

# Case report of primary renal pelvis squamous cell carcinoma coexisting with long-standing calculi in left kidney on $^{18}\text{F}$ -FDG PET/CT

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## Abstract

**Rationale:** Primary renal pelvis squamous cell carcinoma (SCC) is an extremely rare neoplasm. In many patients, the SCC was associated with renal calculi.

**Patient concerns:** A 61-year-old male presented with intermittent pain at the left lumbar region for 3 days. The PET/CT images demonstrated increased  $^{18}\text{F}$ -FDG uptake in the upper pole of the left kidney and left renal hilar lymph nodes.

**Diagnoses:** Pathologic examination revealed well-moderately differentiated renal pelvis SCC with lymphatic metastasis.

**Interventions:** The patient underwent a left nephrectomy a few days after the initial staging PET/CT study.

**Outcomes:** No growing lesion or metastasis was observed during a 6-month follow-up.

**Lessons:** Our case demonstrates that  $^{18}\text{F}$ -FDG PET/CT is a useful diagnostic tool to evaluate primary renal pelvic SCC and detect metastatic lymph nodes in patients with long-standing calculi.

**Abbreviations:**  $^{18}\text{F}$ -FDG PET/CT =  $^{18}\text{F}$ -fluorodeoxyglucose positron emission tomography/computed tomography, CT = computed tomography, DTPA = diethylene triamine penta-acetic acid, GFR = glomerular filtration rate.

**Keywords:**  $^{18}\text{F}$ -FDG, calculi, PET/CT, squamous cell carcinoma

## 1. Introduction

Primary renal pelvis squamous cell carcinoma (SCC) is an extremely rare neoplasm, accounting for less than 1% of all malignant tumors of the kidney.<sup>[1]</sup> In most patients, the squamous cell carcinoma was associated with chronic infection, renal calculi of long duration, hormonal imbalance, endogenous and exogenous chemicals, radiotherapy, and vitamin A deficiency.<sup>[2]</sup> Renal SCC usually presents at an advanced stage with extensive local infiltration and has a poor prognosis.<sup>[3]</sup> Few reports have indicated the capacity of  $^{18}\text{F}$ -FDG PET/CT to detect renal SCC. Herein, we present a case of increased  $^{18}\text{F}$ -FDG uptake of primary renal pelvis SCC coexisting with long-standing calculi in left kidney on PET/CT.

## 2. Case report

A 61-year-old male presented with intermittent pain at the left lumbar region for 3 days. On examination, percussion tenderness over the left kidney region was noticed.

Laboratory investigation revealed no obvious shift in leukocyte counts ( $7.28 \times 10^9/\text{L}$ , N:  $3.5\text{--}9.5 \times 10^9$ ), elevated cytokeratin fragment antigen (CYFR211) (41.02 ng/mL, N: 0–2.08), squamous cell carcinoma antigen (26.5 ng/mL, N: 0–1.5), and ferritin (432.61 ng/mL, N: 21.80–274.66) as well as raised C-reactive protein (12.93 mg/L, N: 0–3) accompanied by slightly increased serum creatinine (116  $\mu\text{mol/L}$ , N: 44.2–104.0).

Color Doppler ultrasonography showed a slightly enlarged left kidney with the presence of mild hydronephrosis secondary to

Editor: Saad Zakko.

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The authors have no conflicts of interest to disclose.

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Medicine (2017) 96:11(e6341)

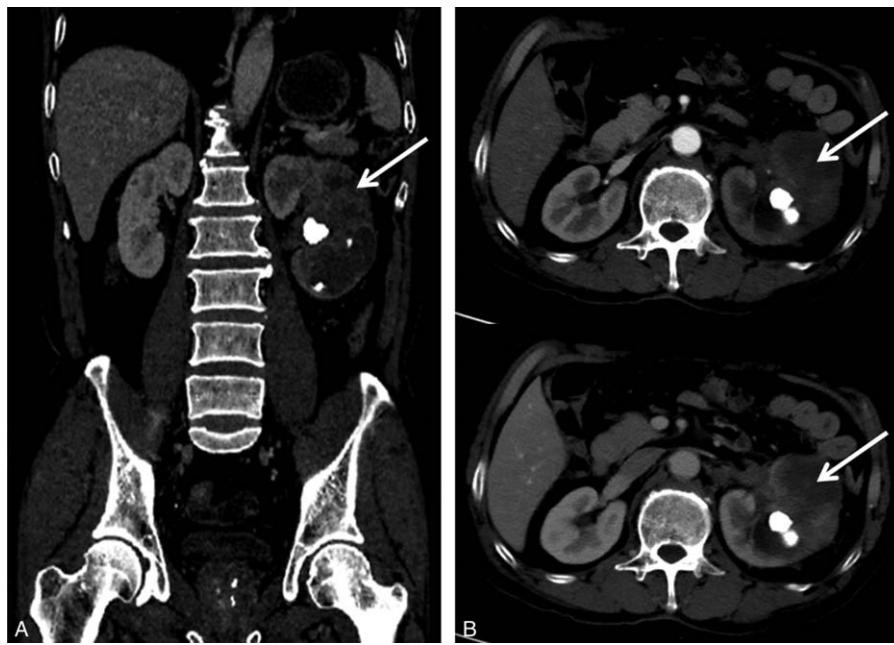
Received: 28 October 2016 / Received in final form: 20 February 2017 /

