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CASE REPORT

Primary renal carcinoid tumor: A rare cystic renal neoplasm

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Abstract

We present the case of a 21-year-old man with an incidentally detected cystic renal mass. A well-defined, solid mass measuring approximately 8 cm x 6 cm with a cystic component was identified in the left kidney by abdominal multidetector computed tomography (CT) and ultrasonography. The mass was well-enhanced on the corticomedullary CT phase and washout of enhancement occurred on the nephrographic phase. The mass contained peripheral wall and septal calcifications in the cystic component. The lesion was resected and diagnosed as a primary renal carcinoid tumor. Primary carcinoid tumors of the kidney are extremely rare. This case is notable because of the rarity of this neoplasm and its unique radiologic and pathologic findings. A review of previously reported cases in the literature is also presented.

Key words: Kidney; Kidney neoplasms; Carcinoid tumor; Neuroendocrine

Core tip: We present a rare confirmed case of primary carcinoid tumor developed at 21-year-old man with incidentally detected a mixed solid and cystic mass in the left kidney. This case is interesting because of the rarity of this neoplasm and its unique radiologic and pathologic findings.

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INTRODUCTION

Carcinoid tumors can arise in almost any organ, but they occur most commonly in the gastrointestinal tract and bronchopulmonary systems and less frequently in the hepatobiliary system[1,2]. Carcinoid tumors are well-differentiated neuroendocrine tumors (NET) with malignant potential that depends on their site of origin[1].

A primary renal carcinoid tumor is an extremely rare neoplasm with only 91 cases reported in the English literatures to date[2-6]. When a carcinoid tumor of the kidney is suspected, great care must be taken to rule out the more common occurrence of metastases from an extrarenal primary site. This report describes the radiologic and immunohistopathologic findings in a patient with a primary renal carcinoid tumor.

CASE REPORT

An incidentally detected cystic renal mass was found in a 21-year-old man by ultrasonography performed at an outside hospital. He had no specific symptoms or previous underlying medical disease, a physical examination showed no abnormalities. The results of other laboratory investigations, including liver tests, urine analysis, urine cytology and serum tumor marker measurements (*i.e.*, alpha-fetoprotein, CA 19-9, and carcinoembryonic antigen) were within normal limits.

On the abdominal multi-detector computed tomography (CT), a bilobed renal mass in the upper portion

