Clinical Case Report

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Bilateral kidneys involvement of collecting duct carcinoma with cystic change

A case report

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Abstract

Rationale: Collecting duct carcinoma (CDC) is a rare neoplasm arising from the collecting duct and should be distinguished from other renal cell carcinomas that mostly originated from the proximal tubular epithelium and tumors originated from the urothelium. It usually occurs in unilateral kidney, sometimes found with cystic change.

Patient concerns: We present the case of a 53-year-old male suffering from repeated bilateral flank pain for 6 months, increased pain with dysuria for 5 days.

Diagnosis: Ultrasound showed 2 similar hybrid echo masses in bilateral kidneys with enlarged lymph nodes surrounded, which accords with magnetic resonance imaging (MRI), and intraoperative biopsy reported malignancy.

Interventions: An exploratory operation was performed and the mass on the left kidney was removed, but pathological result reported collecting duct carcinoma according to the morphological features and immunohistochemical tests. Also postsurgery positron emission tomography-computed tomography (PET-CT) confirmed the mass on the left kidney is also a lesion of CDC.

Outcomes: The patient refused chemotherapy and had an overall survival of 7 months.

Lessons: We presented a case of CDC involving bilateral kidneys with cystic change; this is the first case of bilateral renal occurrence with cystic change to our knowledge. Because of CDC's rapid growth and the lack of effective adjuvant treatment after surgery, the prognosis is poor and the diagnosis should be made carefully.

Abbreviations: AFP = alpha-fetoprotein, ASA = American Society of Anesthesiologists, CA125 = cancer antigen 125, CA242 = cancer antigen 242, CDC = collecting duct carcinoma, CDFI = color Doppler flow imaging, CEA = carcinoembryonic antigen, MRI = magnetic resonance imaging, PET-CT = positron emission tomography-computed tomography, RCC = renal cell carcinomas, WBC = white blood cell count.

Keywords: bilateral kidneys involvement, case report, collecting duct carcinoma, cystic change

1. Introduction

Collecting duct carcinoma (CDC) is a rare but lethal neoplasm that arising from the end of collecting duct, that is, Bellini duct,[1,2] only consists <1% of renal cell carcinomas (RCCs) under current criteria,[3] it is important to be recognized for its highly aggressiveness, according to Staehler's study, 32 patients shared a median survival time of only 6.75 months.[4] It was reported in unilateral kidney,[5] and a cystic component was occasionally presented on imaging findings,[6] sometimes even presented as a renal cyst.[7] The clinical manifestations include hematuria, flank pain, weight loss, palpable abdominal mass and metastasis related symptoms.[1] Compare with other renal or urothelial carcinomas, it has the poorest prognosis for the disease was often in an advanced stage at initial diagnosis,[3] and got limited response to immuo- and chemotherapy.[2]

2. Case report

A 53-year-old man presented with repeated bilateral flank pain for 6 month, at first, the pain is subtle, without apparent cause or any other symptoms such as micturition, urgent emiction, fever or gross hematuria. Since rest can relieve the symptoms, the patient did not pay much attention to it. Five days before being admitted to Xiangya hospital, the patient went to local clinic for

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help because the pain in the low back increased with significant dysuria, catheterization was performed, the drainage was pink with blood clots in it, suggesting urinary system tumor.

After admitted for further treatment, the patient was inquired in detail and examined carefully. He was a farmer and owned no pets. He lived in the west of Hunan province and had not traveled outside China. He got married at 20 and has a daughter, his wife and daughter reported no severe or congenital disease. He drank alcohol occasionally and was a heavy smoker. He had a surgery of nasal polypectomy 5 years ago. He reported no weight loss, headache, chest pain or cough, and declined history of congenital disease, coronary heart disease, hypertension, hepatitis, tuberculosis, schistosoma exposure, toxic and radioactive substances exposure, trauma, transfusion or allergy.

On physical examination, the patient showed no fever, his heart rate was 104 beats per minute, blood pressure 143/108 mm Hg, and respiratory rate 20 breaths per minute. He was clear headed and not in agony. No purpura or ecchymosis was found on the skin. Bilateral renal percussive pain was presented with tenderness in the right but not the left, no tenderness in the ureteral and bladder zone.

