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Case Report

Renal Squamous Cell Carcinoma with Staghorn Calculus

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Keywords
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Abstract
A 70-year-old Japanese woman was referred to our department due to general fatigue and a persistent low fever. We performed percutaneous nephrostomy and administered antibiotics for the pyelonephritis due to her left staghorn calculus. After the infection had been brought under control and her general condition improved, we performed nephrectomy. A pathologic examination revealed renal squamous cell carcinoma (SCC) in addition to xanthogranulomatous inflammation. Seventeen days after the operation, computed tomography demonstrated local recurrence of the tumor; therefore, she received palliative care. Two months after her operation, she died of renal SCC.

Introduction

Staghorn calculi are calculi that occupy the renal pelvis. If a patient with staghorn calculi receives inadequate or no therapy, it can cause severe complications, such as renal dysfunction or bacterial infection, leading to urosepsis. However, some cases have been reported to show squamous metaplasia of the renal pelvis, resulting in carcinogenesis [1].

In the upper urinary tract system, urothelial carcinoma is the most common type of the malignancy. Conversely, squamous cell carcinoma (SCC) is rare and has a prevalence of <1% among urinary tract neoplasms [2].

We herein report a Japanese woman with renal SCC accompanied by a staghorn calculus.

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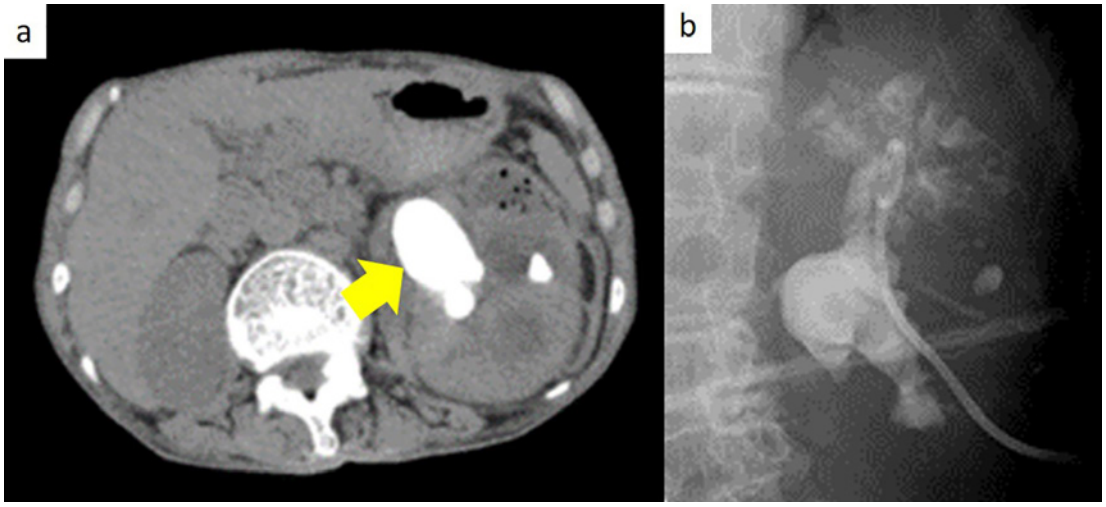

Fig. 1. a Abdominal CT showed that the left renal pelvis was occupied by a staghorn calculus. **b** Percutaneous nephrostomy was performed.

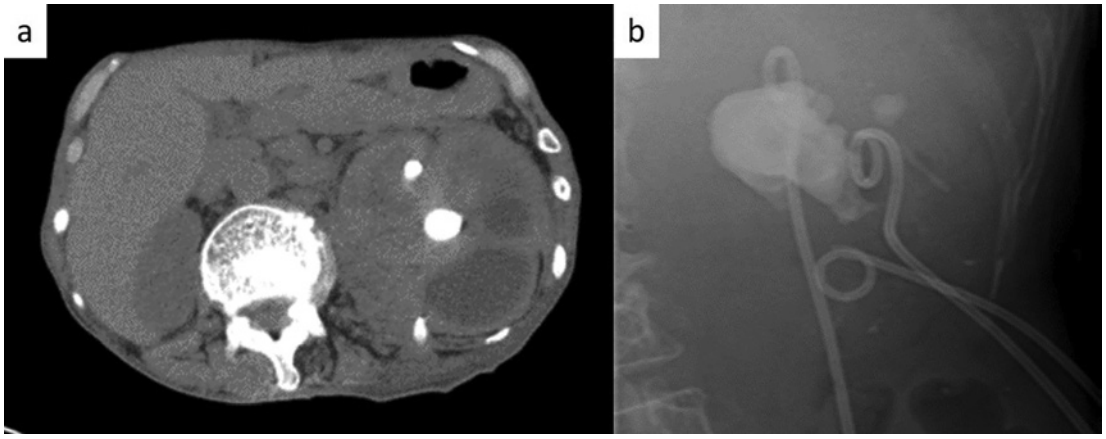

Fig. 2. a CT revealed that the middle and inferior calyxes were not drained adequately. **b** Two additional nephrostomies were performed.