Accepted: 21 February 2017

<http://dx.doi.org/10.1097/MD.00000000000006341>



**Figure 1.** Renal ultrasound of the left kidney revealed multiple calculi and mild left hydronephrosis.

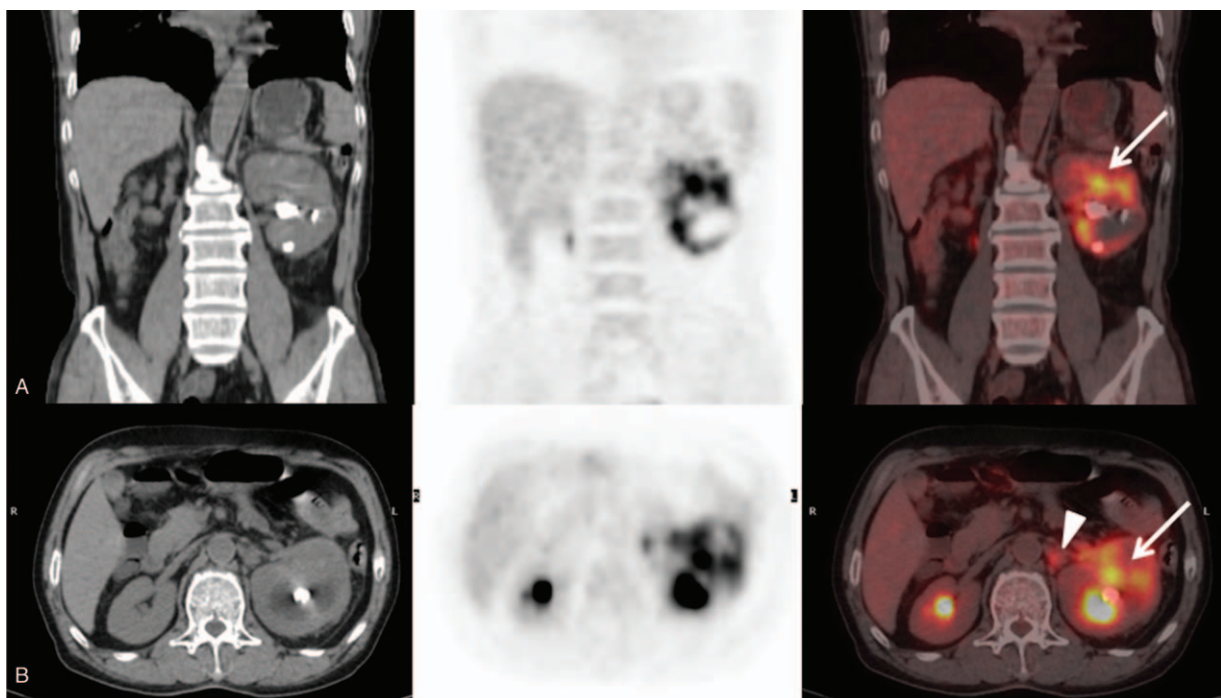


**Figure 2.** Coronal CT (A) demonstrated complex cystic lesions of the left kidney with few septae (white arrow) and calculi in the pelvis. Axial CT (B) showed no contrast excretion by partial left kidney. CT = computed tomography.

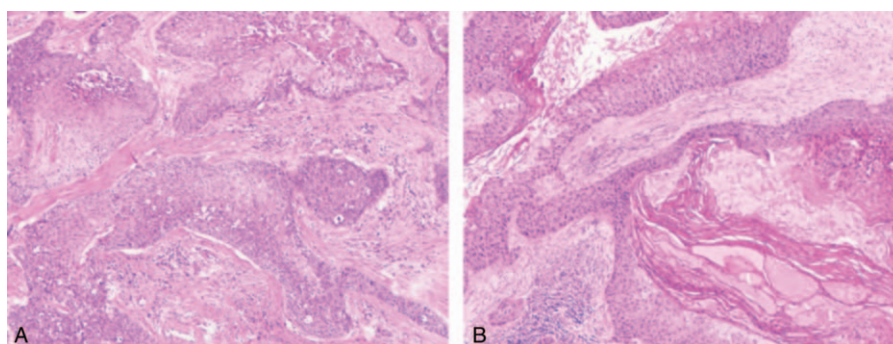
nephroliths in the left renal pelvis (Fig. 1). Enhanced computed tomography (CT) indicated complex cystic lesions in the upper pole of the left kidney with few septae and calcifications (Fig. 2). Partial left kidney did not show excretion of contrast even on delayed scans. There was evidence of a few enlarged left renal hilar lymph nodes with the largest measuring 2.1 cm.