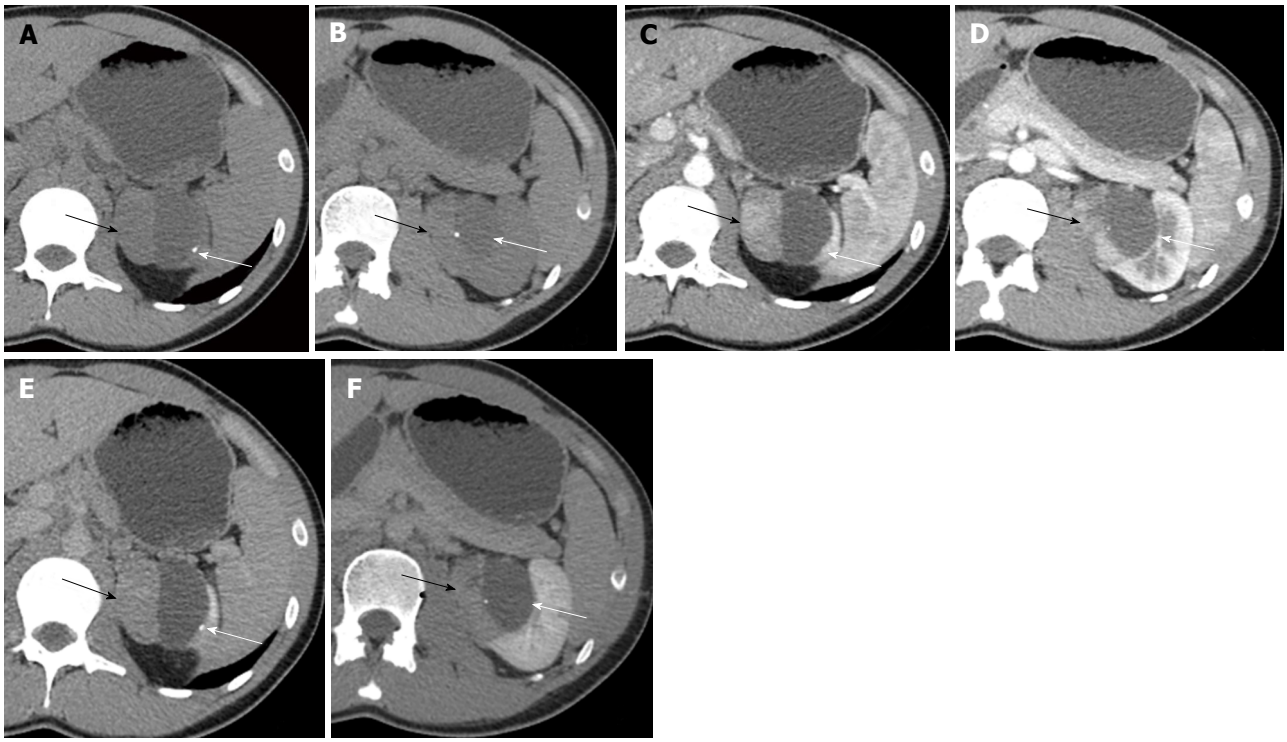

Figure 1 Axial images of the dynamic abdominal computer tomography scans show a well-circumscribed, bilobed renal mass in the left kidney that is composed of a solid part and a cystic part containing peripheral wall and septal calcifications. A, B: Pre-contrast images; C, D: Corticomedullary phase images; E, F: Nephrographic phase images. The lesion has significant enhancement in the right half of the solid portion during the corticomedullary phase and enhancement washout during the nephrographic phase (black arrow). A non-enhancing cystic portion is evident in the left half (white arrow).

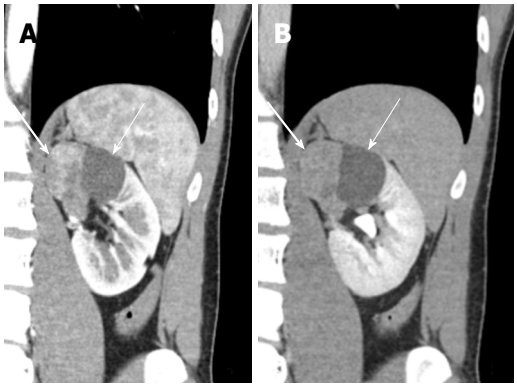

Figure 2 Coronal images of dynamic computer tomography scans show a well-circumscribed, bilobed renal mass in the left renal upper pole with a relatively preserved reniform shape and no definite perirenal fat infiltration or renal sinus invasion or herniation. The early enhancing solid right half (thick arrow, A) and the non-enhancing cystic left half (thin arrow, A) are apparent. The delayed washout pattern of the enhancing solid portion is evident in the nephrographic phase (thick arrow, B).

of the left kidney was identified. The mass was measured approximately 8 cm × 6 cm in size, was well-defined, and consisted of a partially cystic mass within a mainly solid renal mass. The solid portion was apparent on the corticomedullary phase and enhancement washout occurred during the nephrographic phase of the abdominal CT (Figure 1). The cystic component contained peripheral and septal wall calcifications. The left kidney had a preserved reniform shape, and there was no definite hydronephrosis or caliectasis (Figure 2). There was also no malignant thrombus in the renal vein or inferior vena cava. The patient had no other abnormal findings, such as suspected distant metastasis or lymph node metastasis.

The differential diagnoses of this mixed cystic and solid renal tumor includes cystic renal cell carcinoma (RCC), cystic Wilm's tumor, mixed epithelial stromal tumor (MEST), adult-type cystic nephroma, and cystic partially differentiated nephroblastoma. Although the radiologic findings, such as early hypervascular enhancement and late enhancement washout, are most commonly-observed with RCC, we focused on the cystic renal mass containing the hypervascular solid enhancing portion that developed in young adult patient. Cystic RCC or RCC with cystic degeneration is manifested as a solid and cystic mass and can arise during complicated renal cystic disease.

