

# Renal oncocytoma: A report of two cases and review of the literature

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**Abstract.** Renal oncocytoma is one of the most unusual benign lesion, which are usually diagnosed postoperatively, since their differentiation from renal cell carcinoma is challenging. The present study reports two cases of renal oncocytoma in a 60-year-old woman and a 46-year-old man. Relevant clinical and pathological data on the two patients were retrieved. The tumors were excised and the patients underwent laparoscopic radical nephrectomy. Typical features of oncocytoma were observed upon histological examination of the excised specimens. The postoperative course of each patient was uneventful and they were discharged 8 and 7 days post-surgery, respectively. In addition, the current study presents the results of a literature review regarding the radiological, immunohistochemical and pathological characteristics of renal oncocytoma.

## Introduction

Renal oncocytoma is an uncommon tumor of the renal parenchyma, accounting for ~4.3% of all solid renal masses (1). It is composed of oncocytes, which are uniform, round or polygonal neoplastic cells that exhibit a granular eosinophilic cytoplasm (2). Despite certain manifestations of malignancy, the majority of oncocytomas are considered to have a benign behavior, with only a few reported cases of metastasis (3). Based on morphological, histochemical and pathological features, it is usually possible to distinguish renal oncocytoma from other types of renal neoplasms; however, in certain cases, overlapping phenotypes may pose a challenge in the differential diagnosis of the disease (4). Renal oncocytoma usually has a benign clinical course with excellent long-term outcomes; it

has been previously reported that disease-specific survival is 100%. The present study reports two cases of renal oncocytoma that were successfully treated with laparoscopy. The clinical, radiographical and pathological findings of the two cases are discussed in the present study.

## Case report

**Case 1.** A 60-year-old female patient presented to The First Hospital of Jilin University (Changchun, China) in March 2012 with a tumor in the right kidney, which was incidentally observed by imaging modalities during a physical workup at our hospital. The patient denied any history of hematuria, fever, weight loss or other constitutional symptoms, but had a medical history of hypertension and coronary heart disease. Physical examination and laboratory test results were unremarkable. Abdominal ultrasonography demonstrated an ~4.5x5.3-cm solid, relatively well-demarcated mass occupying the right kidney. Computed tomography (CT; LightSpeed VCT; GE Healthcare Bio-Sciences, Pittsburgh, PA, USA) revealed a 5.4x4.8 cm, heterogeneous and markedly enhancing mass in the right kidney (Fig. 1). Chest X-ray, chest CT and bone scans were all negative for metastasis. Based on the radiological findings, laparoscopic radical resection of the right kidney was performed to remove the tumor.

Macroscopic examination of the 12.0x6.0x4.5 cm nephrectomy specimen revealed a 6.5x4.5x4.0 cm quasi-circular mass in the middle of the right kidney adjacent to the renal hilum. The cut section of the mass was tan-colored and light-textured. Necrosis and hemorrhage were not observed. Tissues were sent to the Department of Pathology, Sino-Japanese Friendship Hospital, Jilin University (Changchun, China) to be fixed in 4% formaldehyde, embedded in paraffin and cut into 5  $\mu$ m sections. The specimens were subsequently stained with hematoxylin and eosin. Histological examination of the tumor samples revealed that the cells were round and polygonal, which exhibited abundant granular eosinophilic cytoplasm. Round or oval nuclei with a single centrally placed nucleolus was noted, and focal necrosis was observed (Fig. 2). The cells did not exhibit any cytological atypia and no mitotic figures were detected. For immunohistochemical analysis, 4  $\mu$ m sections were cut and placed on slides coated with 3-aminopropyltriethoxysilane (Sigma-Aldrich, St. Louis, MO, USA).

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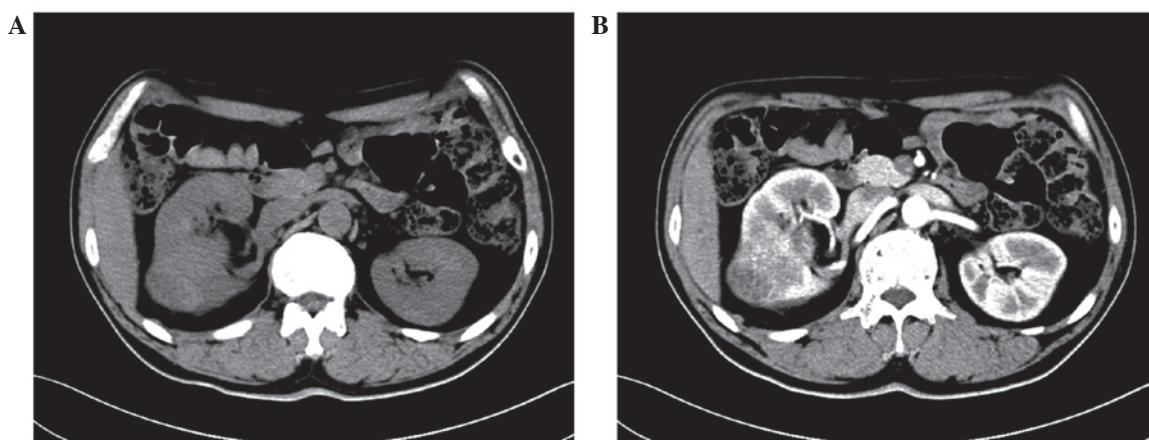


