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CLINICAL CASE REPORT

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The Clinical Characteristics of Metanephric Adenoma

A Case Report and Literature Review

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Abstract: We describe the clinical presentation, diagnosis, treatment, and follow-up data of a 39-year-old woman with asymptomatic right kidney tumor, which was later histopathologically diagnosed as metanephric adenoma (MA). Macroscopically, the tumor had integrity tegument with homogeneous and gray cutting surface. Microscopically, the tumor cells were formed in adenoid or papillary pattern and contained psammoma bodies, without distinctive atypia. Immunohistochemistry results showed they were negative for creatine kinase 7, epithelial membrane antigen, and renal cell carcinoma, and positive for AE1/AE3, vimentin, and Wilms Tumor 1. Pathological diagnosis was MA. The 48 months' follow-up information was available without recurrence.

According to this case and literature review, we figured that it is difficult to make a definite diagnosis of MA only by image examination. Nephron-sparing surgery is eligible to treat MA. Long-term active surveillance is necessary because of the uncertainty of the biological behavior and cellular origin of MA.

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Abbreviations: CDFI = color Doppler flow imaging, Cr = creatinine, CT = computerized tomography, ESR = erythrocyte sedimentation rate, GFR = glomerular filtration rate, HU = hounsfield units, MA = metanephric adenoma, MRI = magnetic resonance imaging, PRCC = papillary renal cell carcinoma, WHO = World Health Organization.

INTRODUCTION

Metanephric adenoma (MA) is an uncommon renal benign tumor, derived from the renal residual organization during embryonic development. Because of lack of specific clinical, radiographic, and histological characteristics, they are frequently misdiagnosed as malignant tumors of the kidney. In this study, we will describe a MA case that was referred to our department on May 2011.

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Contributors HF, HZL, and YSZ looked after the patient, and QQS and YX collected the data. All authors contributed to the report. Written consent to publication was obtained.
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CASE

A 39-year-old woman with asymptomatic right kidney tumor for more than 4 years was admitted to our hospital. She was incidentally found to have a solid mass in the middle part of the right kidney by abdominal computerized tomography (CT) in 2007. The round well-defined mass was of equal density when unenhanced and could uptake contrast after enhancement. The diagnosis of right kidney tumor was suspected (Figure 1). She did not receive any treatment since she felt no particular discomfort. In April 2011, an ultrasound examination showed a regular and well-defined 2.8 × 2.3 cm low-echo area in the middle part of the right kidney. Abdominal CT scan showed a round-like high-density lesion in the middle-lower part of the right kidney with 40 Hounsfield units (HU) before contrast enhancement, and was homogenous on the enhanced phases with 51 to 71 HU (Figure 2). She was referred to our department in May 2011. Her general conditions were well without hematuria, frequent urination, urgent urination, odynuria, and dysuria. Her family history was not significant. Physical examination did not show any abnormalities. After admission, her blood pressure fluctuated between 90 and 110/50 and 75 mm Hg.

In terms of laboratory tests, blood routine test was normal with hemoglobin level of 131 g/L. Erythrocyte sedimentation rate (ESR) level was 5 mm/h and creatinine (Cr) level was 63 μmol/L. Radionuclide renogram examination indicated that both kidneys had satisfactory blood perfusion and functions with the right renal glomerular filtration rate (GFR; 41.4 mL/min) and left renal GFR (42.8 mL/min). Chest X-ray did not indicate any abnormality. The preliminary diagnosis was right renal carcinoma (T1aN0M0).

The patient then underwent partial nephrectomy of the right kidney through 12th rib incision. The nephrectomy specimen revealed a well-circumscribed 3.0 cm × 3.0 cm × 2.8 cm bulging out of the cortex of the middle-lower part of the right kidney. The lesion did not communicate with the collective system and no enlarged lymph nodes were identified around renal hilum and abdominal aorta. Partial nephrectomy of the right kidney was successfully performed and the renal artery was occluded for 14 minutes. Macroscopically, the tumor had intact tegument with homogeneous and gray cutting surface. Microscopically, the tumor cells were formed in adenoid or papillary pattern and contained psammoma bodies, without distinctive atypia (Figure 3A–C). Immunohistochemically, the tumor was positive for AE1/AE3 (Figure 3D), vimentin (Figure 3E), and Wilms Tumor 1 (Figure 3F), and negative for creatine kinase 7 (CK7), epithelial membrane antigen (EMA), and renal cell carcinoma. The pathological diagnosis was MA of the right kidney. Our patient recovered well after surgery. The 48 months' follow-up information was available without recurrence.

DISCUSSION

First named by Brisigotti et al[1] in 1992, MA is an uncommon renal tumor with specific organizational characteristics.