The lesion was resected and diagnosed as a primary renal carcinoid tumor (well-differentiated NET). The tumor met both the histological and immunochemical criteria for the carcinoid designation. The gross features of the resected tumor included a grayish-white soft mass attached to a cystic lesion with bulging contours and well-encapsulated margins. It had small focal hemorrhages and a large cystic component comprised half of the mass and focal calcifications and ossification (Figure 3). There was no evidence of invasion into the renal sinus, pelvis, or calyx. A microscopic examination revealed that the neoplasm was composed of small-to intermediate-sized tumor cells with uniformly round nuclei, nest for-

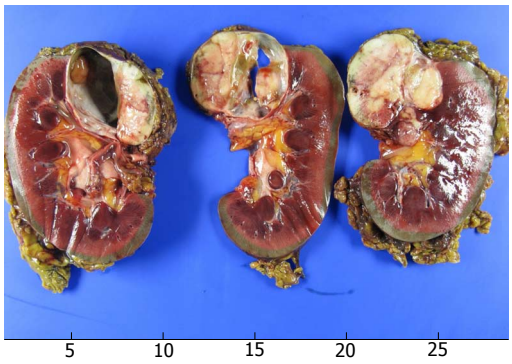

Figure 3 Gross specimen is a whitish, soft yellowish mainly solid mass with well-encapsulated margins and bulging contour. It consists of hemorrhagic foci and a large cystic component that comprises of half of the mass. There was no gross evidence of perirenal fat infiltration.

mation, and abundant cytoplasm (Figure 4) and minimal mitotic activity (1/10 high-power field). Immunohistochemical studies were performed, and the tumor cells tested strongly positive for the neuroendocrine markers-CD99, chromogranin, and vimentin (Figure 4) and negative for cytokeratin, suggesting a diagnosis of RCC.

The microscopic and immunohistochemical findings were compatible with a primary renal carcinoid tumor. Based on these findings, we investigated more thoroughly over a two-year follow-up period to rule out the possibility that the renal tumor was a metastatic or secondary carcinoid tumor. After being meticulously examined with I^{-123} meta-iodobenzylguanidine (MIBG) scanning (Figure 5), single-photon emission computed tomography (SPECT CT), colonoscopy, gastro fiberscope, and chest and abdominal multi-detector CT scans, the patient is doing well, and there is no evidence of other primary foci or distant metastases. Therefore, we concluded that the proper diagnosis in this case was a primary renal carcinoid tumor.

DISCUSSION

Carcinoid tumors are characteristically low-grade malignant tumors with neuroendocrine differentiation. They are located mainly in the gastrointestinal (74%) and respiratory (25%) tracts[7]. In < 1% of cases, the carcinoid tumors are reported in the genitourinary system.

Renal carcinoid tumors have the characteristic features of carcinoid tumors located elsewhere; the World Health Organization (WHO) has proposed a classification system for renal carcinoid tumors that is similar to that of the carcinoid tumors of other organs[8]. The majority of the renal carcinoid tumors reported in the literature are typical carcinoid with low mitotic activity and the absence of necrosis. A mitotic activity index of more than two and the presence of necrosis are features of an atypical carcinoid tumor[8].

A classification system established in 2000 and updated in 2010, differentiates between NETs and neuroendocrine carcinomas[9]. The proliferation index (Ki-67, MIB-1), angioinvasion, and mitoses are important factors in this classification. Thus, tumors are divided into well-differentiated NETs (< 2 cm in size, < 2% Ki-67 index), well-differentiated neuroendocrine carcinomas (> 2 cm in size, > 2% Ki-67 index, or angioinvasive), and poorly differentiated neuroendocrine carcinomas (> 20% Ki-67 index). The patient in our case had minimal mitotic activity (1/10 high-power field) without vascular, lymphatic, and perineural invasion or necrosis. An atypical carcinoid (well-differentiated neuroendocrine carcinoma) of the kidney is rare, with only one reported case in a large study by Hansel *et al*[5]. The natural history, prognosis, and clinical behavior of primary renal carcinoids are not well-understood because of its rarity. The outcomes from case reports suggest that renal carcinoid tumors are usually less aggressive and have a more indolent clinical course than the other renal tumors included in the differential diagnosis, such as RCC and primitive neuroectodermal tumors[10,11].

