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Metanephric Adenoma of the Kidney: Can We Take a Step Forward in a Presurgery Diagnosis?

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ABSTRACT

The widespread use of imaging diagnostic tools has led to the detection of a greatly increased number of incidental renal tumors. Many of these tumors are benign and can be treated with nephron sparing surgery or radical nephrectomy. However, the clinical and even imagiological aspects of these histopathologically benign tumors are too scarce and nonpathognomonic, making their diagnosis rather difficult. Metanephric adenoma (MA) of the kidney, a rare and benign neoplasm, is an example of an entity usually difficult to distinguish from malignant neoplasms. We report one clinical case and review of this clinical entity emphasizing the need for better and more accurate diagnostic means for benign renal masses.

INTRODUCTION

Benign lesions of the kidney represent a challenging clinical diagnosis. Despite the sensitivity of current imaging techniques, a definitive diagnosis is made histologically. The metanephric adenoma of the kidney is a rare, slow-growing tumor with a good prognosis (although there are descriptions of metastatic disease) [1,2]. It can present itself (through ultrasound and computed tomography (CT) scans) as a well-circumscribed, solid lesion, sometimes with calcifications, and hypovascular on angiography [3]. Usually it is asymptomatic, with a 10% association with polycythemia [4]. It occurs mostly in young and middle-aged people, usually in females [4]. Histologically, metanephric adenoma (MA) is composed of epithelial cells whose origin is related to the development of the fetal kidney proximal tubule. Differential diagnoses with malignant lesions such as nephroblastoma or papillary renal cell carcinoma (PRCC) may make this condition regularly over treated [1]. Clinical and radiological aspects of this tumor are not enough for a correct diagnosis before histological evaluation. Cytological diagnosis using fine-needle aspiration can be difficult [5]. At these times, genetics can acquire a significant role in the diagnosis and follow-up of renal benign lesions such as metanephric adenoma [6]. We present, in this paper, 1 rare case report of MA of the kidney that illustrates how difficult an accurate diagnosis for this pathology can be, emphasizing the requirement of new, improved, and tailored diagnoses.

MATERIALS AND METHODS

This paper results from a structured and comprehensive literature review. Searches were done with PubMed. Initial search terms were "metanephric adenoma" and "kidney" (in articles published between 2000 and 2012). Based on the results of these initial searches, additional separate searches were performed using terms such as "renal benign tumor," "radiological diagnosis," and "treatment in combination with metanephric adenoma." The references section in published articles was also examined and compared with electronic search results to maximize the review and inclusion of pertinent data. Medical records of 1 patient submitted to renal surgery for renal masses with a pathology diagnosis of metanephric adenoma of the kidney were reviewed. Images were obtained from the patient's clinical file.

Disease Case Analysis

MCF, a 37-year-old woman, was sent by a general practitioner

KEYWORDS: *Echinococcus*, cystic hydatid disease, retroperitoneum, secondary hypertension

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Figure 1. The abdominal CT, renal view: A solid nodule in the external cortex of the middle third of the left kidney measured 20 mm. It was well circumscribed and exophytic but organ limited. It was hypovascular after intravenous contrast..

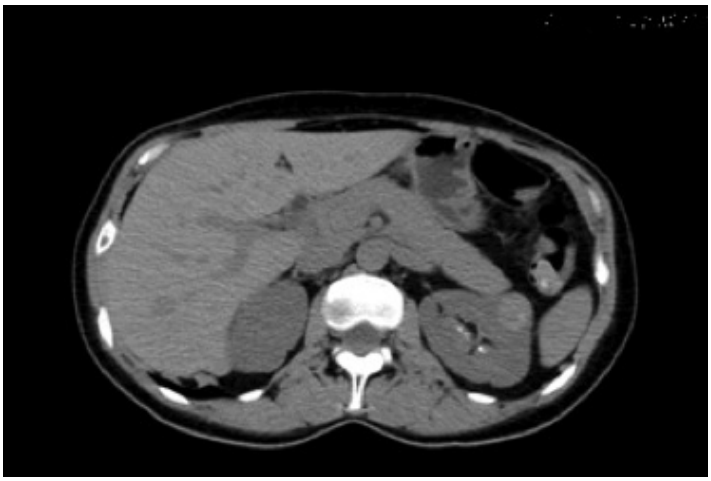
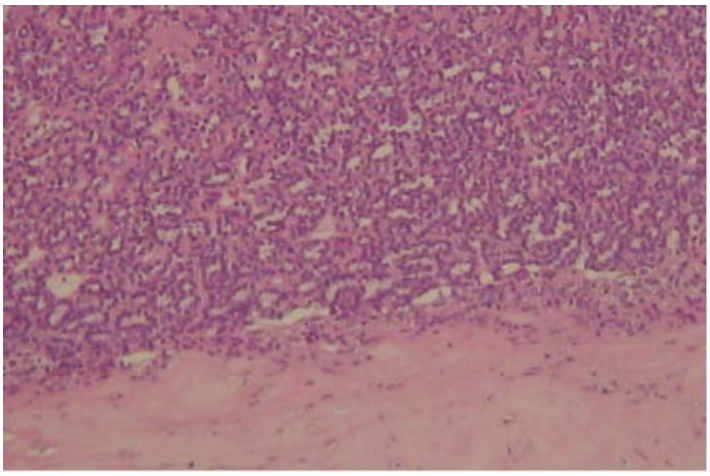
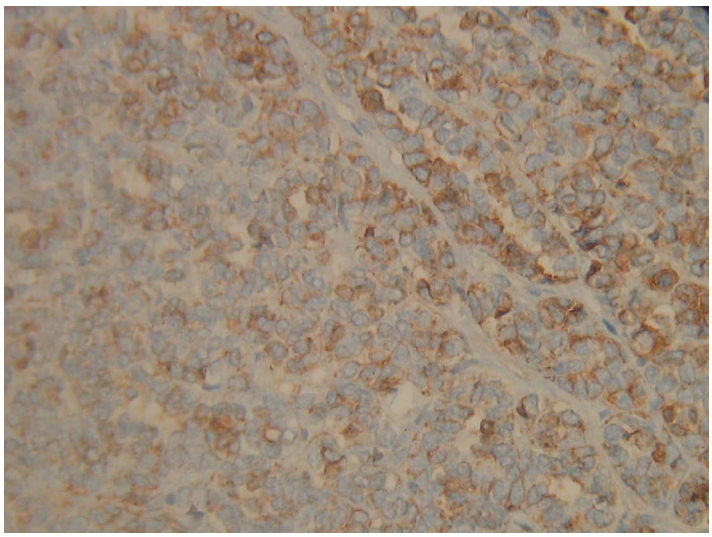