Figure 1. Case 1. (A) CT revealing a heterogeneous mass in the middle pole of the right kidney. (B) Contrast-enhanced CT revealing a markedly enhanced mass in the right kidney. CT, computed tomography.

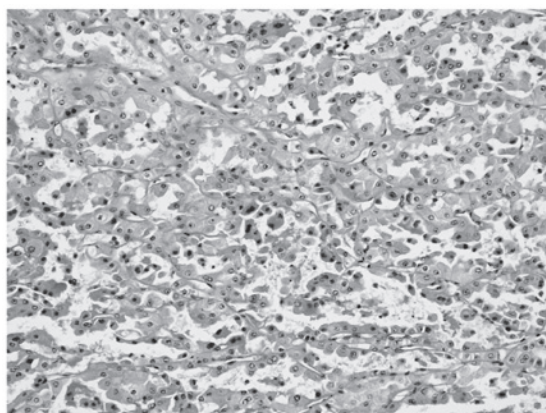


Figure 2. Case 1. High-power magnification revealing that the tumor cells exhibited abundant granular and eosinophilic cytoplasm. Round or oval nuclei with a single centrally placed nucleolus were observed (magnification, x200; hematoxylin and eosin staining).

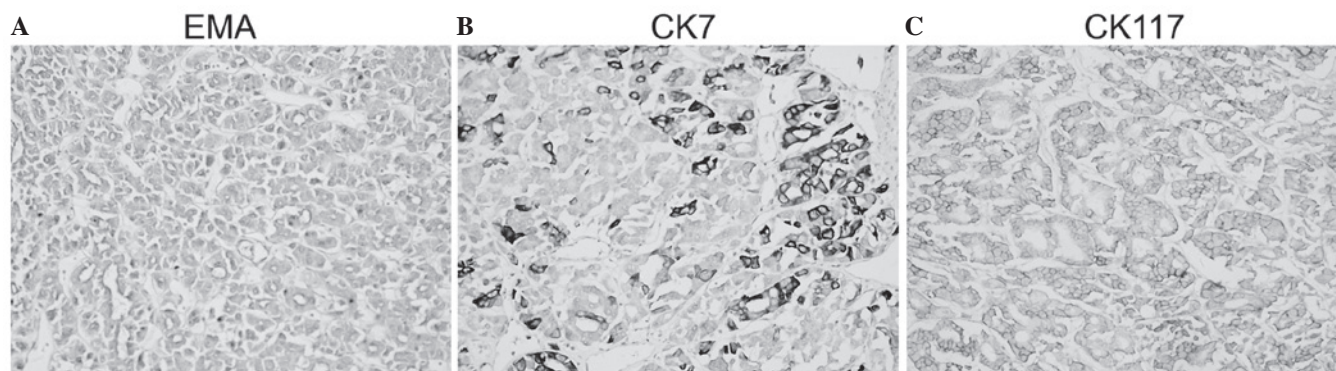


Figure 3. Case 1. Immunohistochemistry of the kidney tumor specimen revealing that the tumor cells were positive for (A) epithelial membrane antigen, (B) CK7 and (C) CK117 (magnification, x200). CK, cytokeratin.

The sections were then deparaffinized by routine procedures and incubated in a microwave oven for 2X 5 min at 700 W in citrate buffer (pH 6.0), or the specimens were predigested by pepsin. The samples were incubated with the following primary antibodies: Cytokeratin (CK)-7 (dilution, 1:200; Dako, Carpinteria, CA), vimentin (dilution, 1:20; Immunotech, Marseilles, France), epithelial membrane antigen (EMA; dilution, 1:50; Dako), CK18 (dilution, 1:50; Dako), CK117

(dilution, 1:100; Dako) and CK8 (dilution, 1:100; Dako). The primary antibodies were visualized using the supersensitive streptavidin-biotin-peroxidase complex (Biogenex, San Ramon, CA, USA). Immunohistochemical analysis demonstrated that the tumor cells were positive for EMA, CK7 and CK117, and negative for vimentin, P504S, inhibin A and cluster of differentiation (CD) 10 (Fig. 3). Nuclear positivity for Ki-67 was observed in <1% of tumor cells.