Renal carcinoid tumors, similar to carcinoid tumors in other locations, are derived from neuroendocrine cells. However, unlike carcinoid tumors arising in the gastrointestinal tract and bronchopulmonary systems, a definitive cell of origin within the renal parenchyma has not been identified[12,13]. Several theories have been proposed about the origin of primary renal carcinoid tumors, including that they are derived from neural crest cells entrapped within the metanephros during embryogenesis[14], that they result from hyperplasia or teratomatous epithelium[14,15], and that they occur after the neuroendocrine differentiation of a primitive totipotential cell[15,16].

A review by Romero *et al*[2] demonstrated an association between renal carcinoid tumors and horseshoe kidneys, renal teratomas, and polycystic kidney disease in 17.8%, 14%, and 2% of reported cases, respectively[17]. Although the exact cell of origin of these tumors is unknown, these study results strongly indicate that their development is related to predisposing embryological factors. The increased incidence of carcinoid tumors in horseshoe kidneys is likely caused by teratogenic events involving the abnormal migration of posterior nephrogenic cells, which coalesce to form the isthmus of a horseshoe kidney. The fact that all horseshoe kidney-derived carcinoids are primarily located in the vicinity of the isthmus strongly supports this theory.

Primary renal carcinoid tumors are slow growing and nonfunctional in most cases, and they are incidentally detected, show no gender predilection, and occur in patients between the ages of 23 and 78 years, with a mean age of occurrence that is lower than for RCC[3]. Despite the lack of gender predilection, carcinoid tumors in horseshoe kidneys are most frequently reported in men, likely reflecting the higher prevalence of horseshoe kidneys in male patients[18].

The most common radiologic feature of carcinoid tumors is calcification, which has been reported in 26.5% of the literature[2], and also shown in present reported case. The tumors have mainly heterogeneous echo-

