Synchronous Renal Collecting Duct Carcinoma and Transitional Cell Carcinoma: a case report

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Renal carcinoma of the collecting ducts of Bellini account for less than 1% of all renal tumors. Here, we report a 57-year-old female with synchronous transitional cell carcinoma in the renal pelvis and collecting duct carcinoma in the renal parenchyma. In this challenging case, diagnosis was difficult and depended on pathological conclusions. Clinically, the renal cell carcinoma manifested as an inflammatory process. The tumor was confined to the renal medulla without distension of the renal capsule and was difficult to differentiate from renal cell carcinoma because of its unusual location. The patient received a radical nephrectomy and died of multiple metastases six months after the surgery. Preoperative tissue diagnosis, such as needle biopsy, should be performed first when radiological findings are suggestive of collecting duct carcinoma to enable proper treatment planning and prolong patient survival. We presented the imaging and histopathological findings of this rare case and the literature was reviewed.

The various mesenchymal cells found in the kidney may potentially develop into tumors of different histology. TCC and RCC are the most frequent malignancy of the kidney. It has been commonly observed that renal cell carcinoma (RCC) originates from renal parenchyma and that transitional cell carcinoma (TCC) arises from the urothelium. Conventional RCC, in contrast with the least common collecting duct variant, comprises more than 80% of renal parenchymal tumors. However, the synchronous occurrence of parenchymal and urothelial cancers in one kidney is rare.

Patients with RCC and TCC can present with symptoms mimicking renal infection. When patients present with symptoms of infection, the diagnosis of RCCs and TCCs is challenging and accurate clinical diagnoses tend to be delayed. Here we report a patient in whom RCC and TCC existed synchronously in one kidney. To add to the rareness of this case, the RCC was a collecting duct variant that make up about 1% of RCCs.

CASE REPORT

A 57-year-old female presented with fever and acute flank pain. Blood tests revealed leukocytosis (white blood cell count 17,000/mm3 with neutrophils 81.4%). Urine analysis showed marked pyuria and hematuria. An intravenous urography showed an absence of contrast opacification in the right kidney (Fig. 1a). Ureteroscopy was performed because of suspicions about a urinary obstruction with secondary infection. However, there was no significant finding and a double-J catheter was placed in the right ureter. Unfortunately, the patient’s clinical symptoms did not improve.

An ultrasound of the abdomen delineated a heterogeneous echoic mass that measured 3 cm in diameter with poor perfusion in the medullary region of the upper pole of the kidney on color Doppler scanning (Fig. 1b, 1c); For further characterization for the

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lesion, abdominal CT was subsequently performed, which showed a lobulated low attenuation lesions about 3 cm in diameter in the medullary area of the right kidney. (Fig. 2a, 2b). These findings suggested a renal medullary tumor. For preoperative evaluation, angiography was performed. Angiography of the right renal artery revealed a hypovascular area in the upper pole of the right kidney (Fig. 2c). An effective renal plasma flow study delineated poor function of the right kidney.

On the basis of the imaging findings, a malignant tumor was highly suspected in the right kidney. The primary conclusion was most likely an atypical RCC or a TCC. Three weeks after the initial presentation, the patient received a radical nephrectomy. In the gross specimen, a whitish infiltrative tumor was found in the upper pole of the kidney (Fig. 3a). A number of papillary tumor cells were also noted in the renal pelvis, just near the main tumor. Diffused large areas of necrosis were also observed in the surrounding renal parenchyma.

Histopathological examination of the gross specimen showed mixed tubulopapillary structures, desmoplasia, and inflammatory reaction.
The carcinoma of the collecting ducts of Bellini comprised an eosinophilic and basophilic high-grade malignancy with hobnail appearance (Fig. 3b-3d). Immunohistochemical studies of the carcinoma demonstrated immunoreactivity in the papillary (positive for CK7 and CK20, and negative for vimentin), tubocystic (positive for CK7 and vimentin, and negative for CK20), and solid (positive for CK7 and vimentin, and negative for CK20) components. The positive staining for vimentin, which is regarded as a malignant marker, indicated malignancy. The pathologic conclusion was that the tumor was a high-grade papillary urothelial carcinoma with mixed collecting duct carcinoma and a Grade 4 conventional-type RCC with poor histological differentiation (Fig. 3b-3d). The patient’s postoperative course was uneventful.