Figure 2. The microscopic appearance of MA (H&E, magnified 100 x). It is noncapsulated and densely cellular (occasional papillary and tubular morphology) with specific glomeruli. There are small uniform epithelial cells and round nuclei without prominent nucleoli or mitoses. Little stromal hyalinization was also observed.



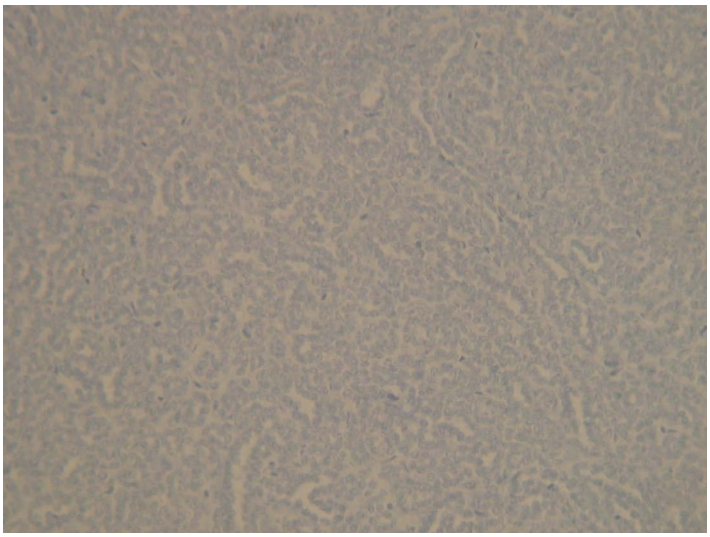
(GP) to urology consultation because of a history of recurrent urinary tract infections (UTIs) over a period of 2 years. She exhibited UTIs with dysuria and fever (maximum of 38° C) but no hematuria. She had no history of other medical diseases or surgery. She took no prolonged medication, and she denied any sexually transmitted diseases. A renal ultrasound revealed a solid and limited right renal mass of 2 cm, suggestive of a cyst without liquid content and bilateral, millimetric renal sinus lithiasis. Her abdominal CT scan (Figure 1) revealed a solid nodule in the external cortex of the middle third (left kidney) measuring 22 mm. The nodule remained hypovascular after intravenous contrast suggesting a complicated cyst or a poorly vascularized solid mass. The liver, spleen, and pancreas were unremarkable, and the right kidney showed no evidence of mass or hydronephrosis. The CT did not show any lymph node involvement. Her urine cytology did not show any malignant cells. Her complete blood count (CBC) showed no alterations. Her biochemical assessment presented normal renal function and normal hepatic function, and both urinalysis and urine cultures were negative. She had normal coagulation tests. Given the size, localization, and the patient's age, a laparoscopic partial nephrectomy was performed.

Figure 3. Immunostaining: Immunopositivity for CD57 in most tumor cells, and focal positivity for AE1/AE3.