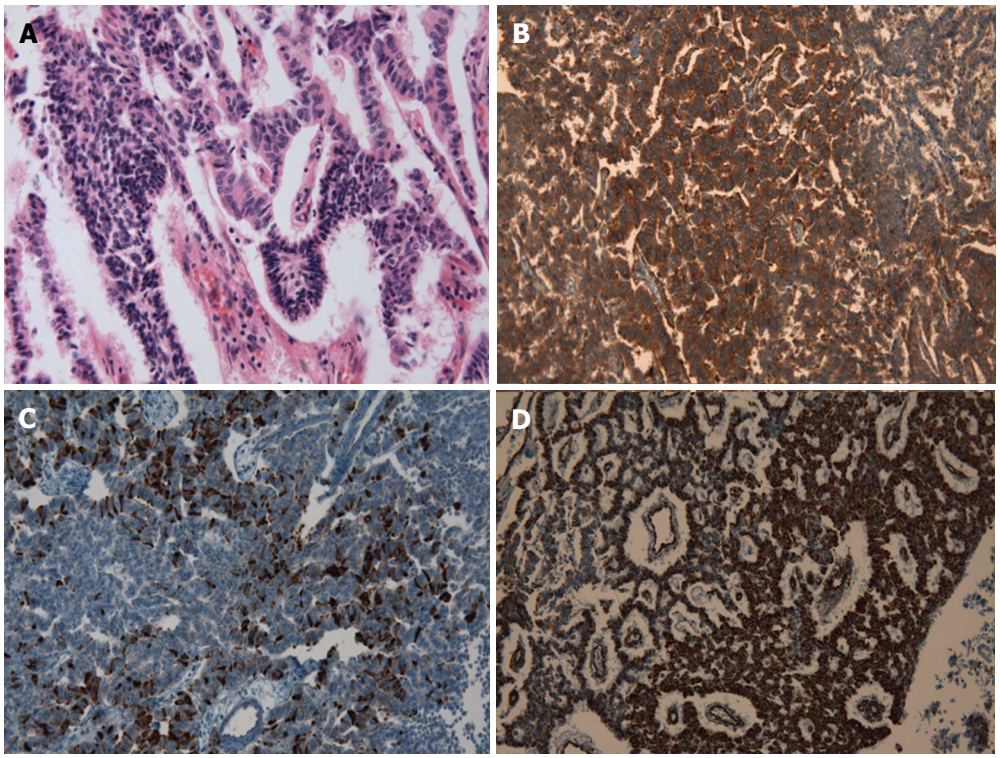

Figure 4 Carcinoid tumors of the kidney are composed of nests and cords of neuroendocrine cells that are noticeable under microscopy. Small- to intermediate-sized tumor cells have uniformly round nuclei with net formation, abundant cytoplasm, and prominent rosette-like structures (A, HE stain, ×200). The neoplasm had low mitotic activity (1/10 HPF). Immunohistochemical studies were performed, and the tumor cells tested strongly positive for the neuroendocrine markers (×200), CD99 (B), chromogranin (C), and vimentin (D). The cells were negative for cytokeratin, the marker for renal cell carcinoma (not shown). Microscopic and immunohistochemical findings were consistent with a well-differentiated neuroendocrine tumor, so called carcinoid tumor.

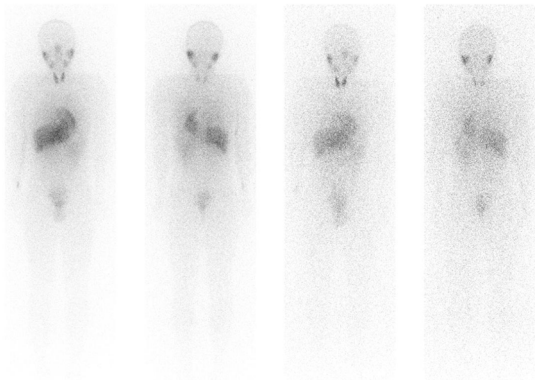

Figure 5 Normal physiologic uptake of I^{-123} meta-iodobenzylguanidine observed in the salivary glands, nasal mucosa, myocardium, liver, bowel, and both thyroid lobes. Low-level uptake was also observed in the lungs on 24-h image. Meta-iodobenzylguanidine (MIBG) was excreted into the urine, and physiologic activity was observed in the bladder. No definite abnormal accumulation of MIBG was apparent in the whole body through the 48-h image.

genicity on ultrasound scans, and tumor appearance on CT scans varies from a hemorrhagic cystic mass[19] to a hypervascular solid mass[10] (Table 1). However, carcinoid generally appears as a minimally enhancing[20] or non-enhancing low-attenuation mass with a necrotic center[21]. Previously reported carcinoid cases have been mainly described histopathologic findings. The case under discussion showed early enhancement of the tumor with delayed washout of the solid component and peripheral and septal calcification of the cystic component. These features resemble the hypervascular features of the carcinoid tumors found at other anatomical sites[1]. Although such radiologic findings are most commonly observed with RCC, renal carcinoid tumors should be included in the differential diagnosis, particularly when hormone-producing syndromes are present. When diagnosing renal carcinoid, a radiologist must consider the possibility of metastasis from a primary extrarenal carcinoid tumor, because metastatic renal carcinoid is possible, although less common[22].

Identifying cystic renal tumors is not uncommon during routine practice in a radiology department. However, cystic renal neoplasms are included in a wide spectrum of disease entities. According to the 2004 WHO classification of renal neoplasms, cystic RCC (*i.e.*, cystic clear cell carcinoma and, multilocular cystic RCC), and primary renal synovial sarcomas comprise malignant renal cystic tumors, adult type cystic nephroma, MEST, and lymphangioma are types of benign cystic tumors that occur in adults[8].