Case Presentation

A 70-year-old Japanese woman visited a hematologist for idiopathic thrombocytopenia. During follow-up, she had general fatigue and a persistent low fever. Her urine analysis and abdominal computed tomography (CT) revealed pyuria and a left staghorn calculus (Fig. 1a). Thereafter, she was referred to our department for a further examination and treatment for her urinary tract infection.

On the day of her initial visit to our outpatient department, her serum C-reactive protein level was 12.34 mg/dL, white blood cell count was 11,400/μL, and serum creatinine was 0.52 mg/dL. We performed percutaneous nephrostomy for the treatment of her pyelonephritis (Fig. 1b). Thereafter, 2 g/day of ceftriaxone (CTRX) was administered intravenously for 9 days. Her fever reduced, and her inflammation markers decreased. The next month, she visited our department again for fever. CT revealed that her middle and inferior calyx had not been adequately drained (Fig. 2). Two additional nephrostomies were therefore performed.

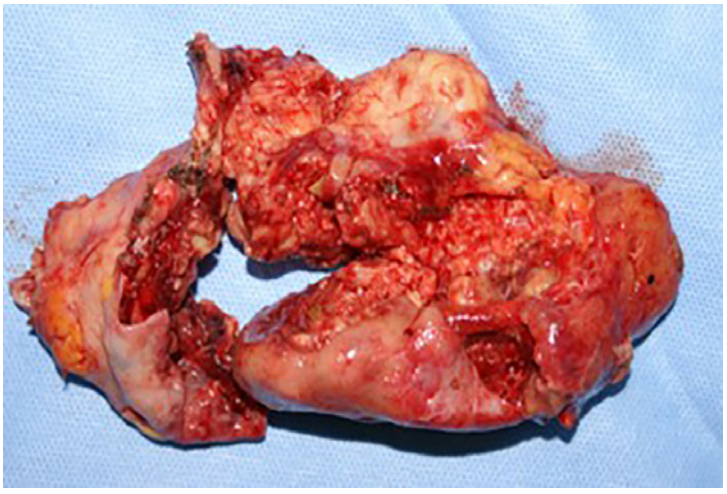

Fig. 3. Nephrectomy was performed, and the kidney was divided into two pieces.

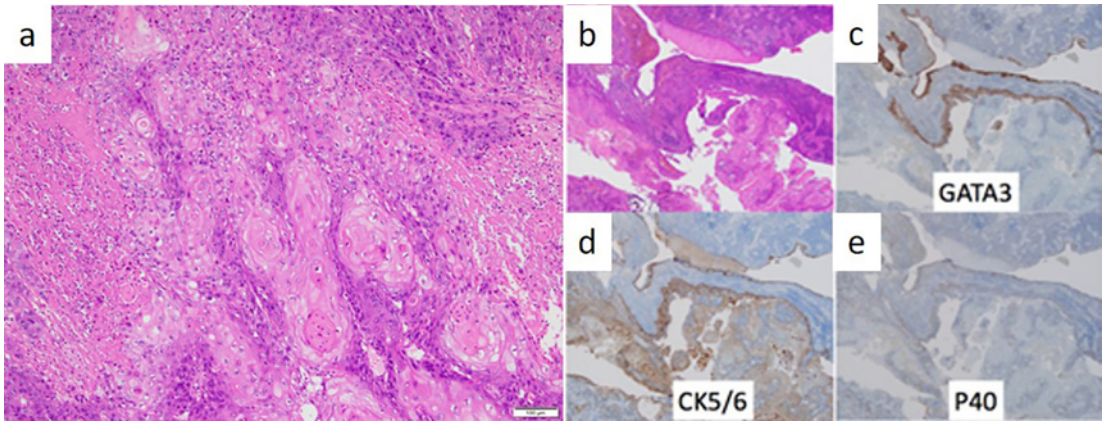

Fig. 4. a, **b** HE staining; squamous cell carcinoma accompanied by a cancer pearl. Immunohistochemical staining was negative for GATA3 (**c**) and P40 (**d**) and positive for CK5/6 (**e**).

We washed each calyx every day and administered CTRX 2 g/day for 9 days. Inflammation slowly decreased, and thereafter, she left our hospital.

Three months after her initial visit to our department, she underwent open nephrectomy. Due to severe adhesion, the kidney was divided into two pieces and removed (Fig. 3). A pathologic examination revealed that the tumor was SCC accompanied by a cancer pearl (Fig. 4a, b). Foam cells were invading the renal parenchyma, suggesting xanthogranulomatous pyelonephritis. We were able to detect the area where the urothelial epithelium and squamous epithelium were mixed. This finding suggested that the tumor was derived from the squamous metaplasia due to the staghorn calculus. Immunohistochemical staining showed that GATA3 and P40 were negative, while CK5/6 was positive (Fig. 4c–e). Based on these findings, a diagnosis of SCC rather than urothelial carcinoma or renal cell carcinoma was made. As her kidney had been broken into two pieces, it was difficult to decide whether or not the surgical margin was positive. Her disease's T stage was assumed to be at least pT3. The final diagnosis was SCC of the left kidney, and after the operation, the serum SCC marker level was 4.8 ng/mL.

