Clinical Case Report

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Imaging appearance of renal epithelioid angiomyolipoma

A case report and literature review

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Abstract

Rationale: Epithelioid angiomyolipoma (EAML) is an extremely rare disease. It commonly occurs in middle-aged females and mainly involves the kidney. Histological and immunohistochemical examination play important roles in differentiating EAML from renal cell carcinoma (RCC) and poor-fat angiomyolipoma (AML).

Patient concerns: Here, We report the imaging phenotype, as well as the pathological findings of a case of EAML in a 39-year-old female.

Diagnoses: Preoperative noncontrast computed tomography (CT) scan revealed a $6.0 \times 5.2 \times 7.0$ cm soft tissue mass with necrosis, located in the left kidney. On contrast-enhanced CT images, aprogressive enhancement pattern was observed. CT angiography did not show any enlarged vessels or vascular malformation. Abdominal MRI showed a well-circumscribed solid mass with a heterogeneous signal on T1-weighted and T2-weighted images. Ultrasonography of the abdomen demonstrated a hypoechoic mass with abundant blood flow. This patient underwent radical nephrectomy. The pathologic diagnosis was EAML.

Interventions: This patient underwent operative resection of the tumor. The resection margins were negative for the neoplastic proliferation and no distant metastases were found. The patient did not receive advanced radiotherapy or chemotherapy.

Outcomes: Four months after surgery, the follow-up CT scan did not reveal any local recurrence or distant metastases.

Lessons: This case adds to the experience with EAML by summarizing its imaging characteristics as well as reviewing the literature. Additionally, we described the state-of-the-art management of the management of this rare tumor.

Abbreviations: AFP = alpha-fetoprotein, AML = angiomyolipoma, CA = carbohydrate antigen, CD = cluster of differentiation, CEA = carcinoembryonic antigen, CK = cytokeratin, CT = computed tomography, EAML = epithelioid angiomyolipoma, HMB = human melanoma black, HU = Hounsfield unit, MRI = magnetic resonance imaging, NSE = neuron-specific enolase, PAX = paired box gene, RCC = renal cell carcinoma, SMA = smooth muscle actin.

Keywords: epithelioid angiomyolipoma, kidney, medical imaging, pathology,

1. Introduction

Epithelioid angiomyolipoma (EAML) is a variant of angiomyolipoma (AML), with malignant potential.[1] EAML is a rare tumor with only 160 cases reported in the English literature.[2] Most EAML occurs in the kidney, although other organs can be involved such as the lung, liver, pancreas, bladder, prostate, uterus, ovary, vulva, vagina, and bone.[3,4] Histologically, the tumor consists of the proliferation of predominantly epithelioid cells with granular eosinophilic cytoplasms.[5] The treatment is surgical resection for early stage and localized lesion.[6]

Here, we report a case of EAML located in the left kidney occurring in a 39-year-old female. The aim of this article was to improve our understanding of EAML by summarizing its characteristics (i.e., imaging phenotype, pathology) as well as reviewing the literature.

2. Case report

In July 2017, a 39-year-old female was admitted to our hospital with a 2-week history of hematuria. One week before admission, the symptoms aggravated with left flank pain. On physical examination, the patient had a regular pulse of 75 beats/min, a respiratory rate of 18 breaths/min, and a temperature of 36.8°C. Her cardiopulmonary and neurologic examinations were normal.

Her laboratory data such as complete blood cell count and creatinine showed no significant abnormalities. The serum neuron-specific enolase was slightly increased as 24.59 ng/mL (normal range, 0–20 ng/mL). Other tumor markers [serum carbohydrate antigen 125 (CA 125), CA 199, CA 153, CA 724, cytokeratin 19 (CK 19), carcinoembryonic antigen (CEA), and alpha-fetoprotein (AFP)] were within normal range.

Preoperative noncontrast CT scan of the abdomen revealed a $6.0 \times 5.2 \times 7.0$ cm oval mass with heterogeneous density (CT value, 17–40 HU), located in the left kidney (Fig. 1A). The mass did not contained any fat or calcification. On contrast-enhanced CT images, a progressive enhancement was observed in the major part of the tumor. The mean CT values were 53 HU, 63 HU, and