Cystic Wilm's tumor and, cystic partially differentiated nephroblastoma should be included in the differential diagnoses for young children. The prominent enhancement of the solid tumor components indicates an increased likelihood of cystic RCC or MEST. The faint enhancement of the solid component indicates that adult type

Table 1 Review of published cases of primary renal carcinoid tumor

Source	Age (yr)	Sex	Symptoms	Size (cm)	CT finding	Metastases
Romero *et al*[2] (56 cases review)	12-68 (49)		Abd./flank pain Endocrine syndrome (73.6%)	> 4	Low density (54.5%) High density (45.5%) Minimal or no enhancement Calcification (26.5%) Necrosis (12.2%)	50%
Jain *et al*[3] (39 cases review, 1 case report)	23-78	N/A	Abd mass Acute loin pain		N/A	N/A
Murali *et al*[4] (51 cases review, 2006)	13-68 (47)	No	Abd./flank pain Wt. loss Abd. Mass hematuria	1.5-22	Well circumscribed enhancing or nonenhancing solid mass	LN (12) Liver (10) Bone (1)
Hansel *et al*[5] (21 cases)	27-78 (52)		Back/flank pain (6) Mass (2) Hematuria (2) Anemia (1)	2.6-17 (6.4)	N/A	L/N (11) Liver (5) Bone (1) Lung (1)
Raslan *et al*[10] (5 cases)	63	M	None	6	Hypervascular mass	Liver
	40	M	Abd. Discomfort	5	Mass	None
	49	F	Hematuria	6	Mass	Liver, LN
	52	F	Carcinoid syndrome	8	Mass	Liver
	62	M	Hematuria	4	Solid and cystic mass	None
Zak *et al*[14] (2 cases)	34	F	None	14	N/A	None
	59	F	Pyuria, urgency	N/A	N/A	Bone
Krishnan *et al*[16]	48	M	Fever	6	Hyperdense nonenhancing mass	None
Bégin *et al*[18]	43	M	None	3.5	Homogeneous solid	None
Kurl *et al*[19]	62	F	flank pain	9	Nonenhancing solid and cystic mass with calcification, hemorrhage	Liver
Moulopoulos *et al*[21]	45	N/A	Abd. pain	8	Solid mass with calcification	LN, Liver
Tal *et al*[22]	33	M	Hematuria	5	Minimal enhance, calcification	None
Present case	21	M	None	8 × 6	Solid and cystic mass with well enhancement	None

LN: Lymph node; CT: computed tomogragy; F: Female; M: Male; N/A: Not applicable.

cystic nephroma, complex renal cysts or multicystic dysplastic kidney is more likely[23]. Cystic changes occur in up to 15% of RCCs. The spectrum of cystic RCCs includes multilocular cystic RCC, RCC arising from a preexisting benign cyst, and cystic degeneration of a previously solid RCC (clear cell RCC). Cystic RCCs tend to have thick, irregularly enhancing septa and enhancing solid components. Primary renal synovial sarcoma (PRSS) is an extremely rare malignant tumor that has a poor prognosis and, most commonly affects adolescents and young adults. The mean age onset is 35 years, and the male-female ratio is 1:1[24].

PRSS appears as a large well-circumscribed heterogeneously enhancing soft-tissue mass that may extend into the renal pelvis, the perinephric region, the renal vein or the inferior vena cava[25]. PRSS commonly presents as a solid renal mass in which large intratumoral cysts may be identified[26].

Adult type cystic nephroma is a rare, benign neoplasm that typically occurs in patients over 30 years of age and predominantly affects women (male-female ratio of, 1:8)[8]. Cystic nephroma appears as a multilocular cystic mass with multiple septations and no solid components. Herniation of the tumor into the renal sinus is a characteristic CT finding[27]. MEST is an uncommon, benign neoplasm. Although the 2004 WHO classification system for renal neoplasms described cystic nephroma and MEST as separate entities, recent studies suggest that they may correspond to different ends of the morphologic spectrum of the same disease entity[28]. MEST is typically manifested in perimenopausal women with a mean age at presentation of 46 years[8]. The tumors are grossly composed of multiple cysts and solid areas. The solid areas may be extensive, and the septa of the cysts are thicker than is typical for cystic nephroma, cystic partially differentiated nephroblastoma, and multilocular cystic RCC[26]. Similar to the tumor in the present case, primary renal carcinoid tumors typically have a cystic and solid renal tumor components.

The current recommended management for primary renal carcinoid tumors includes radical nephrectomy with surveillance and surgical removal of any subsequent metastases[8]. Most primary renal carcinoid tumors and metastases have a high affinity for somatostatin receptors; therefore, somatostatin receptor scintigraphy or an I^{-123} MIBG scan can contribute to the accurate staging and surveillance of metastatic disease after resection[29]. The most common metastatic sites are the lymph nodes and the liver[17]. Primary renal carcinoid tumors are interesting, because if they are correctly diagnosed and treated, good long-term results can be achieved.