Ultrasound revealed 2 similar protruding masses in bilateral kidneys, with mass sizes about 94 × 69 mm (lower left kidney), 81×80 mm (upper right kidney). Both masses were hybrid echoed under ultrasound (Fig. 1A and B), indicating a cystic-solid structure with septa inside. CDFI (color Doppler flow imaging) of the masses described above both showed low blood flow. Enlarged lymph nodes were observed around bilateral renal portals. MRI findings accord with the result of ultrasound, and the mass on the left kidney showed high signal inside (Fig. 1C and D), inferring hemorrhage or necrosis in the mass recently. The white blood cell count (WBC) increased to 13.4×109/L (reference range $3.5–9.5 \times 10^9$/L), alpha-fetoprotein (AFP), carcinoembryonic antigen (CEA), cancer antigen 125 (CA125), cancer antigen 242 (CA242), and cytokeratin-19-fragment were negative for blood screening.

Treatment options and findings were discussed with the patient, and the decision was made to perform an exploratory operation. Because intraoperative biopsy reported malignancy, the mass in the left kidney was removed with an additional 5 mm clinical margin. The gross specimen revealed multiple cysts within the tumor, full of reddish brown matters inferring hemorrhage or necrosis, which accords with the blood clots in the drainage described above. The solid component lies in the border, about $3 \times 2 \times 1$ cm in size, medium texture, and grayish yellow in the cut section.

Hematoxylin and eosin stain show that tumor cells are separated by collagenous fiber (Fig. 2A), in most area, the tumor cells form tubular structure with mucus accumulated within (Fig. 2B), in some area, the tumor cells form papillary structure (Fig. 2C) accompanied with typical high-grade "hobnail" like cells within the tubules. The tumor compressing and invading surrounding tissue is easy to be seen (Fig. 2D). In summary, it is classic morphology for CDC. The cells stained strongly positive for PAX8, GATA3, KSP (Fig. 2F–H), EMA, CK-pan, CK19 and negative for CD10, CK7, TTF-1, OCT3/4, 34βE12. The proliferation rate ki67 is about 20% (focally, Fig. 2I), PAX8 and GATA3 double positive supported the diagnosis (the antibodies employed are listed in Table 1).

The postoperative period was uneventful, the symptom of dysuria disappeared 5 days after surgery. Without adjuvant treatment, the patient went home for recovery, a month later, the patient came back as told. Post-surgery PET-CT confirmed the mass on the left kidney is also a lesion of CDC, and suggested

