

Original Article

Squamous cell carcinoma in a duplicated renal pelvis

Makiko Ogawa¹, Teppei Morikawa¹, Toyoaki Toyoshima², Masashi Fukayama¹

¹Department of Pathology, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan; ²Department of Urology, Yuai Memorial Hospital, Koga, Japan

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Abstract: We report an extremely rare case of squamous cell carcinoma (SCC) of the renal pelvis associated with an incompletely duplicated renal pelvis and ureter. A 71-year-old woman presented with left lower back pain and gross hematuria. Urinary cytology showed atypical squamous cells. Computed tomography, magnetic resonance imaging and retrograde pyelography revealed left incompletely duplicated renal pelvis and ureter and a mass in the left upper renal pelvis. A clinical diagnosis of left renal pelvic cancer was made and the patient underwent total nephroureterectomy. Histological examination of the resected specimen revealed SCC with marked keratinization in the upper renal pelvis. The tumor had invaded the renal parenchyma and perinephric fat. There was no urothelial carcinoma component. The pathological stage was pT4 NO. There was no evidence of recurrence 6 months postoperatively. Because the prognosis of SCC of the upper urinary tract is poor, urologists and pathologists should be aware that SCC may develop in duplicated urinary systems.

Keywords: Cancer, congenital anomaly, duplex kidney, immunohistochemistry, pathological diagnosis, prognosis

Introduction

Duplicated renal pelvis and ureter is one of the most common congenital anomalies of the urinary tract [1]. Cancers arising in duplicated urinary systems are rarely reported; most reported cases have been urothelial carcinomas [2-4]. Here, we report a case of squamous cell carcinoma (SCC) of the renal pelvis associated with an incompletely duplicated renal pelvis and ureter.

Case report

A 71-year-old woman presented with left lower back pain and gross hematuria. Urinary cytology showed atypical squamous cells. Serum tumor marker SCC antigen concentration was increased at 3.5 ng/mL (normal <1.5 ng/mL). Computed tomography and magnetic resonance imaging revealed a left incompletely duplicated renal pelvis and ureter and a mass in the left upper renal pelvis with invasion of the renal parenchyma and retrograde pyelography supported these findings. Neither hydronephrosis nor renal stones were found. On cystoscopy there were no abnormal findings in the

urinary bladder. A clinical diagnosis of left renal pelvic cancer was made and the patient underwent total nephroureterectomy.

Gross examination of the nephroureterectomy specimen revealed a solid whitish lesion measuring 5.5 × 5.0 cm in the upper renal pelvis (**Figure 1A**). The tumor was invading the renal parenchyma through the perirenal fat (**Figure 1B**). It also extended into the ureter for about 4 cm (**Figure 1C**).

Microscopically, papillary proliferation of atypical squamous cells with marked keratinization was observed in the renal pelvis (**Figure 2A**). The cancer cells had formed large nests with central keratinization and invaded the renal parenchyma through the perirenal fat (**Figure 2B, 2C**). Spread into the collecting ducts was also observed (**Figure 2D**). Venous invasion and perineural invasion were noted. There was no urothelial carcinoma component. Squamous metaplasia was not observed in the background mucosa (**Figure 3A**). According to immunohistochemical techniques [5], the cancer cells were diffusely positive for p53 (**Figure 3B**) and cytokeratin 5/6 (**Figure 3C**), only focally