Immunohistochemical staining demonstrated different immunoreactivity in different parts of the tumor. We concluded that the patient had carcinoma of the Bellini ducts in the medullary pyramid and papillary TCCs in the renal pelvis. A minor clear cell component was also observed in the specimen. The patient received adjuvant chemotherapy after the surgery and died of multiple metastases six months later.

**DISCUSSION**

Primary renal pelvic TCC is accounting for 1% of urinary tract tumors [1]. High-grade TCC may invade the renal sinus and extend into the renal medulla [2]. From imaging studies, TCC appears as an ill-defined mass, which is centered in the renal pelvis causing obliteration of the renal sinus fat. These tumors may be mixed hypoechoic and hyperechoic on sonograms, whereas they present as low attenuation lesions on CT scans. Collecting duct or Bellini carcinoma is a highly aggressive subtype...
of RCC that accounts for less than 1% of all malignant renal neoplasms. The tumor originates from the medullary collecting duct, which has been confirmed by histological and immunohistochemical findings. To date, there have only been about 100 cases of Bellini carcinoma reported in the literature, with a predominant occurrence in males (2:1) [3-6]. The mean age at diagnosis is 55 years, with a wide range of cases reported in children as young as 13 years old and in adults over 80 years of age [7, 8]. Most patients present with flank pain and hematuria. Less than one-third of patients survive more than two years after clinical diagnosis, and up to 40% of patients have metastatic disease at presentation [8]. Collecting duct carcinoma is an infiltrative neoplasm that is usually centered in the renal medulla, although extension into the cortex is also seen [6]. The imaging features of collecting duct carcinoma have not been well described in the literature on radiological series of cases [9, 10]. Collecting duct carcinoma may be hyperechoic, isoechoic, or hypoechoic to the renal parenchyma on sonography [11, 12]. CT scans and magnetic resonance imaging (MRI) shows that the appearance

Figure 3. a. The gross surgical specimen in sagittal section showing an irregular shape tumor (arrows) with central necrosis and hemorrhage over the upper pole of the right kidney. b. The histopathology of the renal tumor showed transitional cell carcinoma in the renal pelvis (hematoxylin and eosin stain; magnification 200×). c. A high-field view delineating the renal cell carcinoma localized in the medulla and cortex of the kidney (hematoxylin and eosin stain; magnification 400×). d. The renal cell carcinoma showed hobnail cells (arrows) originating from the collecting duct and cortex of the kidney (hematoxylin and eosin stain; magnification 400×).
of collecting duct carcinoma is heterogeneous with areas of necrosis, hemorrhage, and calcification. Collecting duct carcinoma usually has low signal intensity on T2-weighted MRI and hypovascularity on conventional angiography [11]. Imaging findings that support the diagnosis of collecting duct carcinoma include a medullary location and an infiltrative appearance on CT scans, hyperechogenicity on sonography, hypointensity on T2-weighted MRI, distortion of the renal collecting system on urography, and hypovascularity on angiography [12]. For the majority of patients, surgical treatment does not cure the disease. Chemotherapy and/or immunotherapy appear to have a limited role in the treatment of this disease, and early detection may be the best method for prolonging patient survival [13, 14].

In conclusion, the synchronous occurrence of renal collecting duct carcinoma and TCC is extremely rare. Differentiating collecting duct carcinoma from an invasive pelvic urothelial tumor on the basis of imaging findings may not be possible. Preoperative tissue diagnosis, such as needle biopsy, should be performed in such circumstances to ensure proper treatment planning and prolong patient survival.

REFERENCES

集尿管腎細胞癌同時合併腎盂移行性細胞癌：
病例報告

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集尿管腎細胞癌同時合併腎盂移行性細胞癌是一極罕見的腎臟多重型惡性腫瘤且預後很差。我們報告一位57歲女性，患有一從右腎集尿系統與實質組織長出之兩種不同癌細胞腫瘤，併有發燒、腰痛症狀。此腫瘤非侷限於腎臟集尿系統，也未穿出腎包膜外，此罕見的部位是很難與一般腎臟細胞癌及移行性細胞癌鑑別。在放射線影像學上，若疑似集尿管癌建議先經皮穿刺切片由病理確診後，再進行下一步之治療計畫，藉以延長病患存活期。在此我們提出這罕見案例的影像與病理組織發現以及探討相關的文獻資料。