Diethylene triamine penta-acetic acid scan revealed poorly functioning left kidney with GFR of 16.5 mL per minute and right kidney was normally functioning with GFR of 45 mL per minute.

The PET/CT images demonstrate complex cystic lesions with increased  $^{18}\text{F}$ -FDG uptake in the upper pole of the left kidney ( $\text{SUV}_{\text{max}}$ : 9.37). The left kidney was unremarkable and had



**Figure 3.** PET/CT images (A, B) demonstrate complex cystic lesions with increased radioactivity uptake in the upper pole of the left kidney (white arrow). Transaxial PET/CT (B) also showed increased metabolic activity in a left renal hilar lymph node (arrowhead). PET/CT = positron emission tomography/computed tomography.



**Figure 4.** Histopathology examination of the tissue in the area of the left renal showed well-moderately differentiated renal pelvis SCC (A, hematoxylin-eosin, original magnification  $\times 40$ ). Metastasis was observed in lymph node of squamous cell carcinoma at low-power view (B, hematoxylin-eosin, original magnification  $\times 40$ ). SCC = squamous cell carcinoma.

SUV<sub>max</sub> 6.88 (physiologic renal background). PET/CT also showed increased metabolic activity in left renal hilar lymph nodes (SUV<sub>max</sub>: 6.7) (Fig. 3).

The patient underwent a left nephrectomy a few days after the initial staging PET/CT study. Pathologic examination revealed well-moderately differentiated renal pelvis SCC with lymphatic metastasis (Fig. 4).

Informed consent was signed by the patient for publication of this report and accompanying images.

### 3. Discussion

Most renal pelvic tumors are transitional cell carcinomas. Squamous cell carcinoma of the renal pelvis is a very rare tumor. Urinary calculi are accepted as a main carcinogenic factor for SCC.<sup>[4]</sup> It is postulated that chronic irritation of the renal pelvis induces squamous metaplasia, which later results in neoplasia.<sup>[5]</sup>

CT and ultrasound are important tools to evaluate renal malignancies. Diagnosis of renal pelvic SCC is difficult because CT and ultrasound usually reveal only calculi and hydronephrosis due to obstruction. <sup>18</sup>F-FDG PET/CT was verified as an effective tool in diagnosis, staging, and prognosis evaluation in renal tumors.<sup>[6]</sup> However, renal malignancy is more difficult to identify than extra-renal lesions due to radioactive urine and relatively low activity of the neoplasm. In the present case, a presurgical <sup>18</sup>F-FDG PET/CT was performed. PET/CT revealed the presence of lesions in the left kidney according to increased radioactivity uptake in the tumor. This result suggested that renal pelvic SCC is a special subgroup of tumors, which, maybe, demonstrate a higher <sup>18</sup>F-FDG uptake than other kinds of renal malignancies.

To the best of our knowledge, only 3 cases of renal SCC on <sup>18</sup>F-FDG PET/CT have been reported until now.<sup>[7–9]</sup> In 1 case, an autosomal-dominant polycystic kidney disease patient of concurrent renal pelvis squamous cell carcinoma and tumor embolus was reported. <sup>18</sup>F-FDG PET/CT showed increased radioactivity

uptake in the tumor emboli in the inferior vena cava, but not in the primary tumor.<sup>[7]</sup> Recently, a case of primary kidney parenchyma SCC was introduced. PET/CT showed valid <sup>18</sup>F-FDG was taken up by cystic-solid mixed masses in the right kidney.<sup>[8]</sup> In another study, a renal pelvis SCC patient without renal calculi underwent a PET/CT examination. The staging PET/CT images demonstrate a soft tissue mass in the upper pole of the right kidney with moderately intense <sup>18</sup>F-FDG uptake.<sup>[9]</sup> In the present case, nephroliths and hydronephrosis make it difficult to identify lesions. The PET/CT demonstrated increased tracer uptake in the complex cystic lesions and provided more useful information to evaluate primary renal pelvic SCC. Moreover, PET/CT detected more metastatic lymph nodes than CT and ultrasound.

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