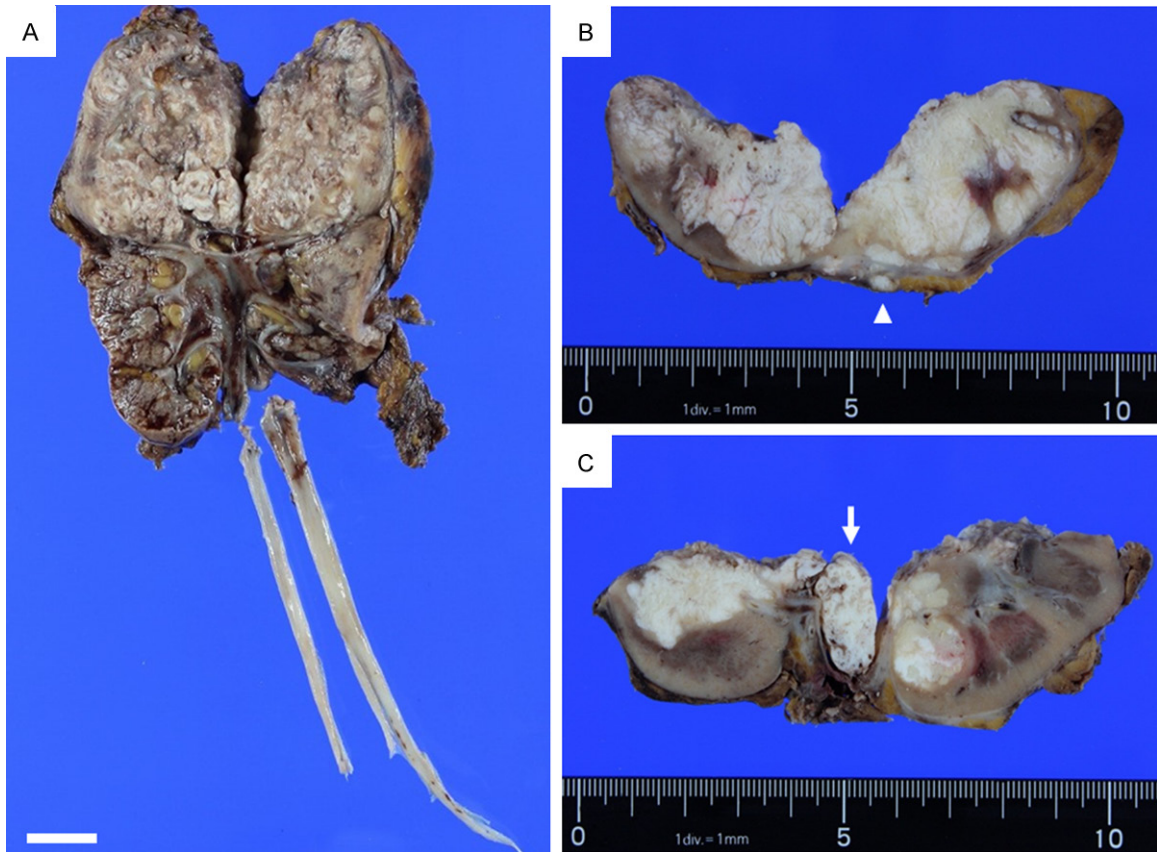


Figure 1. Nephroureterectomy specimen: gross appearance of the left renal pelvic tumor. A. A solid whitish lesion occupies the upper half of the kidney. An incompletely duplicated renal pelvis and ureter is apparent. The ureters were resected by an endoscopic ureteral detachment procedure. B. The tumor is invading the renal parenchyma through the perirenal fat (arrowhead). C. The tumor is extending into the ureteropelvic junction (arrow).

positive for cytokeratin 7 (**Figure 3D**), and negative for cytokeratin 20. No lymph node metastasis was found. Thus, the pathological stage was pT4 N0 [6]. The surgical margins were negative for cancer cells.

The patient received radiation therapy (total 50 Gy) as adjuvant therapy. The tumor marker SCC antigen had declined to 0.8 ng/mL by 5 weeks after surgery. There was no evidence of recurrence of the tumor on computed tomography, urinary cytology or cystoscopy after 6 months of follow-up.

Discussion

Primary SCC of the renal pelvis is a rare tumor subtype, representing less than 1% of malignant renal tumors [7, 8]. In the present case, an SCC developed in the left upper pelvis in a patient with an incompletely duplicated renal pelvis and ureter. To the best of our knowledge,

this is the first published report in English of SCC associated with duplicated renal pelvis and ureter.

Duplicated renal pelvis and ureter is a relatively common congenital anomaly of the urinary tract, occurring in 1 to 2% of the general population [1]. Upper urinary tract cancer in a duplicated urinary system has rarely been reported; fewer than 20 cases have been reported in English [2-4, 9]. Most of the reported cases were urothelial carcinomas, the exceptions being two cases of sarcomatoid carcinoma [9, 10]. It is not known whether duplicated urinary systems are associated with increased risk of upper urinary tract cancer.

Possible carcinogenic mechanisms for SCC of the renal pelvis have been proposed. Chronic irritation of the urothelium may result in squamous metaplasia, which could later develop into SCC. SCCs of the renal pelvis are frequent-

