

Case Report

Metanephric adenoma: two cases report and review of the literature

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Abstract: Metanephric adenoma (MA) is a rare epithelial neoplasm of the kidney. Most of them are benign tumors. We herein report two cases of metanephric adenoma including different histological subtypes, such as classic MA, malignant MA. The first case is a 4-year-old child with a soft tissue density mass in right kidney which has been proved benign MA. The second case is a 56-year-old man with a mass in left kidney which is malignant MA. We distinguish MA from other lesions in the aspects of computed tomography imaging and immunohistochemistry.

Keywords: Kidney, metanephric adenoma (MA), computed tomography (CT), immunohistochemistry

Introduction

In most documented literature, Metanephric adenoma (MA) is characterised as a rare benign tumour of the kidney and is known to be associated with Wilms' tumour. Since Bove [1] described the term "metanephric adenoma" in 1979, less than 200 cases have been reported worldwide in the English literature. It is reported that MA accounts for approximately 0.2% of adult renal epithelial neoplasms. It generally occurs in adults and has an excellent prognosis. In this report, we aim to present 2 cases that were found to have renal tumors which had a final pathology as MA. In addition, review the world literature to describe metanephric adenoma and discuss the difficulty of preoperative diagnosis and the prognosis in the aspects of computed tomography imaging and immunohistochemistry. If we can distinguish it from other lesions, such as renal-cell carcinoma, patients can avoid undergoing unnecessary radical nephrectomy. This report was approved by the Institutional Review Board of our institution.

Case reports

Case 1

A 4-year-old child had been referred incidentally during ultrasonography examination for

upper respiratory tract infection. The patient showed asymptomatic, no abdominal pain, no abdominal palpable mass, no odynuria and hematuria. His physical examination and laboratory tests were normal. Dynamic contrast-enhanced CT scan showed an elliptic well-demarcated soft tissue mass in right kidney without protruding out of renal outline. The mass appeared to contain two elliptic cystic areas without enhancing on contrast-enhanced CT scan. After the injection of contrast materials, peripheral mild nodular enhancement occurred in the corticomedullary phase. Enhancement degree of the peripheral enhanced nodular was lower than that of renal cortex and medullar. The lesion was progressive enhancement, and 91.4 Hu, 94.5 Hu, 95.6 Hu on the cortex-phase, medullary-phase and delayed-phase images, respectively. The perinephric fat gap was clear without clouding and fibrous stripes while none had retroperitoneal lymph node metastasis (**Figure 1A-C**). Microscopy revealed that the tumor was composed of tightly packing acini and tubules. And some region showed occasional papillary and inconspicuous intervening stroma (**Figure 1D, 1E**). On immunohistochemistry, tumor cells were strongly positive for CK7, WT-1, CD57, vimentin, EMA and negative for CD34, a Ki-67 labeling index of 2% (**Figure 1F-M**). The final diagnosis result was pure metanephric adenoma. The patient received a nephrectomy.

