the cyst less than or equal to blood was scored as 1; if it was more than blood but less than or equal to liver, it was scored as 2; if it was slightly more than liver, it was scored as 3 and if it was largely more than liver, it was scored as 4.

P, patient; CKD, chronic kidney disease; D, dialysed; T, transplanted; WBC, white blood count; NA, not available.

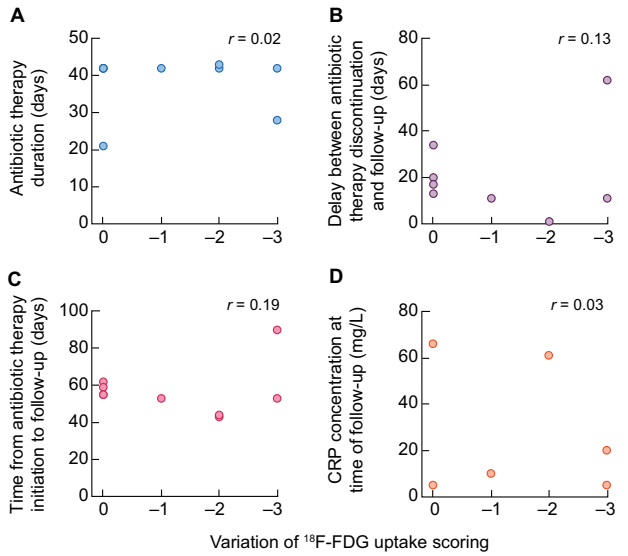

FIGURE 1: Correlation between the variation of ^{18}F-FDG uptake scoring (between follow-up and initial FDG-PET/CT) and (**A**) antibiotic therapy duration, (**B**) delay between antibiotic therapy discontinuation and follow-up FDG-PET/CT, (**C**) time from antibiotic therapy initiation to follow-up FDG-PET/CT and (**D**) CRP concentration at the time of the follow-up FDG-PET/CT.

after diagnostic imaging [8]. Based on the persistence of ^{18}F-FDG uptake, interpreted as treatment failure, antibiotic was continued until ^{18}F-FDG uptake resolution on a third FDG-PET/CT performed 3–4 weeks after. Authors recognized that tailoring treatment duration according to FDG-PET/CT results supposed an unproven relationship between ^{18}F-FDG uptake and infection. Our results contradict this assumption considering the absence of relapse in patients with ^{18}F-FDG persistent uptake, which could be explained by non-specific healing processes [9]. Thus, waiting for the resolution of the ^{18}F-FDG uptake appears to be unjustified and could lead to extension of treatment without benefit and the associated risks inherent to long antimicrobial exposure. Conversely, whether an early negative FDG-PET/CT in patients with satisfying clinical–biological improvement could help to reduce the antibiotic duration remains unknown. This question should be addressed in future studies.

In all, our results do not support using FDG-PET/CT to diagnose CI treatment failure; however, its value in monitoring early recovery needs to be further explored.

SUPPLEMENTARY DATA

Supplementary data are available at ckj online.

CONFLICT OF INTEREST STATEMENT

None declared.

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