



Imaging features of eosinophilic solid and cystic renal cell carcinoma: An additional case report of a novel tumor entity

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ABSTRACT

Eosinophilic solid and cystic renal cell carcinoma (ESC RCC) is a special classification of indolent kidney tumors newly discovered in recent years. It is extremely uncommon, with only a few clinical and pathological reports, and its imaging description are very rare. Here, we present a case of ESC RCC.

1. Introduction

Eosinophilic solid and cystic renal cell carcinoma (ESC RCC) is a unique classification for indolent kidney tumors which have yet to be included in the WHO (2016) Classification of Tumors of the Urinary System and Male Genital Organs.¹

Literature reports of RSC RCC are sparse and do not show typical imaging characteristics. Recently, we encountered a case of ESC RCC showing a multifocal and solid mass on US and CT images, which may be classically misdiagnosed as a benign tumor. To the best of our knowledge, this is the first case report on the imaging of RSC RCC as a multifocal, solid and hypervascular mass.

2. Case presentation

The case was approved by the Institutional Ethical Committee of Hangzhou TCM Hospital Affiliated to Zhejiang Chinese Medical University (Ethics number: 2021LH003). A 40-year-old man with a medical history of invasive adenocarcinoma of the lung status post-surgical resection presented with a mass in his right kidney during routine physical examination. The patient denied low back pain and hematuria. The patient was stable and imaging findings showed no signs of recurrence of his lung cancer.

Grayscale US showed a well-demarcated, round, heterogenous, hypochoic right renal mass that was 4.2 cm in diameter. Acoustic enhancement or shadowing was not seen behind the mass (Fig. 1-A).

Color Doppler US showed present blood flow signal in the periphery and central regions of the tumor (Fig. 1-B).

Unenhanced CT showed that the tumor was of a greater density compared with the regular renal parenchyma (Fig. 1-C) without adiposity or calcification. Contrast-enhanced CT showed a clear homogenous enhancement pattern in the arterial phase (Fig. 1-D) with a weakening of the enhancement in the delayed phase (Fig. 1-E). The lesion measured 48, 123, and 102 Hounsfield units (HU) at unenhanced, arterial, and delayed phases. An isodense nodule with a diameter of about 1.5 cm is seen in the upper right kidney, and the dynamic enhancement pattern was the same as the mass in the middle of the right kidney. The lesion measured 38, 144, and 107 HU at unenhanced (Fig. 2-A), arterial (Fig. 2-B) and delayed (Fig. 2-C) phases. No lymphadenopathy was observed in the retroperitoneum. At this point, the diagnosis of renal cell carcinoma was considered.

Surgical evaluation of the tissue revealed two solid tumors in the upper and middle poles of the right kidney. The masses were round, yellow-gray in color and well demarcated. Histological evaluation demonstrated solid architecture with microscopic cysts (Fig. 3-A), regions of hobnail cells (Fig. 3-B), and densely packed tumor cells. The neoplastic cells contained a voluminous eosinophilic cytoplasm with prominent granular cytoplasmic stippling (Fig. 3-C). Immunohistochemically, tumor cells were weakly immunoreactive for CK20 (Fig. 3-D). PAX-8, CK7, CK8, and CD10, while TFE3 and CD117 were negative. ESC RCC was diagnosed by pathology. No recurrence or metastasis was found in follow-up for 6 months post-operatively.

Abbreviations: ESC RCC, Eosinophilic solid and cystic renal cell carcinoma; TSC, Tuberous sclerosis complex; RCC, Clear cell renal cell carcinoma.

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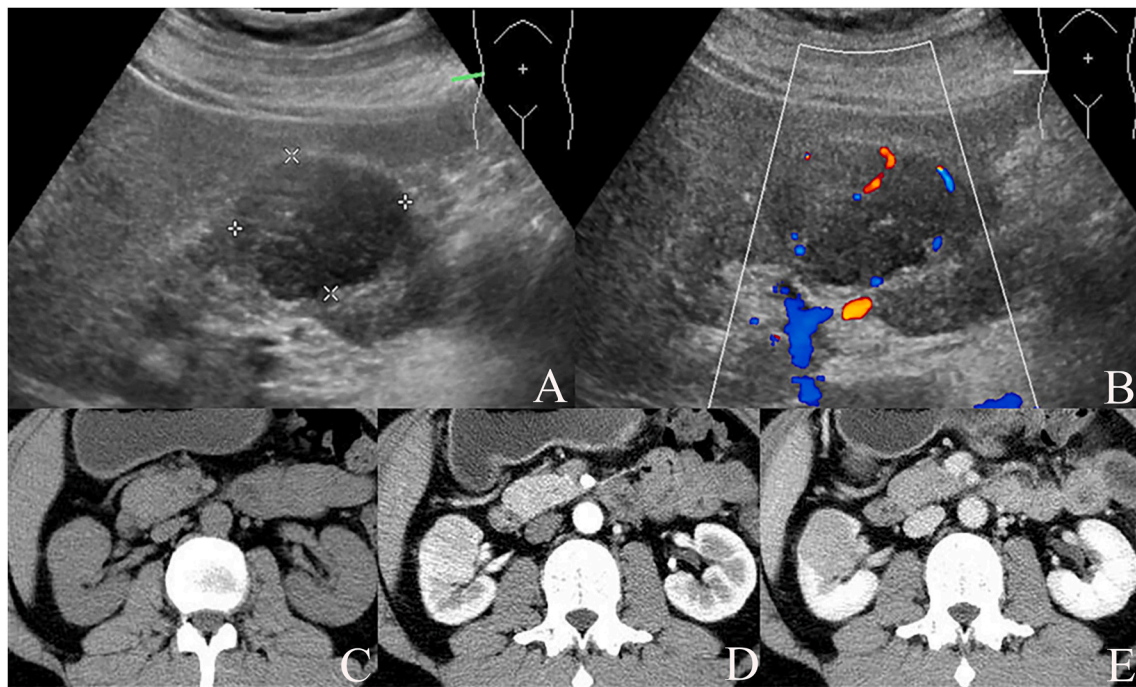


