Incidental congenital renal and ureteric anomalies in patients studied for neoplastic deseases

To the Editor: In daily clinical practice, the use of a positron emission tomography/computed tomography (PET/CT) in oncology frequently reveals in various sites of the whole body incidental physiologic, anatomic, benign or pathologic findings [1-4] that may have clinical significance [1-9].

In our patients, fluorine-18 fluorodesoxyglucose (^{18}F-FDG) in a dose of 5.5MBq/kg was administered intravenously and 60min later, a two-dimensional (2D) mode ordered subset-expectation maximization (OS-EM) imaging (with septa) was acquired on a Discovery ST PET/CT scanner (General Electric Company-GE®-Milwaukee, WI, USA) with standard CT parameters (80mA, 120kV without contrast; 4min per bed-PET-step of 15cm). The reconstruction was performed in a 128×128 matrix and 60cm field of view. Fluorine-18 fluorodesoxyglucose (^{18}F-FDG)-PET/CT was performed in the fasting state with glucose level lower than 150mg/dL for at least 6h. A written consensus was obtained from all patients before the studies.

We describe five cases of patients mostly studied for neoplastic diseases by ^{18}F-FDG-PET/CT in which we incidentally noticed congenital variants.

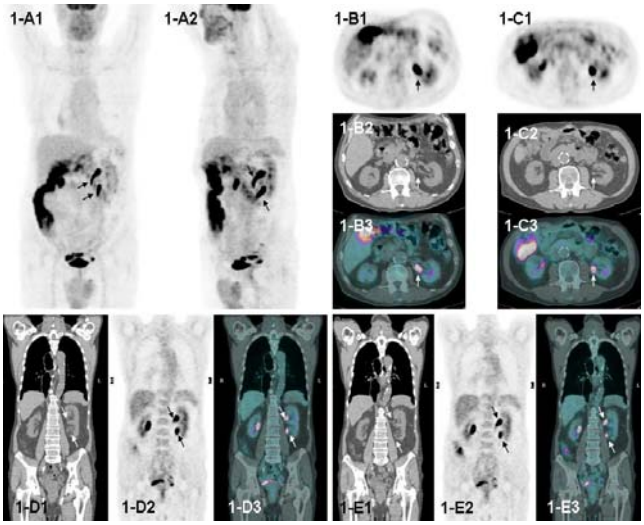

Figure 1. Anterior view (1-A1) and left oblique anterior view at 45° (1-A2) of maximum intensity projection show double left kidney collecting system (arrows). Axial PET (1-B1), CT (1-B2), fused (1-B3) images show lower pelvis (arrows); axial PET (1-C1), CT (1-C2), fused (1-C3) images show upper pelvis (arrows); coronal CT (1-D1;1-E1), PET (1-D2;1-E2) and fused (1-D3;1-E3) images show both pelvis (arrows).

The first patient (Fig. 1) had oesophageal carcinoma previously treated by surgery and was examined for a follow-up. The study was negative for neoplastic lesions but revealed high uptake at the right ascending colon probably due to inflammation and an incidental finding of a double left kidney collecting system.

The second patient (Fig. 2) was examined because of fever of unknown origin and suspected for lympho-proliferative disease. A pathological uptake was identified at the right large bowel, probably due to chronic inflammatory bowel disease and also a double right kidney collecting system. No lymphoma was finally diagnosed.