In conclusion, we presented a rare primary renal car-

cinoid tumor with unique radiologic findings, particularly focusing on dynamic multi-detector CT imaging and histopathologic characterizations using immunochemistry. The prognosis and clinical behavior of these tumors have been unclear because of their rarity and short-term follow-up periods of the cases that have been published in the literature. The surgery is the treatment of choice, and even partial nephrectomy is recommended for small tumors.

REFERENCES

1 **Kulke MH**, Mayer RJ. Carcinoid tumors. *N Engl J Med* 1999; **340**: 858-868 [PMID: 10080850 DOI: 10.1056/NEJM199903183401107]
2 **Romero FR**, Rais-Bahrami S, Permpongkosol S, Fine SW, Kohanim S, Jarrett TW. Primary carcinoid tumors of the kidney. *J Urol* 2006; **176**: 2359-2366 [PMID: 17085102]
3 **Jain D**, Sharma MC, Singh K, Gupta NP. Primary carcinoid tumor of the kidney: case report and brief review of literature. *Indian J Pathol Microbiol* 2010; **53**: 772-774 [PMID: 21045413 DOI: 10.4103/0377-4929.72087]
4 **Murali R**, Kneale K, Lalak N, Delprado W. Carcinoid tumors of the urinary tract and prostate. *Arch Pathol Lab Med* 2006; **130**: 1693-1706 [PMID: 17076534]
5 **Hansel DE**, Epstein JI, Berbescu E, Fine SW, Young RH, Cheville JC. Renal carcinoid tumor: a clinicopathologic study of 21 cases. *Am J Surg Pathol* 2007; **31**: 1539-1544 [PMID: 17895755]
6 **Lane BR**, Jour G, Zhou M. Renal neuroendocrine tumors. *Indian J Urol* 2009; **25**: 155-160 [PMID: 19672338 DOI: 10.4103/0970-1591.52905]
7 **Modlin IM**, Sandor A. An analysis of 8305 cases of carcinoid tumors. *Cancer* 1997; **79**: 813-829 [PMID: 9024720]
8 **Eble JN**, Sauter G, Epstein JL. World Health Organization Classification of tumours. Pathology and genetics of tumours of the urinary system and male genital organs. Lyon: IARC Press, 2004: 81-82
9 **Lüttges J**. [What's new? The 2010 WHO classification for tumours of the pancreas]. *Pathologe* 2011; **32** Suppl 2: 332-336 [PMID: 21915659 DOI: 10.1007/s00292-011-1515-2]
10 **Raslan WF**, Ro JY, Ordonez NG, Amin MB, Troncoso P, Sella A, Ayala AG. Primary carcinoid of the kidney. Immunohistochemical and ultrastructural studies of five patients. *Cancer* 1993; **72**: 2660-2666 [PMID: 8402487]
11 **Jimenez RE**, Folpe AL, Lapham RL, Ro JY, O'Shea PA, Weiss SW, Amin MB. Primary Ewing's sarcoma/primitive neuroectodermal tumor of the kidney: a clinicopathologic and immunohistochemical analysis of 11 cases. *Am J Surg Pathol* 2002; **26**: 320-327 [PMID: 11859203]
12 **Guy L**, Bégin LR, Oligny LL, Brock GB, Chevalier S, Aprikian AG. Searching for an intrinsic neuroendocrine cell in the kidney. An immunohistochemical study of the fetal, infantile and adult kidney. *Pathol Res Pract* 1999; **195**: 25-30 [PMID: 10048091]
13 **Armah HB**, Parwani AV, Perepletchikov AM. Synchronous primary carcinoid tumor and primary adenocarcinoma arising within mature cystic teratoma of horseshoe kidney: a unique case report and review of the literature. *Diagn Pathol* 2009; **4**: 17 [PMID: 19523243 DOI: 10.1186/1746-1596-4-17]
14 **Zak FG**, Jindrak K, Capozzi F. Carcinoidal tumor of the kidney. *Ultrastruct Pathol* 1983; **4**: 51-59 [PMID: 6857764]