Fig. 1. A. Longitudinal grayscale US showed a well-demarcated, round, heterogenous, hypoechoic mass in the middle right kidney. B. Longitudinal Color-Doppler US showed the blood flow signal in the periphery and inside of the tumor. Unenhanced CT showed that the tumor was hyperdense compared to the normal renal parenchyma. Contrast-enhanced CT showed homogenous enhancement in arterial phases which weakens in the delayed phase. The lesion measured 48, 123, and 102 HU at unenhanced (C), arterial (D) and delay (E) phases. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

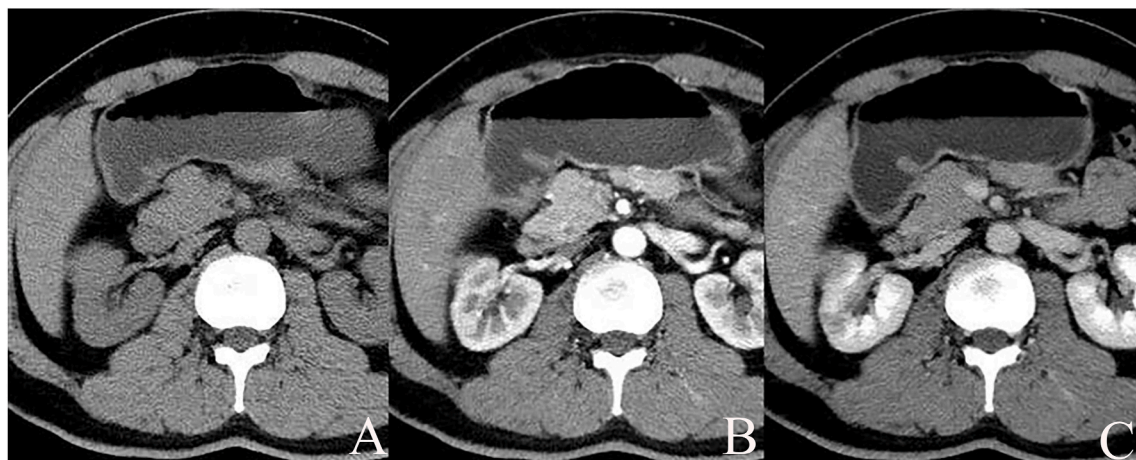


Fig. 2. A. Unenhanced CT cannot visualize the lesion in the upper right kidney as it is isodense compared to the renal parenchyma. However, significant arterial enhancement (B) was observed on contrast scans with weakening in the delayed phase (C). The lesion measured 38, 144, and 107 HU at unenhanced, arterial and delay phases.

3. Discussion

ESC RCC is a new classification of renal tumors, which was first reported by Trpkov et al.² in 2016. Many of these cases have previously been misdiagnosed or as an unclassified renal cell carcinoma. The Genitourinary Pathology Society (GUPS) recommended ESC RCC as a novel renal entity in 2021.³ Approximately 10% of ESC RCC occur in patients with documented tuberous sclerosis complex (TSC), but the majority are sporadic and are not associated with TSC. Demographically, ESC RCC mainly occurs in asymptomatic female patients as solitary, low stage tumors. Yet, occasional multifocal and bilateral cases have been documented,² as in this case of ESC RCC.