Metanephric adenoma

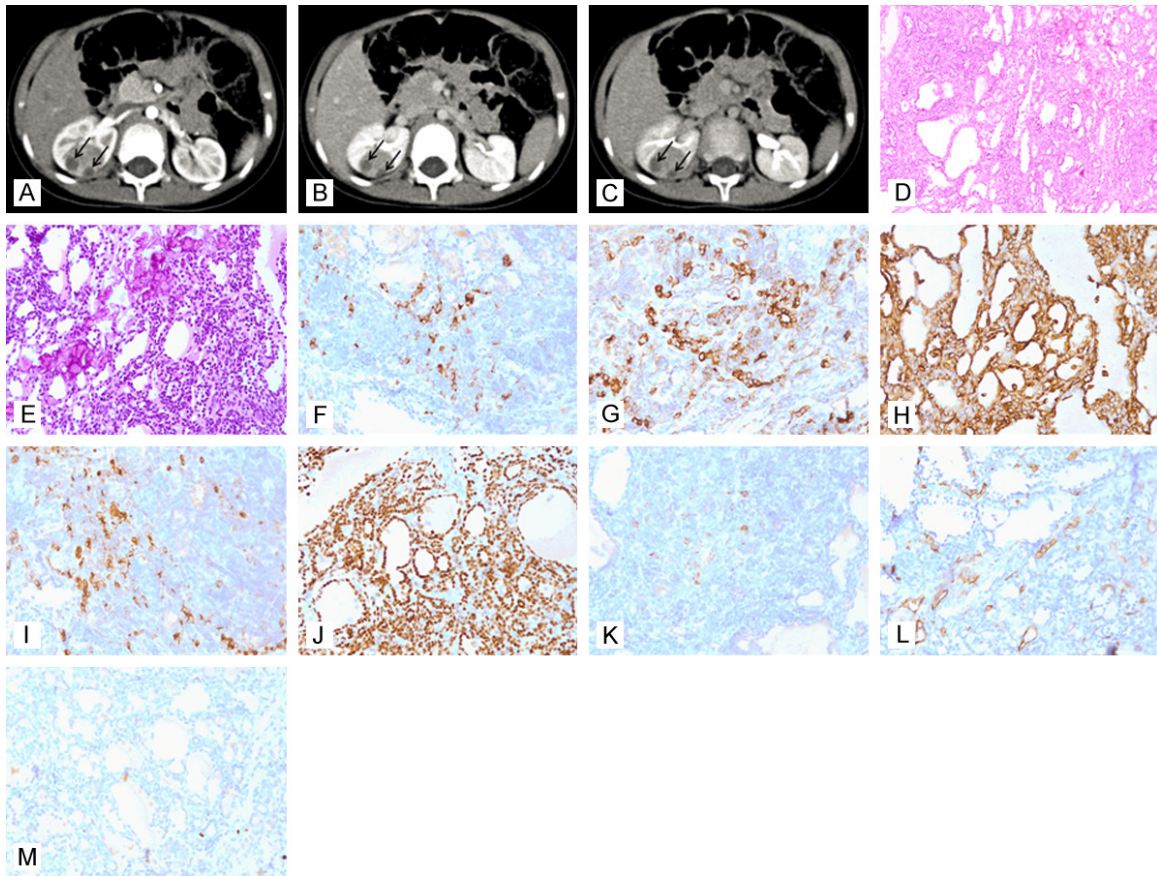


Figure 1. A 4-year-old child. Dynamic contrast-enhanced CT scan showed an elliptic well-demarcated soft tissue mass in right kidney without protruding out of renal outline (A-C). The mass appeared to contain two elliptic cystic areas without enhancing on contrast-enhanced CT scan (arrow in A-C). Enhancement degree of the peripheral enhanced nodular was lower than that of renal cortex and medulla. The lesion was progressive enhancement on the cortex-phase, medullary-phase and delayed-phase images (A-C). Microscopy (Hematoxylin & Eosin, D \times 100, E \times 200) revealed that the tumor was composed of tightly packed acini and tubules with occasional papillary and inconspicuous intervening stroma (D, E). Immunocytochemical profile of the metanephric adenoma (\times 200): (F) showed fraction positive staining for CK7, (G) showed positive staining for CK, (H) showed positive staining for vim, (I) showed fraction positive staining for EMA, (J) showed positive staining for WT-1, (K) showed fraction positive staining for CD57, L showed a Ki-67 labeling index of 2%, M showed negative staining for CD34 (F-M).

Case 2

A 56-year-old man with hepatitis B surface antigen positive was admitted to our hospital for further examination of lung abscess. Computed tomographic (CT) scan of chest revealed the asymptomatic renal mass in left kidney. The patient presented with nonspecific manifestations related to renal diseases such as a palpable mass, flank pain, odynuria, haematuria, or chyluria. On unenhanced CT examination, the attenuation of heterogeneous mass was isodense and hyperdense compared to normal renal parenchyma (**Figure 2A**). On abdominal dynamic enhanced CT scan, the CT attenuation of metanephric adenoma was lower than nor-

mal renal cortex. CT enhanced scan appearance was centripetal and slightly irregular in homogeneous enhancement, but the enhancement was lower than that of renal cortex in the three phases. In the corticomedullary phase and the nephrographic phase, enhancement degree of the mass was higher than normal renal medulla. However, the density of medulla exceeded that of the mass in the excretory phase. The lesion was progressive enhancement, and 45.7 Hu, 61.5 Hu, 63.7 Hu on the cortex-phase, medullary-phase and delayed-phase images, respectively (**Figure 2B-D**). As proved by the unenhanced peripheral and central areas in the lesion on contrast-enhanced CT scan, the lesion appeared to contain necrot-