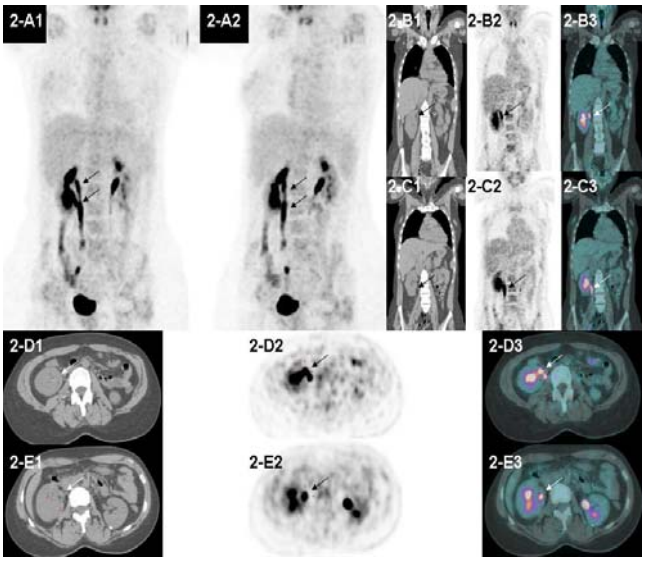

Figure 2. Anterior view (2-A1) and left oblique anterior view at 30° (2-A2) of maximum intensity projection show double left kidney collecting system (arrows). Axial PET (2-D2), CT (2-D1), fused (2-D3), coronal CT (2-C1), PET (2-C2) and fused (2-C3) images show lower pelvis (arrows); axial PET (2-E2), CT (2-E1), fused (2-E3), coronal CT (2-B1), PET (2-B2) and fused (2-B3) images show upper pelvis (arrows).

The third patient (Fig. 3) underwent ^{18}F-FDG-PET/CT for staging purposes because of an advanced metastatic right breast cancer; pathological uptake was identified at the left breast mass, left axillary lymph nodes, left internal mammary chain lymph nodes, mediastinal lymph nodes and many hepatic lesions. A right horizontal abdominal ectopic kidney was also identified in the meso-hypogastric part of the abdomen.

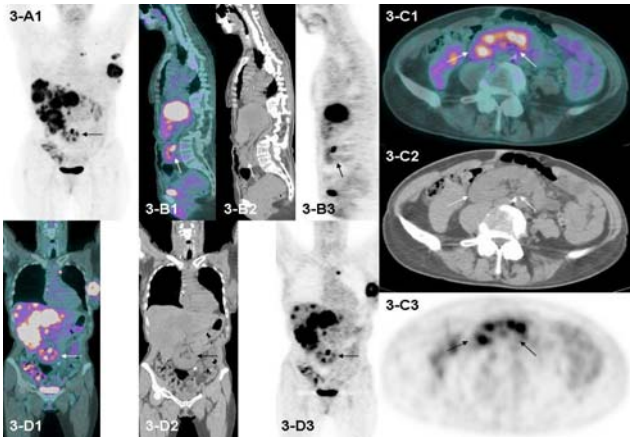

Figure 3. Anterior view (3-A1) of maximum intensity projection shows horizontal abdominal ectopic kidney (arrow); axial fused (3-C1), CT (3-C2) and PET (3C-3) images, sagittal fused (3-B1), CT (3-B2), and PET (3-B3) images, coronal fused (3-D1), CT (3-D2) and PET (3-D3) images show horizontal ectopic right kidney (arrows).

The fourth patient (Fig. 4) underwent ^{18}F-FDG-PET/CT scan after surgical resection of uterine carcinoma and chemotherapy. A horseshoe kidney was identified at the central part of the abdomen and also a metastatic abdominal lymph node and the port-a-cath, site of injection.

The fifth patient (Fig. 5) was affected by rhinopharyngeal carcinoma and underwent ^{18}F-FDG-PET/ CT during follow-up. The study was negative for neoplastic lesions but revealed an ectopic left kidney.

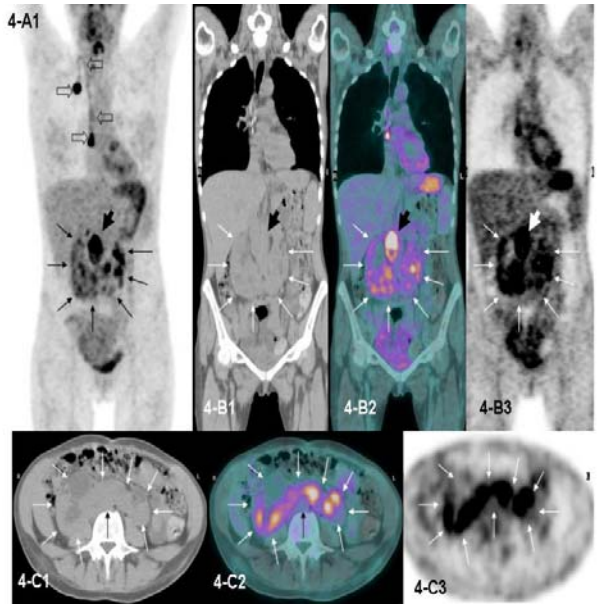

Figure 4. Anterior view (4-A1) of maximum intensity projection show horseshoe kidney at the central part of the abdomen (slim arrows); it's moreover visible secondary lesion at an abdominal lymph-node (big arrow) and the port-a-cath, site of injection (empty arrows). Axial CT (4-C1), fused (4-C2) and PET (4-C3) images, coronal CT (4-B1), fused (4-B2) and PET (4-B3) images show horseshoe kidney (slim arrows).