15 **Unger PD**, Russell A, Thung SN, Gordon RE. Primary renal carcinoid. *Arch Pathol Lab Med* 1990; **114**: 68-71 [PMID: 2403781]
16 **Krishnan B**, Truong LD, Saleh G, Sirbasku DM, Slawin KM. Horseshoe kidney is associated with an increased relative risk of primary renal carcinoid tumor. *J Urol* 1997; **157**: 2059-2066 [PMID: 9146580]
17 **Canacci AM**, MacLennan GT. Carcinoid tumor of the kidney. *J Urol* 2008; **180**: 2193 [PMID: 18804792 DOI: 10.1016/j.juro.2008.08.011]
18 **Bégin LR**, Guy L, Jacobson SA, Aprikian AG. Renal carcinoid and horseshoe kidney: a frequent association of two rare entities--a case report and review of the literature. *J Surg Oncol* 1998; **68**: 113-119 [PMID: 9624041]
19 **Kurl S**, Rytkönen H, Farin P, Ala-Opas M, Soimakallio S. A primary carcinoid tumor of the kidney: a case report and review of the literature. *Abdom Imaging* 1996; **21**: 464-467 [PMID: 8832873]
20 **Sahin A**, Demirbaş M, Ozen H, Sungur A, Küçükali T, Aygün N, Remzi D. Primary carcinoid of the kidney. *Scand J Urol Nephrol* 1996; **30**: 325-327 [PMID: 8908658]
21 **Moulopoulos A**, DuBrow R, David C, Dimopoulos MA. Primary renal carcinoid: computed tomography, ultrasound, and angiographic findings. *J Comput Assist Tomogr* 1991; **15**: 323-325 [PMID: 2002118]
22 **Tal R**, Lask DM, Livne PM. Metastatic renal carcinoid: case report and review of the literature. *Urology* 2003; **61**: 838 [PMID: 12670585]
23 **Chu LC**, Hruban RH, Horton KM, Fishman EK. Mixed epithelial and stromal tumor of the kidney: radiologic-pathologic correlation. *Radiographics* 2010; **30**: 1541-1551 [PMID: 21071374 DOI: 10.1148/rg.306105503]
24 **Iacovelli R**, Altavilla A, Ciardi A, Urbano F, Manai C, Gentile V, Cortesi E. Clinical and pathological features of primary renal synovial sarcoma: analysis of 64 cases from 11 years of medical literature. *BJU Int* 2012; **110**: 1449-1454 [PMID: 22452647 DOI: 10.1111/j.1464-410X.2012.11105.x]
25 **Katabathina VS**, Vikram R, Nagar AM, Tamboli P, Menias CO, Prasad SR. Mesenchymal neoplasms of the kidney in adults: imaging spectrum with radiologic-pathologic correlation. *Radiographics* 2010; **30**: 1525-1540 [PMID: 21071373 DOI: 10.1148/rg.306105517]
26 **Moch H**. Cystic renal tumors: new entities and novel concepts. *Adv Anat Pathol* 2010; **17**: 209-214 [PMID: 20418675 DOI: 10.1097/PAP.0b013e3181d98c9d]
27 **Parienty RA**, Pradel J, Imbert MC, Picard JD, Savart P. Computed tomography of multilocular cystic nephroma. *Radiology* 1981; **140**: 135-139 [PMID: 7244215]
28 **Zhou M**, Kort E, Hoekstra P, Westphal M, Magi-Galluzzi C, Sercia L, Lane B, Rini B, Bukowski R, Teh BT. Adult cystic nephroma and mixed epithelial and stromal tumor of the kidney are the same disease entity: molecular and histologic evidence. *Am J Surg Pathol* 2009; **33**: 72-80 [PMID: 18971776 DOI: 10.1097/PAS.0b013e3181852105]
29 **McCaffrey JA**, Reuter V, Herr HW, Macapinlac HA, Russo P, Motzer RJ. Carcinoid tumor of the kidney. The use of somatostatin receptor scintigraphy in diagnosis and management. *Urol Oncol* 2000; **5**: 108-111 [PMID: 10765017]

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