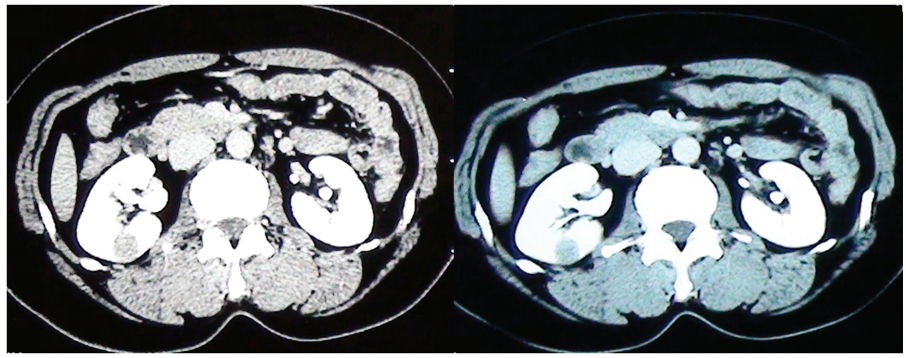

FIGURE 1. Enhanced computerized tomography (CT) in 2007 indicated the lesions were slightly enhanced with homogeneous density.

Thus far, these tumors have been known for their benign behavior and mostly derived from metanephrogenic embryonic tissue. Our patient was admitted to our hospital for right kidney mass for 4 years. The lesion size gradually increased, but the patient was asymptomatic. No metastatic signs were identified, and repeated laboratory tests and also other examinations were normal. According to her clinical presentation, benign tumor was considered in priority. Thus, nephron-sparing surgery was a preferred treatment option.

Metanephric adenoma was classified as benign renal epithelial tumor (nephradenoma) by the World Health Organization (WHO) in 1998. Currently, most studies advocated that MA is closely related to Wilms tumor and papillary renal cell carcinoma (PRCC). Some scholars considered MA as the benign counterpart of Wilms tumor. WHO (2004) indicated that MA is a kind of epithelial tumor, with small, embryonic tumor cells that have similar size and indefinite origin.

Metanephric adenoma affects people of any age, with a minimum of 5 months and a maximum of 83 years. The predilection age is between 50 and 70 years. MA preferentially affects women with a male-to-female ration of 1:2 to 1:3. More than half of MA was asymptomatic, which was incidentally discovered by routine physical examination. Few patients may present such conditions as flank pain, abdominal mass, painless gross hematuria, and intermittent fever. According to previous studies, polycythemia can be seen in 12% of patients, with MA cells producing and secreting erythropoietin and a variety of other factors.[2] MA always presented as well-defined, round-like, low or high-echo solid mass. Color Doppler flow imaging (CDFI) showed no significant blood flow. The ultrasound of our patient showed a regular and well-defined 2.8×2.3 cm dark area in the middle part of the right kidney, which agreed with the above features.

On CT scan, these tumors are consistently well-defined, differ in size, and mostly have intact capsule. They are mostly spontaneous and slightly hyperdense in comparison twith the normal adjacent renal parenchyma. Calcifications of various sizes can be seen.[3] The CT features of MA lack specificity compared with renal cell carcinoma. MA has been described as being hypointense on T1-weighted magnetic and hypointense or slightly hyperintense T2-weighted magnetic resonance imaging (MRI) scans. MRI does not further elucidate the image diagnosis of MA.[4] The definite diagnosis depends on pathological examination. Although preoperative biopsy can improve diagnosis accuracy, it is not routinely recommended for its invasiveness and may put the patient at the risk of implantation metastasis. Our patient did not undergo biopsy and was diagnosed by postoperative pathology.

Histopathological features of MA include the following: the tumor cells are round or ovoid, small, and uniformed without apparent heterologous, and mitosis is absent or sporadic; the tumor cells are arranged as tubular, papillary, and glomerular structures, and the lateral 2 structures are specific to MA and possess diagnostic values; MA is clearly defined from the surrounding tissue. Immunohistochemically, MA is always positive for WT and vimentin, but negative for EMA, alpha-methylacyl coenzyme A racemase (AMACR), and CK7. Besides, focal expression of CK7 and diffused expression of CD57 can be occasionally seen. The expression of WT1, CD57, CK7, and AMACR has a significant value for the diagnosis and differential diagnosis of MA.[5] The IHC results of our patient showed positive expression of vimentin and WT1, which was accordant with the above characteristics.