Metanephric adenoma

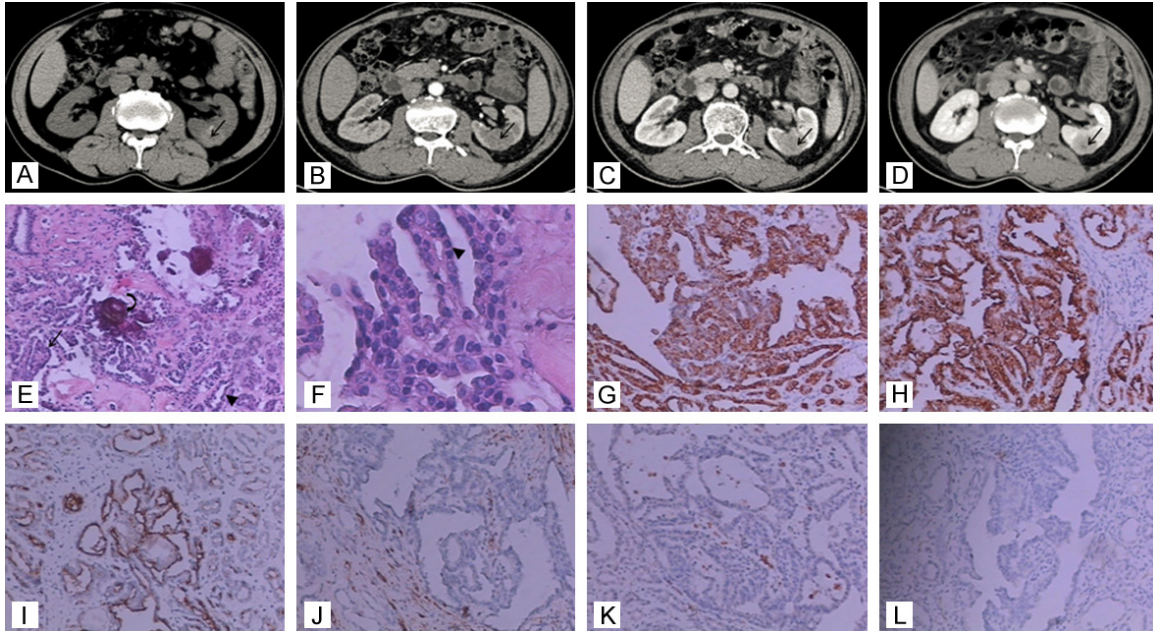


Figure 2. A 56-year-old man. On unenhanced CT examination, the attenuation of heterogeneous mass was isodense and hyperdense compared to normal renal parenchyma (A). Dynamic enhanced CT scan showed the CT attenuation of metanephric adenoma was lower than normal renal cortex (B-D). The lesion was centripetal and more pronounced enhancement, but enhancement was lower than that of renal cortex in the three phases (B-D). On contrast-enhanced CT scan, the lesion appeared to contain necrotic or hemorrhagic irregular area (arrow in A-D). The histological specimen microscopically (Hematoxylin & Eosin, E \times 100, F \times 400) showed morphology single and uniform sized tumor cells. They were mainly composed of packed acini (arrowhead in E) and papillae (arrow in E and F) accompanied by scanty stroma including psammoma bodies (curved arrow in E). Immunocytochemical profile of the metanephric adenoma (\times 400): (G) showed positive staining for CK7, (H) showed positive staining for P504S, (I) showed fraction positive staining for EMA, (J) showed negative staining for Vim, (K) showed negative staining for WT-1, (L) showed negative staining for CD10 (G-L).

ic or hemorrhagic irregular area. In this case, no perinephric fat nor lymph node metastasis was detected (Figure 2A-D). The histological specimen microscopically showed morphology single and uniform sized tumor cells. They were mainly composed of packed acini and papillae accompanied by scanty stroma. Sometimes, psammoma bodies could be seen among tumor cells (Figure 2E, 2F). The tumor cells were immunoreactive for CD7, P504S, epithelial membrane antigen and negative for WT-1, CD10, CD117, vimentin (Figure 2G-L). The final diagnosis result was malignant metanephric adenoma.