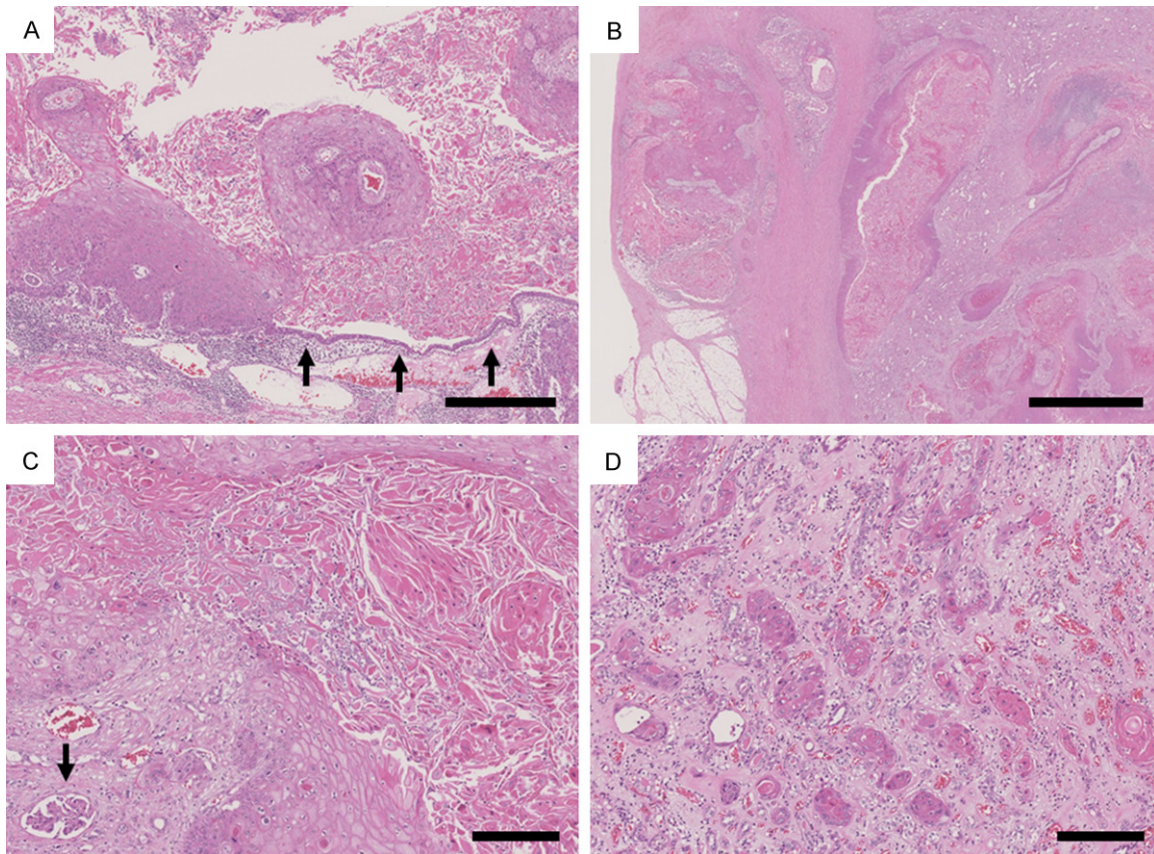


Figure 2. Microscopic findings of resected renal pelvic tumor (hematoxylin and eosin stain). A. Papillary proliferation of cancer cells in the renal pelvis accompanied by marked superficial keratinization. Arrows indicate non-neoplastic urothelium. Bar, 500 μ m. B. The cancer cells are forming large nests and invading the renal parenchyma (right) and perirenal fat (left). Bar, 2 mm. C. Cancer cell invasion in the renal parenchyma. Marked central keratinization is apparent in the tumor nest. Arrow indicates a glomerulus. Bar, 200 μ m. D. Spread of cancer cells into the collecting ducts. Bar, 200 μ m.

ly associated with urolithiasis, hydronephrosis and chronic infection, all of which may contribute to chronic irritation and subsequent development of squamous metaplasia in the neighboring epithelium [7, 11, 12]. Completely duplicated urinary systems are also complicated by ectopic ureters and vesicoureteral reflux that may cause urinary tract infection and hydronephrosis. However, none of these predisposing factors were identified in the present case; the cause of this patient's SCC is unknown.

The prognosis of SCC of the upper urinary tract is reported as being poor. Most patients present at an advanced stage (pT3 or more) [8]. Holmang et al. reported a median postoperative survival of 7 months and a 5-year survival rate of less than 10% [8]. Considering the dismal prognosis and the fact that the benefits of

neoadjuvant and adjuvant radiotherapy/chemotherapy seem minimal [8], early detection is important. SCCs typically contain areas of keratinization and keratotic cellular debris. Detection of these abnormalities by preoperative urine cytology would help to establish the diagnosis, as in the present case. Development of a novel therapy against SCC of the upper urinary tract is also urgently needed.