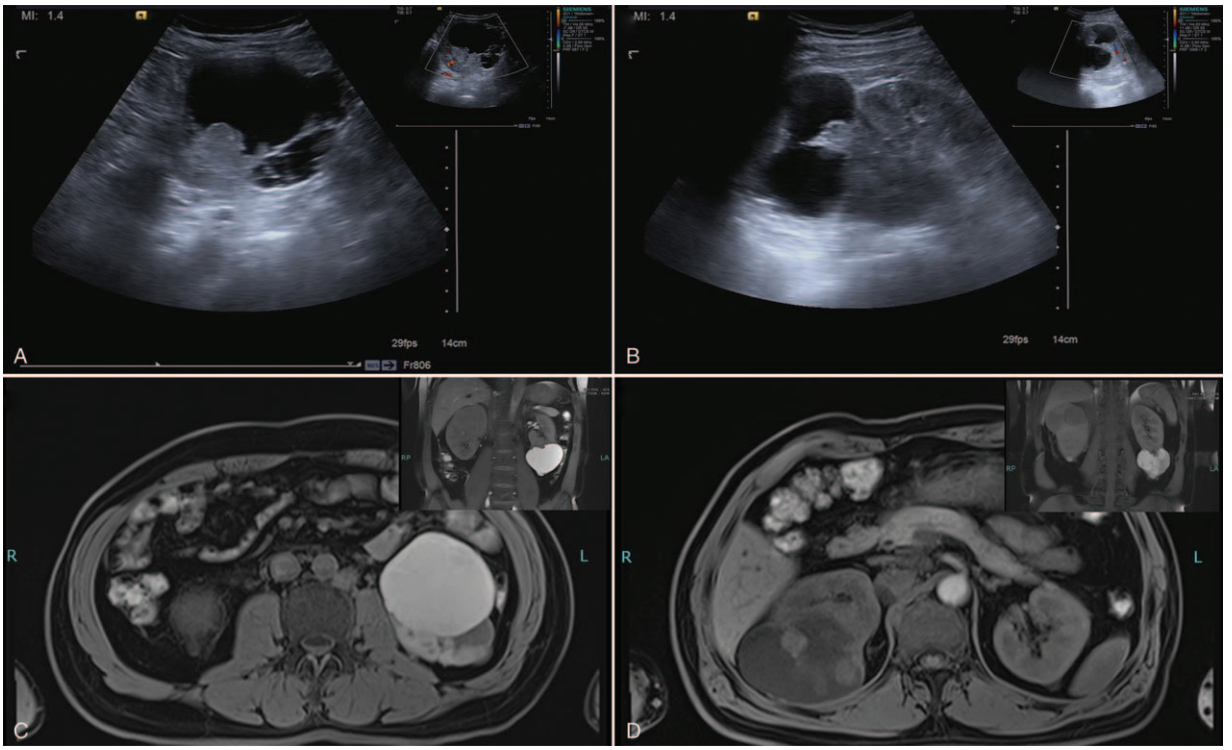

Figure 1. (A) Ultrasound showing a hybrid echo (cystic-solid) mass in the left kidney. (B) Ultrasound showing a hybrid echo (cystic-solid) mass in the right kidney. (C) Cross section of MRI showing a (cystic-solid) mass in the left kidney. (D) Cross section of MRI showing a (cystic-solid) mass in the right kidney. The coronal image is in the inset.