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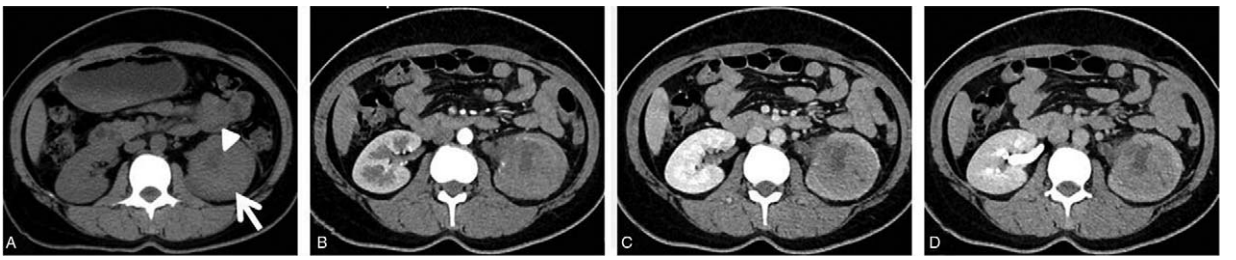

Figure 1. (A) Unenhanced CT scan shows a mass (white arrow) with necrosis (white triangle) in the left kidney. (B–D) On contrast-enhanced CT images, the tumor presents progressive and heterogeneous enhancement. CT = computed tomography.

67 HU at the arterial, portal venous, and delayed phases, respectively (Fig. 1B–D). Necrotic areas in the tumor demonstrated no contrast enhancement. The tumor had an unclear interface with adjacent renal tissue causing pressure on the renal pelvis. CT angiography (CTA) did not reveal any tumor feeding vessels or vascular malformation (Fig. 2).

Abdominal MRI showed a heterogeneous mass with high signal intensity on noncontrast T1-weighted images, low-to-high signal intensity on T2-weighted images and complete capsule with distinct edges (Fig. 3A and B). The lesion exhibited low-to-intermediate signal intensity on the diffusion-weighted images (Fig. 3C).

Ultrasonography (Fig. 4) of the abdomen demonstrated a solid mass occupying the lower middle portion of the left kidney. No fat density was appreciated.

Renal cell carcinoma (RCC) was suspected. This patient underwent radical nephrectomy. Postoperative pathology showed that the tumor had central hemorrhage and necrosis, but no vascular and perineural invasion. The ureter, perirenal fat, and surgical margins were free of malignancy. Microscopically, the mass consisted of a large quantity of proliferative epithelioid cells with abundant eosinophilic cytoplasm and pleomorphic nuclei (Fig. 5A). The immunostaining (Fig. 5B and C) showed that the tumor cells were positive for melanocytic markers [human melanoma black 45 (HBM-45) and Melan-A], cluster of differentiation 117 (CD 117) and negative for smooth muscle actin (SMA), desmin, cytokeratin 7 (CK 7), paired box gene 8 (PAX8), pan-cytokeratin, and S-100. The proliferation index, expressed as a percentage of Ki-67 antigen-positive nuclei, was

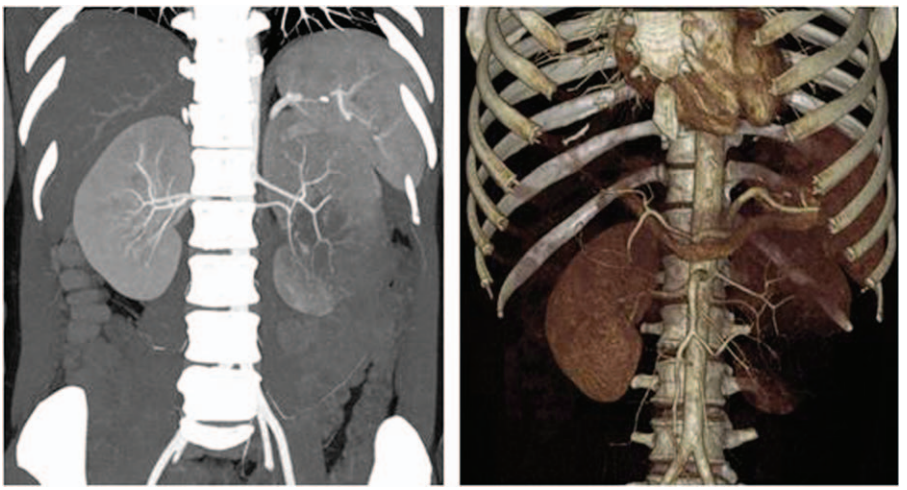

Figure 2. CT angiography does not reveal any tumor feeding vessels or vascular malformation. CT = computed tomography.