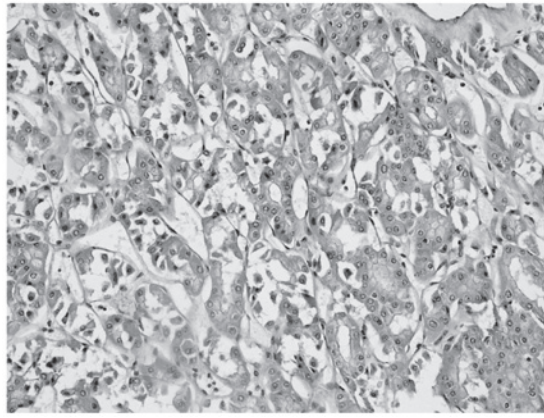


Figure 4. Case 2. High-power magnification revealing that the resected tumor was composed of polygonal oncocytes exhibiting granular eosinophilic cytoplasm and round nuclei (magnification, x200; hematoxylin and eosin staining).

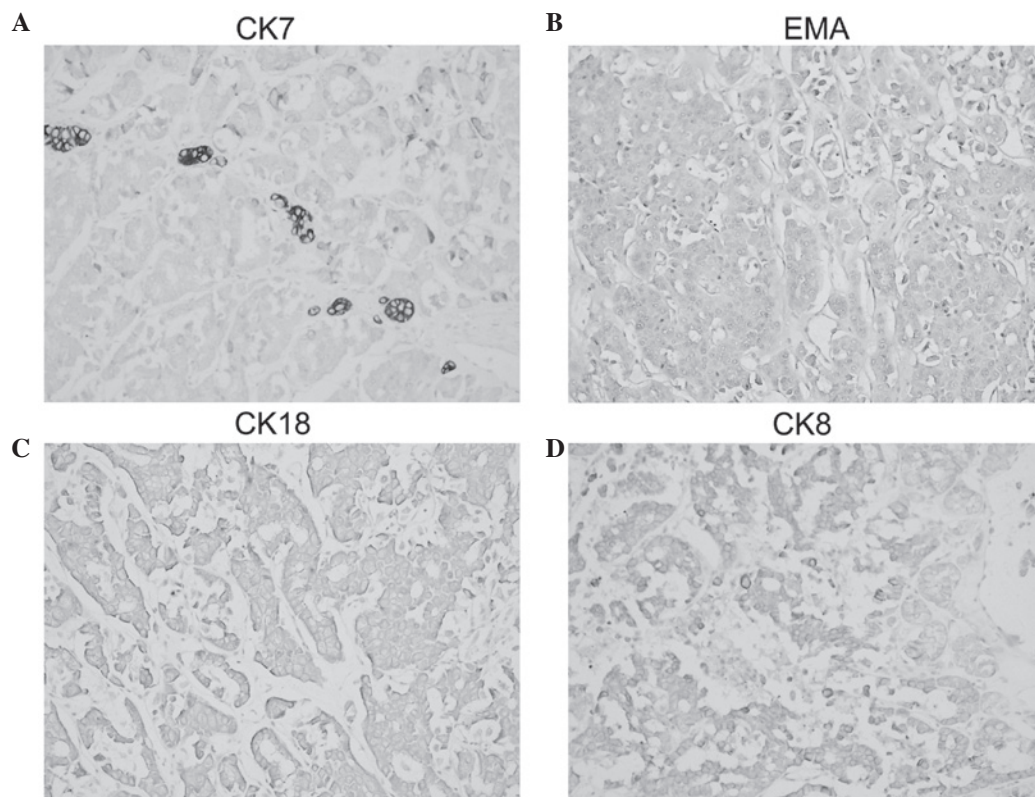


Figure 5. Case 2. Immunohistochemistry of the kidney tumor demonstrating that the tumor cells were positive for (A) CK7, (B) epithelial membrane antigen, (C) CK18 and (D) CK8 (magnification, x200). CK, cytokeratin.

Histopathological and immunohistochemical findings confirmed the diagnosis of renal oncocytoma. The tumor was confined to the kidney without lymphovascular invasion. Due to the final diagnosis, neither chemotherapy nor radiation therapy were administered postoperatively. The patient was discharged 8 days following surgery. The patient was followed up every 3 months for 2 years, followed by semi-annual CT scans and laboratory tests. No disease recurrence was observed at the 2-year follow-up.