Discussion

In 1979, Bove firstly raised the term 'metanephric adenoma' which origins from primitive epithelium of the proximal nephron [1]. In 1998, the World Health Organization (WHO) histological type of renal tumors classified MA in the kidney epithelial benign tumor--renal adenoma. Metanephric adenomas (MAs) account for < 1%

of all renal tumors and are classified as benign [2]. In most English literature, MA is characterized as a rare benign tumour of the kidney that accounts for approximately 0.2% of adult renal epithelial neoplasms. In recent years, more and more studies found MA has the possibility of malignancy. Pathological examination revealed MA includes different histological subtypes, such as classic MA, malignant MA and composite MA with coexistence of malignant components [3]. Furthermore, some cases of MA with regional lymph node metastases were described [4-6]. But the origin and occurrence of MA were not clarified.

MA occurs in both adults and children, and generally affects women than men. Age of onset range from 38 to 64 and 5 to 83 with the average age of 48.6 years and 41 years in two studies done by Jones et, al and Davis et, al [7, 8]. But two literatures reported MA was also detected by prenatal ultrasound in fetus and subsequently histopathologically confirmed [9, 10]. The female to male ratio for occurrence of this disease is 2:1 [7, 8].

Metanephric adenoma

Most of the patients were asymptomatic. They were diagnosed incidentally during follow-up for other clinical problems. However, other patients experienced nonspecific symptoms similar to other renal-mass lesions, including fever, abdominal and flank pain, and hematuria. Just by clinical manifestations are unable to make a diagnosis of MA.

In terms of imaging, there are lots of related literature and reports. But until now it is still difficult to distinguish benign from malignant of MA, and distinguish MA from s-PRCC and e-WT just by imaging features alone. In the present cases, case 1 is benign while case 2 is malignant. The benign lesion was well-defined and its shape was regular-oval. The tumor is cystic-solid whose solid component is homogeneous. There were two regular-shaped, oval cystic areas. The lesion of case 2 is malignant. There are lots of malignant performances. On unenhanced CT examination, the attenuation of heterogeneous mass was isodense and hyperdense. Simultaneously, the border of the lesion is ill-demarcated which infiltrate to the surrounding renal parenchyma. There were irregularly shaped lower attenuation areas in the mass that were necrotic areas without enhancing on abdominal dynamic enhanced CT scan. These were their differences, the common denominator was progressive peripheral enhancement with centripetal filling-in. But the research studied by Gang Li et al, at revealed that border and homogeneous could not be the standard to distinguishing benign from malignant of MA [3]. Most previous reports were surrounding how to distinguish MA from other renal tumors. Typical performance of MA is a well-demarcated, solitary tumor which is composed mainly of solid components. On unenhanced CT imaging, the mass is usually of equal attenuation with regular margin. And on dynamic enhanced CT scan, it is a lower-attenuation mass with progressive peripheral enhancement [11-15]. Calcifications, necrotic and hemorrhagic areas, as well as cysts can be seen in MAs. However, these features overlap with those of the solid variant of papillary renal cell carcinoma (s-PRCCs) and well-differentiated WT [16-20]. So the final diagnosis of MA depends on histopathological examination.

Now histopathological and Immunohistochemistry examinations are gold standards to make the diagnosis. Photomicrograph of histological specimen revealed small, uniform aggre-

gates of epithelial cells without karyokinesis. Microscopy revealed that the tumor was composed of tightly packed acini and tubules. Unlike MAs, e-WTs and s-PRCCs showed nuclear atypia and brisk mitotic figures. Meanwhile, s-PRCCs contain foamy or hemosiderin-laden macrophages [21-23]. In immunohistochemistry examinations, immunohistochemical stainings with CD57 and WT-1 are strong predictors of MAs. And the tumor cells are negative for CD56, AMACR and CK7. In contrast to MAs, s-PRCCs are immunoreactive for AMACR, CD15 and CK7 and negative for CD57 and WT1. Unlike MAs and s-PRCCs, e-WTs are positive for CD56 and WT1 [23, 24]. In recent years, there have been new discoveries to distinguish MA from other renal masses. For example, a study showed that CDH17 was a sensitive and specific marker for MA [25]. The mutations of the BRAF gene have been recently reported in MAs and could become useful as a discriminative marker among renal tumors [26, 27]. BRAF V600E was found no significant expression in several renal cell carcinoma subtypes except MA [27].

Distinguishing MA from its mimics such as s-PRCCs and e-WT is important because of the implications for surgical management. An inspection technology alone has limitations. In order to improve the accuracy of diagnosis, we should apply examinations in combination.

Disclosure of conflict of interest

None.

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Metanephric adenoma

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