Case report

The definitive role of CEUS in an ambiguous case of renal cell carcinoma

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Abstract

Angiomyolipoma is a benign tumor consisting of abnormal vessels, smooth muscles, and fatty tissue. Renal cell carcinoma is an insidious neoplasm accounting for approximately 2% of global cancer diagnoses. Due to similar diagnostic features, the differentiation between the two types is sometimes difficult. We hereby present the case of a 60-year-old patient with no clinical symptoms and a focal lesion in the parenchymal layer of the left kidney incidentally detected on ultrasound examination. The putative diagnosis was angiomyolipoma, which was then confirmed by another ultrasound and computed tomography examinations. However, a further radiologic consultation revealed another probable diagnosis – renal cell carcinoma. Contrast-enhanced ultrasound was conducted, and the enhancement pattern was suggestive of cancer. To sum up, a thorough imaging examination plays an important role in the diagnostic work-up of neoplastic lesions in the kidney. Even then, however, the radiological image of the lesion may be misleading, so differential diagnosis is important for making a proper diagnosis.

Keywords

angiomyolipoma, renal cell carcinoma, ultrasound, contrast-enhanced ultrasound

Introduction

Angiomyolipoma (AML) is a benign tumor consisting of abnormal vessels, smooth muscles, and fatty tissue. It accounts for 0.3–3% of all renal masses and is the most common type of benign kidney tumors(1). About 80% of AMLs present as isolated entities(2), but they are also frequently associated with tuberous sclerosis complex (TSC) (3). AML is radiologically classified into three subtypes according to the amount of fat which is quantified by CT or MRI: fat-rich AML, fat-poor AML, and fat-invisible AML(4). Abundant fat tissue is a characteristic feature on imaging. However, sometimes there is too little of it to be detected. This poses a difficulty in differentiating AML from renal cell carcinoma (RCC). RCC is an insidious neoplasm accounting for approximately 2% of global cancer diagnoses(5). It is classified into three major histological subtypes: clear cell, papillary, and chromophobe(6).

Imaging plays a central role in the diagnosis and management of renal AMLs and RCC. Ultrasound is the examination through which kidney lesions are most commonly diagnosed. Contrast-enhanced ultrasound (CEUS) allows for the identification of active bleeding and is a valuable real-time diagnostic test in abdominal emergencies due to AML. It can also be used for distinguishing between malignant and benign renal lesions.

Case description

We present the case of a 60-year-old patient with no clinical symptoms and a focal lesion in the parenchymal layer of the left kidney which was incidentally detected on ultrasound examination. The lesion was well-demarcated, hyperechoic, measuring 22×18 mm, with no blood flow signals in the Doppler option, and located on the dorsolateral side, extending slightly beyond the contour of the kidney. Based on the
US findings, the diagnosis of AML was made. In four follow-up ultrasound examinations performed by independent ultrasonographers over a period of 18 months, the morphological image and dimensions of the lesion were invariable, so the diagnosis of AML was maintained.

In order to verify the nature of the lesion (despite the absence of clinical symptoms) CT was performed, revealing an isodense well-demarked lesion in the native phase, with strong enhancement after contrast administration (Visipaque 120 ml). In the axial projection, there was an area of fatty tissue at the periphery of the lesion, recognized as its component, supporting the diagnosis of AML. Afterwards, however, the patient reported to a highly specialized medical center, where his CT images were re-assessed by an independent radiologist who raised the suspicion of the malignant character of the lesion, possibly RCC. Coronal reconstruction of the CT showed that the renal capsule surrounding the tumor was distorted, enabling the subcapsular fatty tissue to protrude around the mass, thus mimicking the fatty component of angiomyolipoma (Fig. 1 and Fig. 2). CEUS examination was then performed three times with 1.2 ml of SonoVue contrast agent (total of 3.6 ml) at 10 min intervals, each time after complete washout of contrast. Rapid, robust contrast enhancement of the lesion was observed in the early arterial phase, followed by an earlier wash-out as compared to the surrounding renal parenchyma. Although the morphological US image did not allow for unambiguous discrimination
• acoustic shadow – may be seen in some AMLs (21–33%), but has not been described in renal cell carcinomas;
• AMLs are more often homogeneous lesions. Renal cell carcinoma is more often heterogeneous (65–76%). Fluid areas are far more common in renal cell carcinoma;
• The presence of an anechoic “halo” around the lesion is more frequently observed in carcinomas than in AMLs;
• Intra-tumoral cysts are found in 73% of RCCs but are rarely seen in classic AMLs8.

CEUS is a fast, low-risk and cost-effective method for the local diagnosis and staging of renal cell carcinoma9. It can be used to observe the continuous micro- and macrocirculation of a renal mass10. Benign and malignant kidney lesions can be distinguished since they exhibit a different vascularization pattern to the surrounding healthy renal parenchyma. Furthermore, CEUS is relatively harmless, with no effects on the thyroid and kidney function. It also shows only a low incidence of side effects such as nephrotoxicity9. CEUS is a valuable real-time diagnostic work-up for abdominal emergencies caused by AML or RCC. Besides that, using color-flow Doppler sonography, the blood flow of tumor can be measured, and solid tumor, aneurysm, and pseudoaneurysm can be distinguished. Therefore, despite the lack of accuracy, US has certain clinical value in the diagnosis of AML or RCC11.

Other diagnostic procedures such as CT or MRI may help to diagnose AML. The detection of adipose tissue is the fundamental diagnostic criterion in classic AMLs12. However, a minority of AMLs lack visually detectable fat on imaging, making them harder to distinguish from renal cell carcinomas12. In addition, the occurrence of AML and RCC simultaneously may be possible. The presented case shows the differences between various imaging examinations. US revealed the typical picture of AML, which was checked by many by independent ultrasonographers. However, other imaging modalities – CEUS and CT – suggested carcinoma, which was then confirmed histopathologically.

To sum up, AML is mostly detected incidentally during abdominal imaging examinations. Symptoms may not
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Occur, therefore a thorough imaging examination plays an important role in the diagnostic work-up of neoplastic lesions in the kidney. Even then, though, the radiological image of the lesion may be misleading, so differential diagnosis is very important for making a proper diagnosis.

Conflict of interest
The authors do not report any financial or personal connections with other persons or organizations which might negatively affect the contents of this publication and/or claim authorship rights to this publication

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