Pathology results revealed a noncapsulated renal neoplasia, with 2.5 cm x 2.2 cm x 1.5 cm densely cellular cells with tubular morphology, occasionally papillary, with aspects specific to glomerulus. Hematoxylin and eosin stains revealed neoplastic epithelial small cells, uniform with round nuclei without mitoses (Figure 2). Diffuse-positive staining for CD57 (Figure 3) in almost all cells, focal or the absence of positivity for AE1/AE3, and EMA and cytokeratin 7 are characteristics that allow the diagnosis of metanephric adenoma of the kidney. Immunostaining for racemase (P504) was not performed; neither were cytogenetic studies to evaluate trisomy for chromosomes 7 and 17 (for the

Figure 4. Immunostainning: No immune stain for CK7.



diagnosis of PRCC). The predominance of epithelial cells also excludes the diagnosis of Wilms tumor. After 2 years of follow-up, the patient remains disease free with normal renal function.

DISCUSSION

Metanephric adenoma is a rare and benign (only 1 case of metastatic disease neoplasm of the kidney reported) renal disease [7]. Generally, the patients are asymptomatic, although symptoms can include abdominal pain, abdominal mass, hematuria, dysuria, fever, and hypertension [1]. Polycythemia has been described [4,8,9], probably related to the production of erythropoietin and cytokines by MA cells [10]. This lesion generally appears in middle-aged adults and more frequently in women (> 2:1) [11].

Similar to other small renal masses (SRMs), this tumor is normally revealed incidentally during radiologic studies for other clinical problems and constitutes a serious diagnostic challenge. Several diseases can resemble MA, including Wilms tumor, PRCC, and metastatic papillary thyroid carcinoma [1]. Radiologic findings are not pathognomonic. The ultrasound (US) shows a lesion hypo-, iso-, or hyperechoic compared with the adjacent renal cortex. MA is considered hypovascular or weakly vascularized, with no vascular flow on the color Doppler US [3]. It is a well-circumscribed, solid, and homogeneous neoplasm showing higher attenuation than adjacent renal parenchyma on CT [3]. However, in some cases, areas of hemorrhage, necrosis, and cystic degeneration have been reported [3,4,12] and generally form well-demarcated masses without fibrous capsules in their majority [4,12].

Protrusion above the renal capsule is common [4], but not extrarenal invasion [13]. Cytology and immunohistochemistry assays can unveil the diagnosis, although the differential diagnosis from epithelial carcinoma, predominantly Wilms tumor, and solid variants of papillary carcinoma can be problematic. Wilms tumors generally appear at a younger age, are grossly tan-gray with hemorrhage or cysts, triphasic. WT1+, CD57+, and vimentin appear on the immunohistochemistry stain. PCCR is red-brown with thick capsules, and cells have more cytoplasm, nuclear grooves, and prominent nucleoli. Immunostaining shows strong cytokeratin 7 (CK7), strong AE1, strong alpha-methylacyl-CoA racemase (AMACR), epithelial membrane antigen (EMA+), CD57-, and WT1-.

Metanephric adenomas are composed of tight, short papillae and loose sheets of cells with scant cytoplasm, round nuclei, fine chromatin, and rare small nuclei. MA shows reactivity for CD57, vimentin, S-100 protein, and lysozymes [14]. Diffuse-positive immunostaining for CD57 and WT1 are often observed; CD57 staining argues against Wilms tumor. Weak or negative staining for CK7 and EMA argue against PRCC. Chromosomal analysis may also be helpful. Wilms tumors show alterations at chromosome 11p, and PRCC is characterized by the loss of chromosome 3, trisomy of chromosomes 7 and 17, and the loss of chromosome Y [15,12].

The need for accurate diagnoses has led some surgeons to perform diagnostic biopsies preoperatively. Nevertheless, even some reports support that percutaneous fine-needle aspiration biopsy can be sufficient to establish the diagnosis [5] while others defend that immunocytochemical analysis is essential [16] for differentiation between MA and Wilms tumor. However, recent studies showed excellent results in the genetic identification of MA of the kidney. DNA studies (from samples harvested by biopsy) performed by Choueiri et al. revealed that BRAF V600E mutations are present in approximately 90% of all MA cases studied. This new discovery has potential value in the differential diagnosis of SRMs undergoing a percutaneous biopsy and consequent clinical management and follow-up [6]. Genetic studies have been limited because of the rarity of such tumors, but recent findings are a step closer in the diagnosis of benign small renal masses that can be amenable just by surveillance. More studies are needed to have better accuracy in the diagnosis of renal masses, reducing the need for surgical approaches in most patients and the resulting morbidities.

CONCLUSION

The author's intent is to highlight a rare disease that may simulate other malignant renal tumors. In our department, this is the second MA of the kidney operated on since 2007, confirming the increased and widespread use of radiologic tools and the consequent diagnosis of small renal masses, the

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majority of them asymptomatic and benign. MA is a rare renal tumor, which remains a diagnostic challenge since it is similar to 2 aggressive renal tumors: Wilms tumor and PRCC. Most of the time, diagnoses are made postoperatively with cytogenetic and immunohistochemistry assays.

MA showing typical features can be safely regarded as a benign tumor, and treatment should consist of local resection or active surveillance. However, there is scarce knowledge about the genetic and histologic behavior of renal masses in order to permit the conscientious management of these lesions and appropriate surveillance.

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