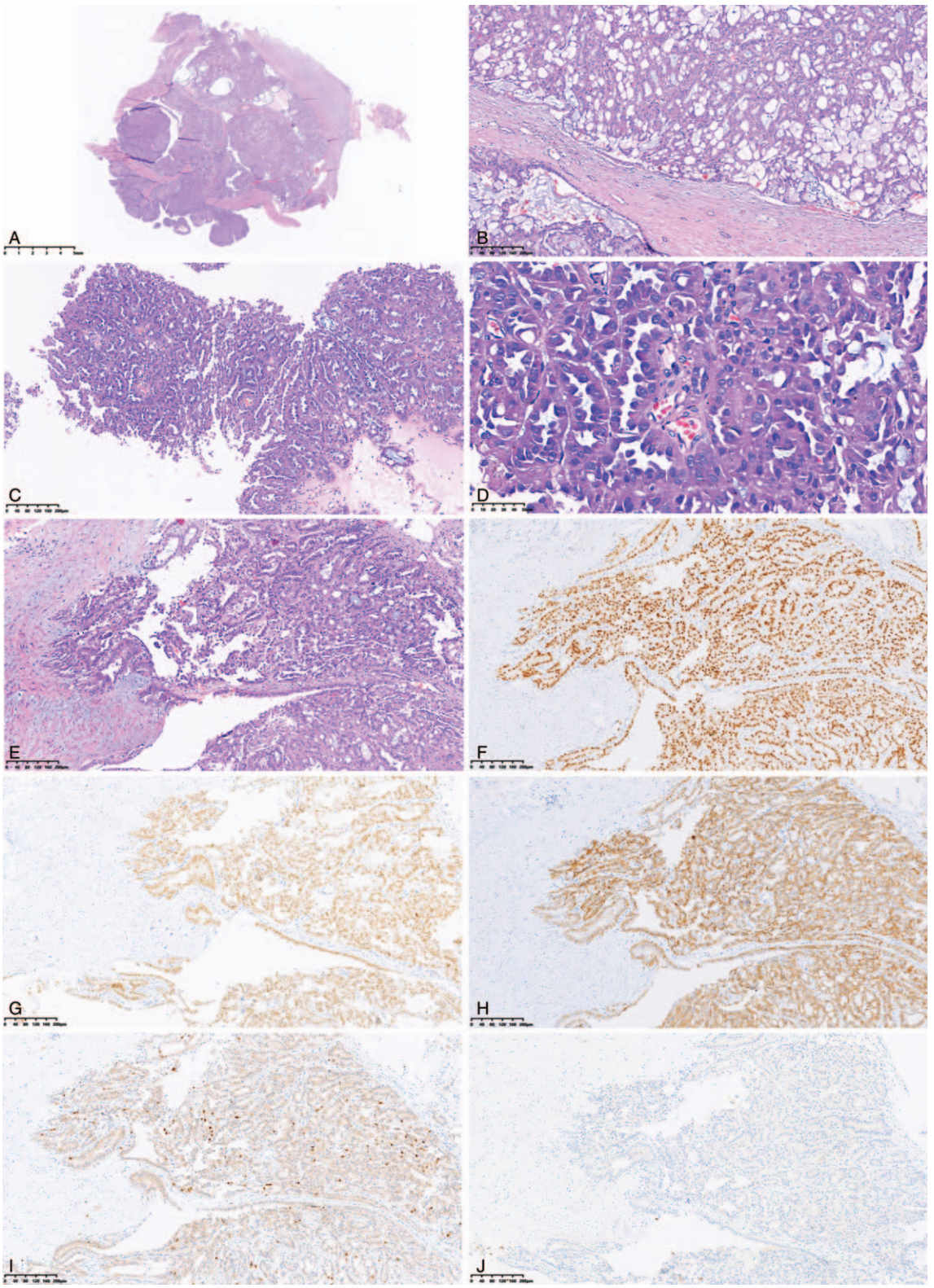

Figure 2. (A) Hematoxylin and eosin stain show tumor cells are separated by collagenous fiber (magnification ×5). (B) Most area of the tumor showed tubular structure with mucus accumulated within (magnification ×100). (C) "Hobnail" like cell lining at the end of the papillary (magnification ×100). (D) Hematoxylin and eosin stain show papillary growth of the tumor in some area. (E) Hematoxylin and eosin stain show the tumor compressing and invading surrounding tissue (magnification ×100). (F–J) Immunohistochemical staining for PAX8, GATA3, KSP, Ki67, CD10, successively (magnification ×100).

Table 1

Antibodies employed for immunohistochemistry.

Antibody	Source	Cat #	Dilution
34βE12	MXB biotechnologies, China	Kit-0020	Ready-to-use
CD10	ZSGB-BIO, China	ZM0283	1:200
CK7	MXB biotechnologies, China	Kit-0021	Ready-to-use
CK19	MXB biotechnologies, China	Kit-0030	Ready-to-use
CK-pan	MXB biotechnologies, China	Kit-0009	Ready-to-use
EMA	MXB biotechnologies, China	Kit-0011	Ready-to-use
GATA3	MXB biotechnologies, China	MAB-0695	Ready-to-use
Ki67	MXB biotechnologies, China	Kit-0005	Ready-to-use
KSP	MXB biotechnologies, China	MAB-0787	Ready-to-use
OCT3/4	ZSGB-BIO, China	ZM0233	1:100
PAX-8	ZSGB-BIO, China	ZM0468	1:100
TTF-1	ZSGB-BIO, China	ZM0270	1:200