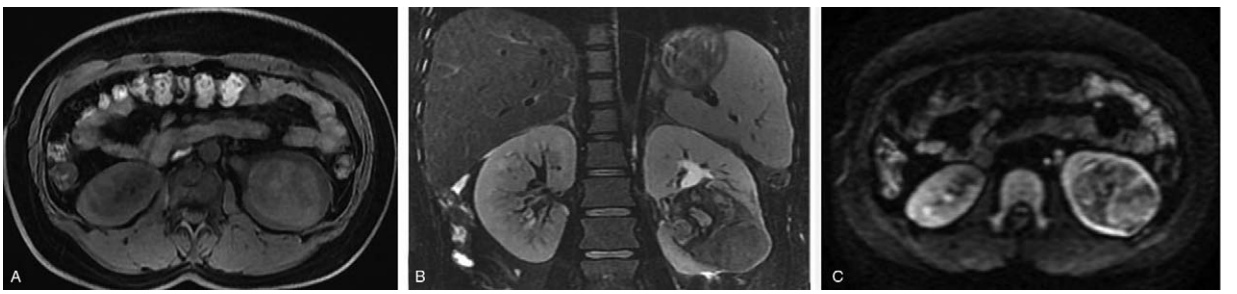

Figure 3. (A–C) The tumor presents as low to high signal on T1WI and T2WI with slightly diffusion restriction.

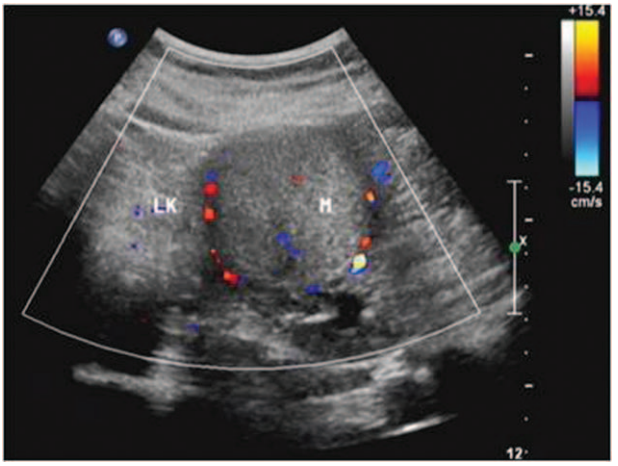

Figure 4. Ultrasonography of the abdomen shows increased blood flow signal around the hypoechoic mass. LK = left kidney, M = mass.

around 10% (Fig. 5D). Based on the pathologic and immunohistochemical findings, the renal mass was diagnosed as epithelioid angiomyolipoma.

3. Discussion

Clinically, EAML presents as a potentially malignant mesenchymal neoplasm occurring between the ages of 30 and 80 years (mean, 49.7 years) with a M:F ratio of 9:11.[7] Up to now, 160 cases of EAML have been reported in the English literature and most of them are presented as case reports or small series without any specific symptoms.[2,8] In most patients, EAML arises in kidney and its symptoms are similar with RCC.[9,10] EAML can occur in other organs such as the lung, liver, pancreas, bladder, prostate, uterus, ovary, vulva, vagina, and bone.[3,11] In the current report, the tumor of $6.0 \times 5.2 \times 7.0$ cm in size was located in the left kidney. It mechanically compressed the renal pelvis and caused hydronephrosis. The patient presented with hematuria and flank pain.

There are 3 members of perivascular epithelioid cell tumor (PEComa) family: angiomyolipoma (AML), lymphangioleiomyoma, and clear cell sugar tumors.[12] EAML is a rare subtype of AML (AML includes EAML, triphasic AML, and monophasic AML).[13] The etiology of EAML is unknown. Some characteristics differentiate EAML from other AML such as the expression of the p53, TSC1, and TSC2 genes.[6,13–16] More than 50% of EAML patients suffer from tuberous sclerosis, which may have relationship with the loss of tumor suppressor genes TSC1 or TSC2.[6] The mutations in the p53 gene might play a key role in distal metastasis of EAML.[17–19]

Nese et al[20] suggested that 5 clinical features allow the identification of malignant EAML, including (a) the presence of tuberous sclerosis syndrome, (b) tumor necrosis, (c) extra-renal extension or renal vein invasion, (d) carcinoma-like histology, and (e) tumor size >7.7 cm. In our case report, only one feature (tumor necrosis) was consistent with the above criteria.

Histological and immunohistochemical findings are crucial for the diagnosis of EAML. Histologically, EAML is characterized by the proliferation of epithelioid cells with granular eosinophilic cytoplasms. EAML is distinguished from RCC by the lack of delicate vascular network and alveolar and tubular architectural patterns, all of which are characteristics of RCC.[11,19] Immunologically, EAML is associated with an almost uniformly positive expression for melanocytic markers HMB-45 and/or Melan-A. In contrast, the makers of epithelial cells (CK) and neural cells (S-100) are negative.[21] The expressions of SMA and desmin are different.[3,11,22] In the present case, tumor cells were positive for HBM-45 and Melan-A, but there was no immunoreactivity for CK 7, S-100, SMA, and desmin.