Because of its rarity, the immunophenotype of SCC of the renal pelvis is unknown. Diffuse expression of p53 was observed in the present case, suggesting the presence of *TP53* mutation [13]. Guo et al. have reported that immunohistochemical methods show that about 70% of nonbilharzial SCCs of the urinary bladder are positive for p53, supporting that p53 plays an important role in bladder SCC [14]. Cytokeratin 5/6 positivity is reported to be more common in

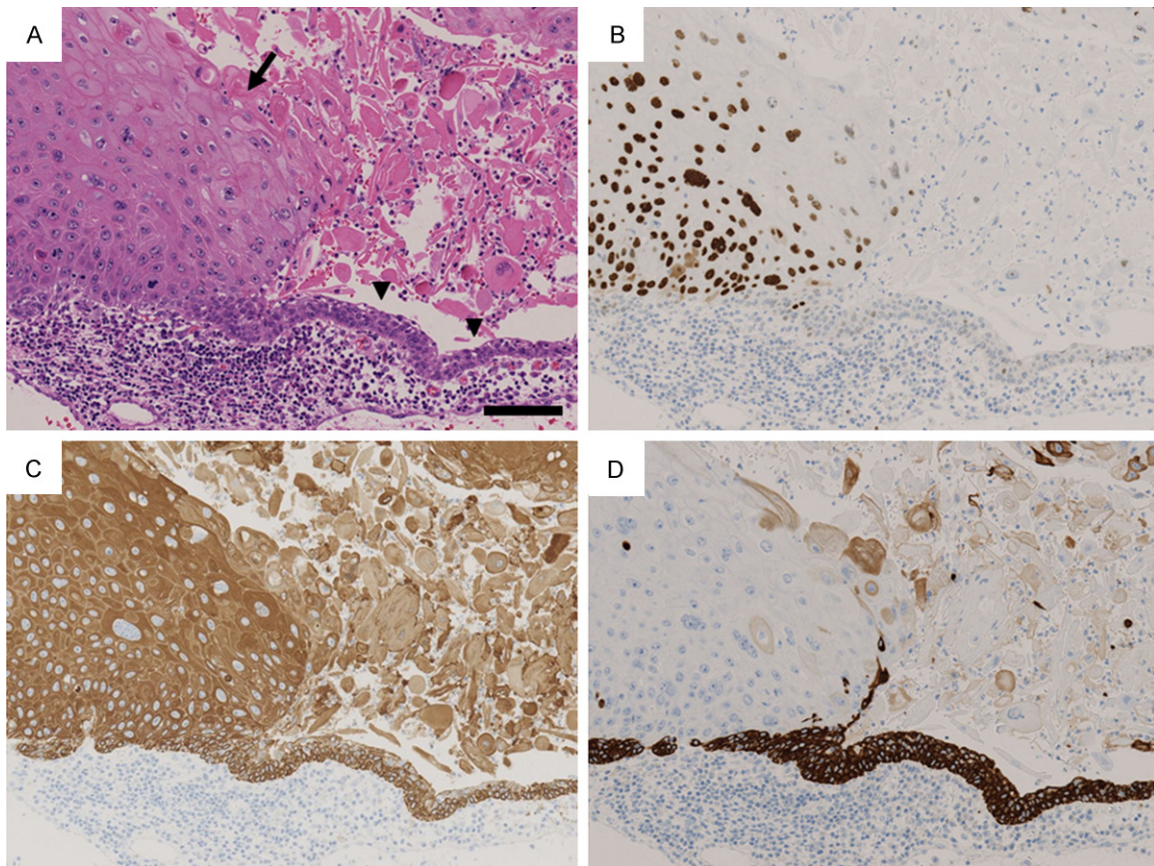


Figure 3. Immunohistochemical findings. A. The boundary between the squamous cell carcinoma of the renal pelvis (arrow) and normal urothelium (arrowheads) is shown (hematoxylin and eosin stain). Bar, 100 μ m. B. p53 is diffusely positive in the cancer cells, but negative in the normal urothelium. C. Cytokeratin 5/6 is diffusely positive in the cancer cells as well as in the normal urothelium. D. Cytokeratin 7 is focally positive in the cancer cells, whereas it is diffusely positive in the normal urothelium.

SCC than in urothelial carcinoma of the urinary bladder [15]. Cytokeratin 20 is constantly negative, whereas cytokeratin 7 is sometimes focally positive in SCC of the urinary bladder [15]. The tumor in the present case had the typical immunophenotype of SCC of the urinary tract.

In conclusion, we report this case of SCC arising in a duplicated renal pelvis; to our knowledge, no such cases have previously been reported in English. Because the prognosis of SCC of the upper urinary tract is poor, urologists and pathologists should be aware that SCC may develop in duplicated urinary systems.

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Disclosure of conflict of interest

None.

Address correspondence to: Dr. Teppei Morikawa, Department of Pathology, Graduate School of Medicine, The University of Tokyo, 7-3-1 Hongo, Bunkyo-Ku, Tokyo 113-0033, Japan. Tel: +81-3-5841-3341; Fax: +81-3-3815-8379; E-mail: tmorikawa-ky@umin.ac.jp

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