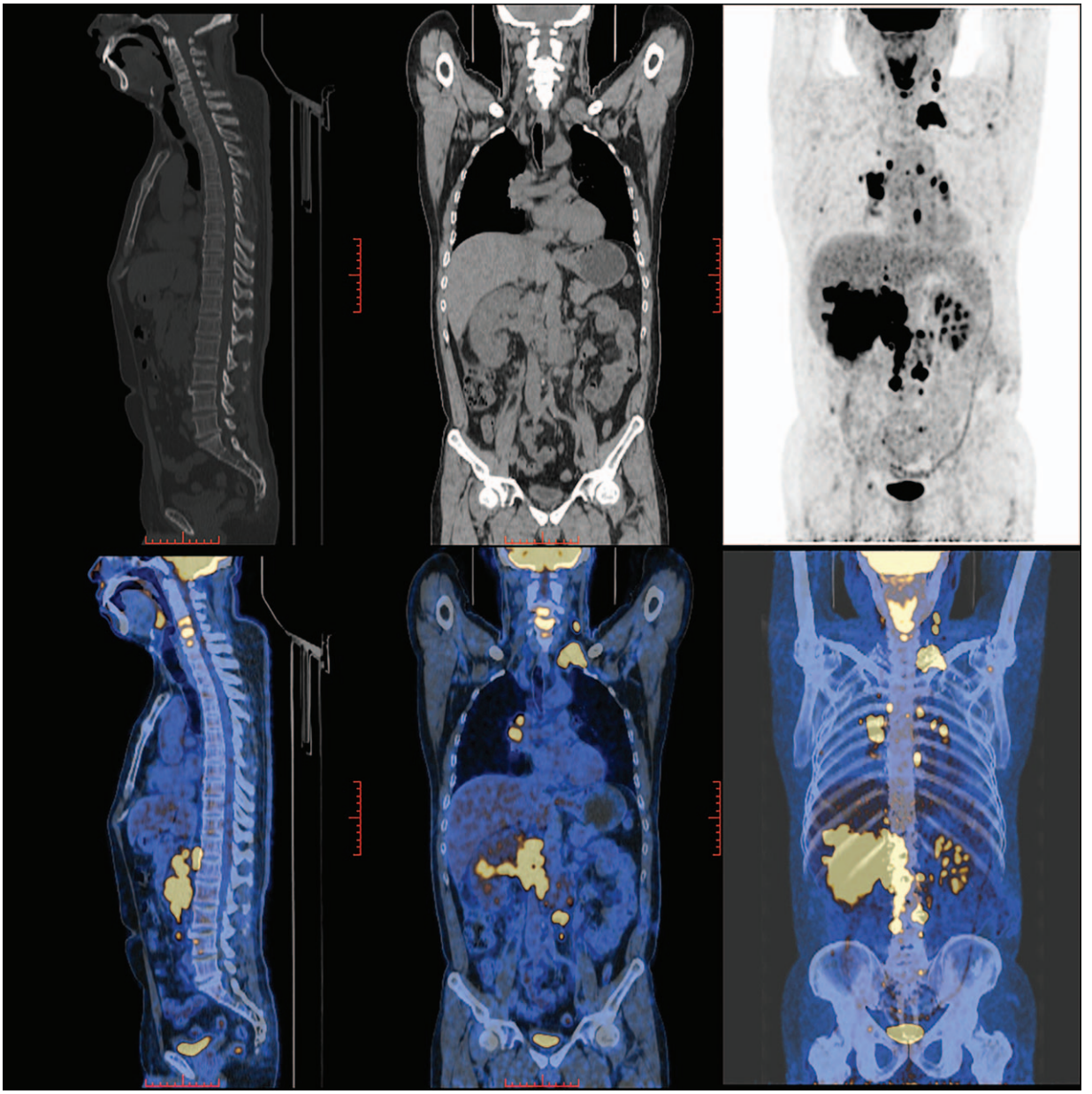

Figure 3. PET-CT using 18F-FDG shows the postoperative residues and multiorgan and lymphonodes metastasis of the tumor 1 month after surgery.

there were metastasis in lungs, bones and multiple sites of lymph nodes (Fig. 3). After consulting the department of oncology, we suggested the patient to consider getting chemotherapy, he refused and discharged. With telephone follow-up every 3 months, we were informed that the patient survived for only 7 months and his family refused autopsy.

3. Discussion

CDC is a rare, highly aggressive renal tumor favoring mid-aged male,[8] with high prevalence of metastasis at initial diagnosis (just like the case we reported), about 2/3 of patients die within 2 years of diagnosis,[2] so, differential diagnosis should always be considered. The major differential diagnosis include papillary cell carcinoma, urothelial carcinoma with glandular feathers, renal medullary carcinoma, and metastatic carcinoma.[9] Although image findings may help to the distinguishment,[10] pathology remains the only approach for the diagnosis of CDC, and the stand criteria were summed as follow: medullary involvement, predominant tumor morphology, inflammatory desmoplastic stromal reaction, irregular tubular architecture and cytologically high-grade, infiltrative growth pattern, the absence of other renal cell carcinoma subtypes or urothelial carcinoma.[2] There are also few reports suggested chromosome loss in CDC, such as 8p, 13q, and 1q32.1-32.2.[11,12]

Although both kidneys are equally likely to be affected by CDC,[5] no report of bilateral kidneys involvement with cystic change was found after searching the web and literature. Metastases to regional lymph nodes, liver and bone are common in CDC, occasionally gross renal vein invasion is seen according to the literature.[2] The origin of the malignancy of the patient we reported is still unknown. It is more likely that the CDC arisen from one kidney, then the tumor cells were transferred to another kidney through blood, urine or lymphatic tract, other than 2 tumors came into being simultaneously. The molecular events that contribute to the metastasis of CDC are poorly understood, autopsy and additional DNA sequencing may help us to determine the origin if conditions permit, and this is the limitation of the study.

Cystic change of the both masses we reported also should be noted, this is not rare in CDC,[2] but rare when accompany with bilateral kidneys involvement, that can be misleading, moreover, cystic changes also happens in numerous renal tumors such as multilocular cystic renal cell carcinoma,[13] so we should always be careful with cystic changes in renal lesions.

At present, little is known concerning the optimal management of CDC,[14] there is no effective treatment for CDC except radical nephrectomy, and the current standard of care for metastatic CDC is a gemcitabine–cisplatin regimen. The efficacy of immunotherapy and targeted therapy for CDC are still in doubt. There are reports that CDC patients in early stage got a longer survival than that in advance stage after surgery,[15] indicate early detecting may be the best method for prolonging patient survival, but there is still a long way to go for early detection. May M assessed parameters prognostic for CDC, and found American Society of Anesthesiologists (ASA) score 3–4, tumor size >7 cm, stage M1, Fuhrman grade 3–4 and lymphovascular invasion independently predicted disease specific mortality.[16]

In conclusion, we presented a case of CDC involving bilateral kidneys with cystic change; this is the first case of bilateral renal occurrence with cystic change to our knowledge. Because of CDC's rapid growth and lack of effective adjuvant treatment after surgery, the prognosis is poor and the diagnosis should be made carefully.

Author contributions

Conceived and designed the report: Guanghui Gong, Ruijie Liu
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