From a macroscopic perspective, ESC RCC is a well-circumscribed, non-encapsulated tumor with cysts of varying sizes. A few cases have demonstrated the presence of microscopic cysts. In this report, no cystic component was present. Histologically, the tumors are typically solid with a cystic architecture. Macroscopic cysts are often large enough to be visible without microscopy. A diagnostic hallmark is that the neoplastic cells contain a voluminous eosinophilic cytoplasm with prominent granular cytoplasmic stippling.^{3,4} Immunohistochemically, CK20 positive and CK7 negative are important diagnostic clues for ESC RCC. CK20 is the most important diagnostic marker for ESC RCC.⁵

Currently, almost all reports on ESC RCC are clinicopathological,²⁻⁴ and rare cases have been reported on radiology. Fenelon et al.⁵ reported

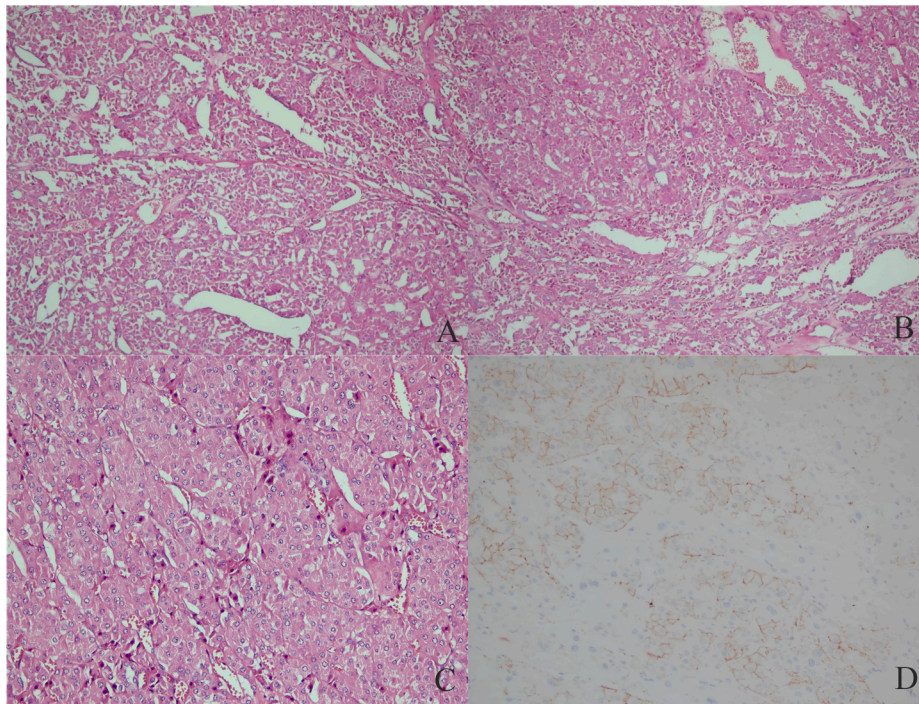


Fig. 3. Histologically, the tumors present with a solid architecture, microscopic cysts (A), regions of hobnail cells (B) and voluminous eosinophilic cytoplasm (C) with prominent granular cytoplasmic stippling (hematoxylin and eosin, original magnification $\times 200$). A weakly positive CK20 was observed (D).

2 cases with imaging features, mainly showing as cystic solid and hypervascular tumors. In this case, two solid tumors were seen in ESC RCC, which was different from previous literature reports. The solid tumor was hyperdense on the noncontrast imaging and demonstrated significant arterial enhancement after intravenous contrast administration. A possible explanation for this finding could be the abundance of tumor cells and high blood vessel density in these tumors histologically. The tumor has no calcification or adipose tissue and has clear borders. In this diagnosis, one small tumor was missed on ultrasound and non-contrast scan but was discovered later with significant arterial enhancement on contrast imaging.

While this case was confirmed by pathology as ESC RCC, images are often misdiagnosed as a clear cell renal cell carcinoma (RCCC), angiomyolipoma or renal oncocytoma. The typical features of RCCC are arterial enhancement on contrast scan and weakening of the enhancement in the delayed phase. RCCC typically demonstrates as a hypodensity on noncontrast scan with necrotic cysts. These factors are diagnostic to separate a solid ESC RCC from RCCC. Multifocal hyperdensity on non-contrast CT and hypervascularity of tumors are also typical findings of angiomyolipoma. However, the absence of adipose tissue or blood vessels on contrast CT can help rule out angiomyolipoma. Hypervascular and non-infiltrating masses need to be considered for renal oncocytoma. However, there was no central stellate scar and segmental enhancement reversal in this case. Therefore, renal oncocytoma was excluded.

In conclusion, ESC RCC is a rare, novel renal cell carcinoma. On imaging, ESC RCC typically presents with a solid, multifocal, well-demarcated lesion with hypervascularity. Given the recent nature of the discovery of ESC RCC, further cases will be needed to define additional imaging characteristics to help differentiate ESC RCC from RCCC and angiomyolipoma.

Author agreement

All authors read and approved the final manuscript.

Credit author statement

HuiJing Xu: Investigation, Formal analysis, Data Curation, Writing - Original Draft. ZhiPing Li: Investigation, Visualization. Feng Cui: Investigation, Visualization. Yu Zhang: Investigation, Visualization. Dan Yan: Investigation, Visualization. YongSheng Zhang: Conceptualization, Methodology, Resources, Writing - Reviewing and Editing, Supervision, Project administration.

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