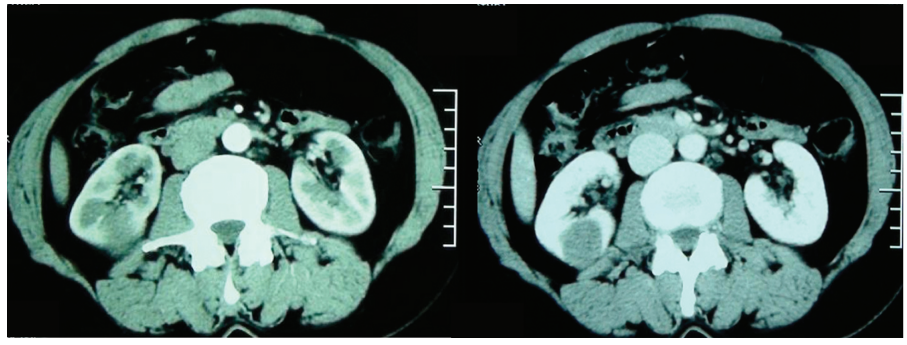

FIGURE 2. Enhanced computerized tomography (CT) in 2011 indicated the lesions were obviously increased.

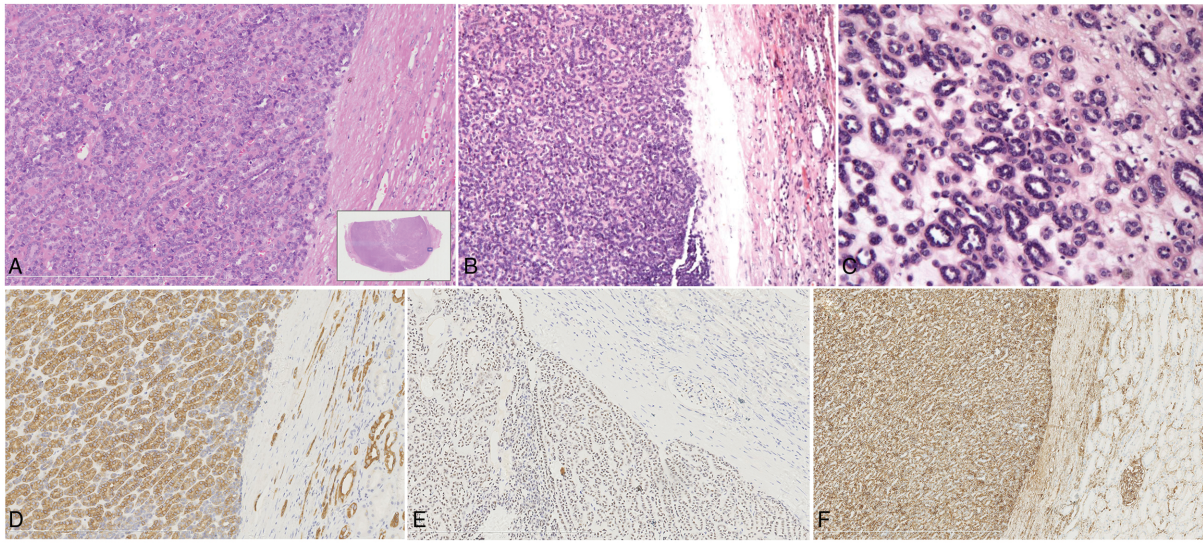

FIGURE 3. A–C, HE staining: tumor cells formed an adenoid or papillary pattern and contained psammoma bodies, without distinctive atypia. Immunohistochemically, the tumor was positive for (d) AE1/AE3, (e) vimentin, and (f) Wilms Tumor 1 (WT-1).

Metanephric adenoma can arise from any part of the kidney, more located in the cortex. These tumors mostly localize to unilateral kidney, but can also affect bilateral kidneys.[6] Tumor size ranges from 0.3 to 20.0 cm (mean 5.15 cm) with thin layer coated or without capsule. They are gray, yellowish, or brown, homogeneous, with clear surrounding kidney tissues, and can be associated with cystic change, hemorrhage, necrosis, and secondary calcification change. Most MA can be cured by simple removal of tumor or nephrectomy. For definite diagnosed cases, nephron-sparing surgery (such as tumor enucleation or partial nephrectomy) is recommended. While in clinical practice, MA is hard to be differential diagnosed from malignant tumors, which makes the preoperative diagnosis difficult. Thus, surgical method should be determined according to tumor location and size, and also proficiency of surgeons. For those smaller tumors that are definitely diagnosed, follow-up observation is allowed. However, there were also case reports of nephradenoma with lymph node metastasis[7,8] or other malignant cells.[9,10] In conclusion, MA cannot be seen as absolute benign lesion. Prognosis judgment should be made with great caution, and timely intervention must be given in case of recurrence or metastasis during follow up.

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