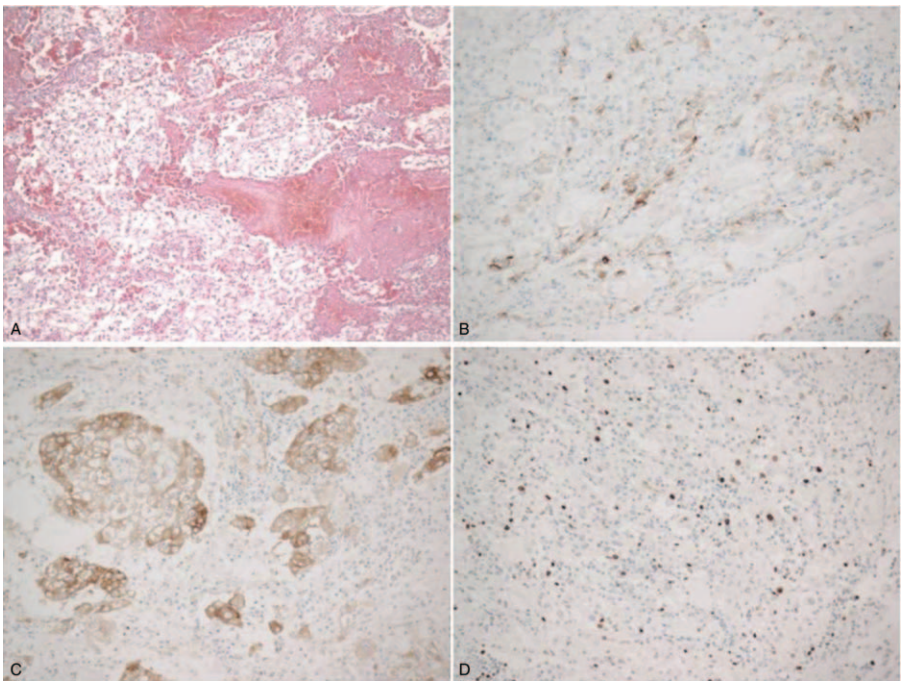

Figure 5. (A) The tumour is comprised of the proliferation of predominantly epithelioid cells with granular eosinophilic cytoplasms (H&E, ×100). (B) Immunostain for human melanoma black 45 in tumor cells. (C) Immunohistochemical stain for Melan-A. (D) The proliferation index, expressed as a percentage of Ki-67 antigen-positive nuclei, is around 10%.

The typical imaging phenotype of EAML can be deciphered from a comprehensive literature review of published reports. On CT imaging, EAML presents as large size soft tissue lesion with higher density (than normal renal parenchyma). "Rapid wash-in and slow wash-out" is the characteristic enhancement pattern.[23] MRI imaging features are a low-to-high T1WI signal (with acute hemorrhage), low T2WI signal with diffusion restriction (due to lesion hypercellularity), lack of fat, distinct margins, and marked heterogeneous enhancement.[2,24] Ultrasonography typically shows hypoechoic mass with heterogeneous peak enhancement or the presence of pseudocapsule.[25,26] In our current report, radiological imaging findings described a heterogeneous soft tissue mass located in the left kidney without fat or calcification. The substantial part of the tumor was apparently enhanced on contrast-enhanced imaging. We did not find any enlarged feeding vessels in the mass, which was inconsistent with previous study.[23] EAML has a range of imaging manifestation, some overlap with other renal tumors. So, it is difficult to make differential diagnosis from RCC and poor-fat AML without immunohistochemistry.

Surgical resection remains the gold standard treatment for localized and resectable EAML.[6] Metastatic EAML has been treated with systemic chemotherapy, but the effects of therapy are unsatisfactory.[8] In our current case report, the resection margins were free of malignancy and no distant metastases were found. So the patient did not accept advanced chemotherapy. Four months after the operation, the follow-up CT-scan did not reveal any local recurrence and distant metastases.

In conclusion, our case report allows for a comprehensive analysis of the imaging phenotype of EAML on CT-scan, MRI, and ultrasonography. Additionally, we described the state-of-the-art management of the management of this rare tumor.

Acknowledgment

This study was approved by the institutional review board at the Second Affiliated Hospital of Nanjing Medical University in China. Patient gave informed consent.

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