**Case 2.** A 46-year-old male patient underwent an abdominal ultrasound for the detection of renal function abnormalities at The First Hospital of Jilin University (Changchun, China) in

February 2012, which revealed a solid mass in the right kidney. No flank pain or any other relevant clinical symptoms were noted. The patient had a history of neurodermatitis and family history of hypertension. A physical examination was normal and no renal mass was observed. Routine laboratory tests revealed that the serum creatinine level was 305.8  $\mu\text{mol/l}$  (normal male range, 44-133  $\mu\text{mol/l}$ ; normal female range, 70-108  $\mu\text{mol/l}$ ), and there were markedly elevated levels of blood urea nitrogen (11.76 mmol/l; normal range, 3.2-6.0 mmol/l), uric acid (595  $\mu\text{mol/l}$ ; normal male range, 149-416  $\mu\text{mol/l}$ ; normal female range, 89-357  $\mu\text{mol/l}$ ) and 24-h urinary protein (3.39 g/24 h; normal range, <150 mg/24h). CT revealed a heterogeneous lumpy mass that was not well-defined, measured 4.2x3.0 cm



and originated from the middle pole of the right kidney. Due to the possibility of renal malignancy, laparoscopic radical nephrectomy was performed.

Macroscopic examination revealed a 542 g mass measuring 10.0x5.5x4.7 cm, brown in color, solid, well-circumscribed and with no necrotic regions. Tumor samples were prepared for histological and immunohistochemical analysis as previously described in case 1. Histopathology lead to a diagnosis of renal oncocytoma; the tumor was composed of polygonal oncocytes exhibiting granular eosinophilic cytoplasm and round nuclei. There was no evidence of necrosis or hemorrhage, and no vascular invasion was observed (Fig. 4). The maximal diameter of the tumor was 4 cm. Immunohistochemistry was positive for CK7, EMA, CK18 and CK8, and negative for vimentin and CD10, which additionally supported the initial diagnosis (Fig. 5). Nuclear positivity for Ki-67 was observed in <1% of the tumor cells.

The postoperative course of the patient was uneventful and the patient was discharged 7 days subsequent to surgery. The patient was followed up every 3 months for 2 years, followed by semi-annual CT scans and laboratory tests. There were no signs of tumor recurrence at the 2 year follow-up.

## Discussion

Renal oncocytoma is usually asymptomatic and is observed incidentally during routine examination for non-urolological abnormalities. The peak occurrence age range is between 40 and 60 years, with a male/female ratio of 2/3:1 (5). Renal oncocytoma usually appears as a solitary tumor measuring 4-8 cm; however, it may metastasize or infiltrate peripheral renal tissues, causing the tumor to grow larger (6,7). Only a few cases of metastases following radical nephrectomy for oncocytoma have been reported (8). In the present cases, the tumors were observed during routine examinations. No local invasion or distant metastasis was observed in either of the two cases during 2 years of follow-up.

Clinical and laboratory findings usually reveal no specific characteristics, rendering a preoperative definitive diagnosis challenging. CT may demonstrate the presence of a solid homogeneous lesion with a centrally located scar, and arteriography may reveal a spoke-wheel vascular pattern (5,9). Immunohistochemical staining may aid in the differentiation of oncocytoma from other renal tumors based on the levels of several markers, including CD10, S100 calcium binding protein A1 and CK7 (10-12). However, these markers do not definitively distinguish oncocytoma from other renal tumors. As a result, numerous patients with oncocytoma are treated aggressively, due to the possibility of renal malignancy.

Radical or partial nephrectomy is performed on the majority of patients, based on their clinical circumstances. Patients with tumors <4 cm in size that are located in the

upper or low pole of the kidney may be treated with a partial nephrectomy, whilst all other patients require a radical nephrectomy to be performed. However, considering the benign behavior of these tumors, a that partial nephrectomy is a more appropriate treatment option compared with radical nephrectomy (8,13). In the present cases, laparoscopic radical nephrectomy was performed due to the challenge in making an accurate diagnosis.

In summary, the present study reported two cases of renal oncocytoma, and demonstrates that renal oncocytoma should be taken into consideration in the differential diagnosis of renal tumors. The combination of clinical, radiological and immunohistochemical features may assist lesion characterization, but only histology can provide a definite diagnosis. Partial nephrectomy is considered the most appropriate treatment for the majority of patients with oncocytomas.

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