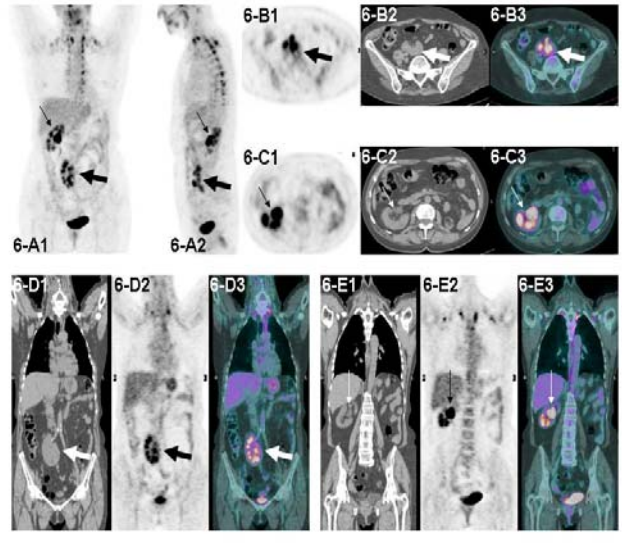

Figure 5. Anterior view (5-A1) and left lateral view (5-A2) of maximum intensity projection image show ectopic left kidney (big arrow) and normal right kidney slim arrow); axial PET (5-B1), CT (5-B2), fused (5-B3) images show left ectopic kidney (big arrows); axial PET (5-C1), CT (5-C2), fused (5-C3) images show right kidney (slim arrows); coronal CT (5-D1), PET (5-D2), fused (5-D3) images show left ectopic kidney (big arrows); coronal CT (5-E1), PET (5-E2), fused (5-E3) images show right kidney (slim arrows).

Congenital anomalies of the kidney and urinary tract are present in about 10% of the population and account for approximately one-third of all congenital malformations [10]. In our department the prevalence of these anomalies is approximately 3%-5%. Incidental findings on PET/CT images are frequent and often reveal unknown diseases or anatomic variants that are not usually related to the current pathology of the patient [3-9]. It is mandatory to identify and report anatomic variants and potentially unknown mal- formations for further investigation and treatment.

In conclusion, we present five cases with congenital renal-ureteric anomalies examined by PET/CT for cancer metastases.

Bibliography

1. Yeung HW, Grewal RK, Gonen M et al. Patterns of ^{18}F-FDG uptake in adipose tissue and muscle: a potential source of false-positives for PET. *J Nucl Med* 2003; 44: 1789-96.
2. Wang X,Koch S. Positron emission tomography/computed tomography potential pitfalls and artifacts.*Curr Probl Diagn Radiol* 2009; 38: 156-69.
3. Shammas A, Lim R, Charron M. Pediatric FDG PET/CT: physiologic uptake, normal variants, and benign conditions. *Radiographics* 2009; 29: 1467-86.
4. Kostakoglu L, Hardoff R, Mirtcheva R et al. PET-CT fusion imaging in differentiating physiologic from pathologic FDG uptake. *Radiographics* 2004; 24: 1411-31.
5. Chen W, Parsons M, Torigian DA et al. Evaluation of thyroid FDG uptake incidentally identified on FDG- PET/CT imaging. *Nucl Med Commun* 2009; 30: 240-4.
6. Bae JS, Chae BJ, Park WC et al. Incidental thyroid lesions detected by FDG-PET/CT: prevalence and risk of thyroid cancer. *World J Surg Onco*. 2009; 10: 7-63.
7. Halac M, Yilmaz S, Mut SS et al. Situs inversus totalis shown in the ^{18}F-FDG PET/CT scan. *Hell J Nucl Med* 2007; 10: 121.
8. Halac M, Mut SS, Ylmaz S et al. Appearance of situs inversus totalis and polysplenia syndrome on FDG-PET/CT. *Clin Nucl Med* 2008; 33: 142-3.
9. Minotti AJ, Shah L, Keller K. Positron emission tomography/computed tomography fusion imaging in brown adipose tissue. *Clin Nucl Med* 2004; 29: 5-11.
10. Berry CA, Channtler C. Urogenital malformations and disease. *Br Med Bull* 1986; 42: 181-6.

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