One week after surgery, while her laboratory data showed improvement, general fatigue and appetite loss progressed. Two weeks after the operation, CT revealed local recurrence of the tumor (Fig. 5a). One month after her surgery, she was readmitted to our department

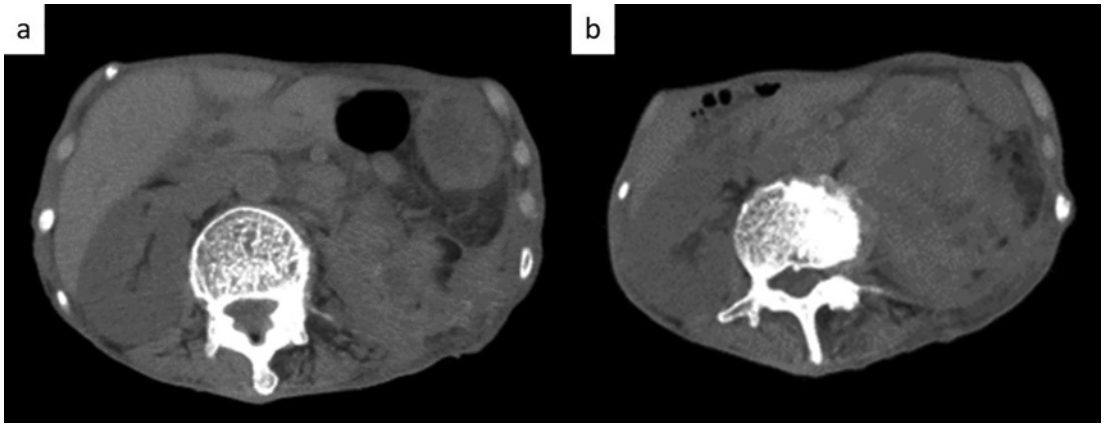

Fig. 5. a CT revealed local recurrence with rapid enlargement occupying the abdomen (**b**).

because of her severe appetite loss and malnutrition. CT demonstrated enlargement of the local recurrence near the left renal hilum (Fig. 5b). At this point, her serum SCC marker level was 32.2 ng/mL.

Her general condition continued to worsen, and she was unable to receive chemotherapy or radiotherapy. Therefore, she received best supportive and palliative care. Two months after the operation, she died of renal SCC.

Discussion

In the urinary tract, the most frequent neoplasms are urothelial carcinomas; SCC in the renal pelvis is rare and only accounts for 0.5% of malignant renal tumors [1, 3]. Renal SCCs are reported to be aggressive tumors with a worse prognosis than other urinary tract carcinomas because they tend to be detected in an advanced stage (pT3 or greater) [4, 5]. The prognosis for renal SCC is extremely poor, and less than 10% of patients survive for 5 years [5, 6].

Whether or not renal calculi cause SCC is unclear. Some studies have reported that urothelial epithelium may lead to squamous metaplasia with chronic irritation or inflammation, which progresses to dedifferentiation, dysplasia, and ultimately to carcinogenesis [5]. The coexistence of calculi has been reported in many (approximately 90%) cases of renal SCC [3, 7, 8]. Some previous studies have mentioned that patients with renal SCC had chronic episodes of pyelonephritis or nephrolithiasis [9, 10]. Based on these findings, we hypothesized that the renal calculus might have initially provoked the metaplasia, with the squamous metaplasia subsequently exacerbating the calculus, leading to a vicious cycle and conclusive squamous carcinogenesis.

The radiographic characteristics of renal SCC are variable. CT shows a diffuse, swollen kidney with thinning of the cortex and renal calculi and perirenal infiltration. In many cases, the renal parenchyma shows a degraded density. It is difficult to distinguish primary renal SCC from xanthogranulomatous pyelonephritis or other malignant neoplasms of the kidney preoperatively [11]. In the present case, CT showed a large staghorn calculus with hydronephrosis and a stretched renal cortex.

Advanced SCC has a poor prognosis, and adjuvant chemotherapy or radiation therapy has not been established for SCC. In order to detect tumor aggressiveness before treatments are

administered, the evaluation of serum SCC markers is recommended. When a patient with a renal staghorn calculus shows elevated serum SCC markers, the coexistence of SCC should be considered. We encountered a rare case of renal SCC with renal calculus.

Statement of Ethics

Written informed consent to participate in this study and for the publication of this report was obtained from the patient for ethics approval. A copy of the written consent form is available for review from the Editor-in-Chief of this journal. Due to ethical restrictions, the raw data underlying this paper are available upon request to the corresponding author.

Disclosure Statement

We declare no conflicts of interest.

Funding Sources

None.

Author Contributions

R.K., T.K. drafted the manuscript. R.K., K.K. performed the experiment. H.U. supervised this study.

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