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Case Report

Giant cellular schwannoma of the kidney with peripheral lymphocytic cuffing: a case report and literature review

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Abstract: Renal cellular schwannoma is anextraordinarily rare neoplasm with an unusual location; the diagnosis is based entirely on histological and immunohistochemical evaluations. We report a renal cellular schwannoma with peripheral lymphocytic cuffing in a 62-year-old woman who was incidentally found to have an renal-occupying lesion during a routine medical examination. Computed tomography revealed a 72 mm×100 mm soft tissue mass in the right renal parenchyma and extended into the renal hilum. The patient underwent right radical nephrectomy. Histological examination of the tumor showed the histologic features of cellular schwannoma with a well-circumscribed, encapsulated spindle cell lesion. The spindle cells were arranged in whorls and intersecting fascicles. To be noted, the mass was surrounded by a discontinuous cuff of benign lymphoid hyperplasia with lymphoid follicle formation. On immunohistochemistry, the tumor cells were strongly positive for S-100, NSE, Vimintin and CD99 expression, but negative for HMB-45, Melan-A, CD117, Dog-1, bcl-2, SMA, CD34, Desmin, EMA and CKpan. The final histopathological diagnosis was renal cellular schwannoma.

Keywords: Kidney, cellular schwannoma, differential diagnosis, treatment

Introduction

Schwannomas are uncommon benign tumors, which originate from the schwann cells of the peripheral nerve sheath and are commonly found in the head and neck, extremities, and posterior mediastinum [1]. Although schwannomas occuring in the retroperitoneum account for 1 to 3% of all schwannomas and 1% of all retroperitoneal tumors, involvement of visceral organs is extremely uncommon [2]. Cellular schwannomas of the kidney are even more rare, with a limited number of cases has been reported. A lymphoid cuff with germinal centers typically surrounded tumor was often presented in the gastrointestinal tract schwannomas, but involvement of the kidney has been rarely reported, and to the best of our knowledge, only two cases were reported in the English-language literature so far. Herein we report a case of a large cellular schwannoma of the kidney with peripheral lymphocytic cuffing, including clinical and histopathological features, clinical prognosis, and diagnostic and therapeutic approaches, and following a comprehensive literature review.

Materials and methods

Clinical data

A 62-year-old woman was discovered to be affected with a large mass of the right kidney during an incidental abdominal ultrasound while undergoing a medical examination for health checkup. The patient had no flank and colicky pain, no other urologic symptoms and no history of gross hematuria or previous related illnesses. A CT program demonstrated mildly enhancing solid, irregular and non-homogeneous mass measuring approximately 7.2 cm×10.0 cm, arose in the right renal parenchyma and extended into the renal hilum (**Figure 1A**, **1B**). In addition, the renal tumor was well

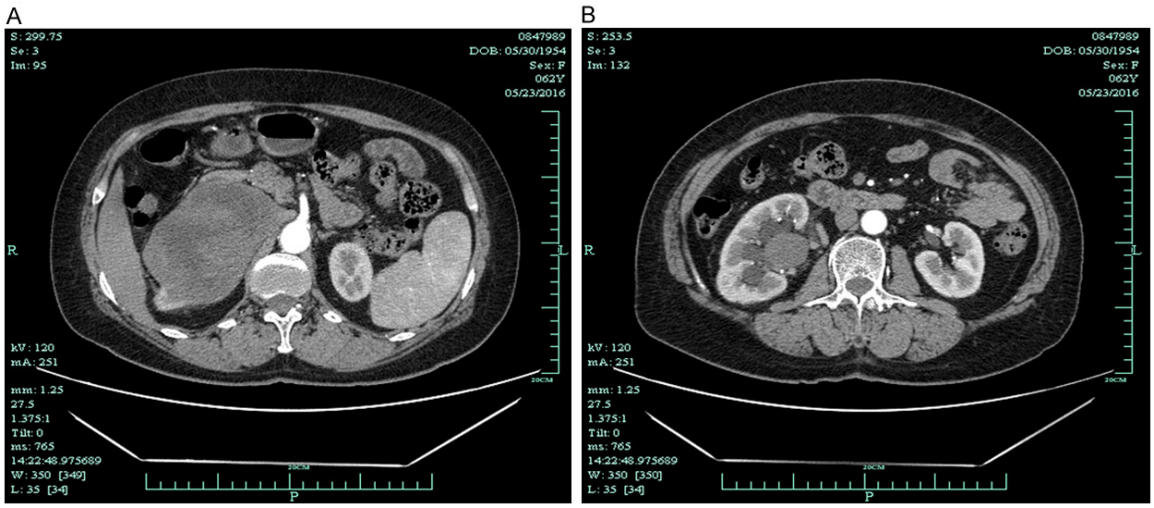

Figure 1. CT findings revealed a mildly enhancing solid, irregular and non-homogeneous mass measuring approximately 7.2 cm×10.0 cm, arose in the right renal parenchyma and extended into the renal hilum (A and B).

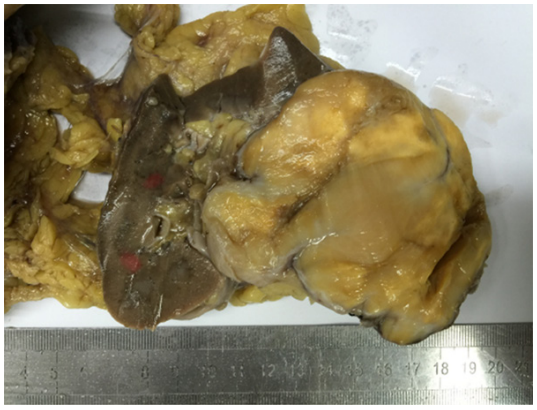

Figure 2. On gross examination, the excised kidney revealed a 4.0 cm×9.0 cm×7.0 cm mass locate in the middle-upper pole of the kidney, which was extended into the renal hilum and was surrounded by a whitish fibrous capsule with oval shaped and lobulated external surface. Cut surface appeared firm, yellowish and lobular in composition.

demarcated from the adjacent renal parenchyma, and covered by fibrous capsule. The mass pushed the right renal artery and mildly compressed the renal pelvis, but no dilation of the bilateral ureters and didn't cause hydronephrosis. The left kidney and urinary bladder were normal, and the workup was with normal limits.

The mass was assumed to be a malignant tumor and the patient underwent a right radical nephrectomy. Surgery revealed a right kidney tumor adherent to the perirenal adipose tissue, but the right adrenal gland, abdominal aorta and inderior vena cava were not involved. No enlarged perirenal and periaortic lymph nodes were observed. Our patient was not given any treatment after operation, and with a follow-up period of 5 months, no clinical and radiological evidence of recurrence and metastasis was found.

Methods

Specimens were fixed in 10% formalin, dehydrated, and embedded in paraffin for 4 μm sections. After HE staining and immunohistochemical staining, the slides were observed under light microscopy. Immunohistochemical studies using the avidin-biotin-complex immunoperoxidase technique were performed. The following commercially available antibodies were used in present case: S-100, NSE, Vimintin, CD99, HMB-45, Melan-A, CD117, Dog-1, bcl-2, SMA, CD34, Desmin, EMA , CKpan and Ki-67.

Results

Pathological examination

On gross examination, the excised kidney revealed a 4.0 cm×9.0 cm×7.0 cm mass locate in the middle-upper pole of the kidney, which was extended into the renal hilum and was surrounded by a whitish fibrous capsule with oval shaped and lobulated external surface. Its cut surface appeared firm, yellowish and lobular in composition (**Figure 2**).

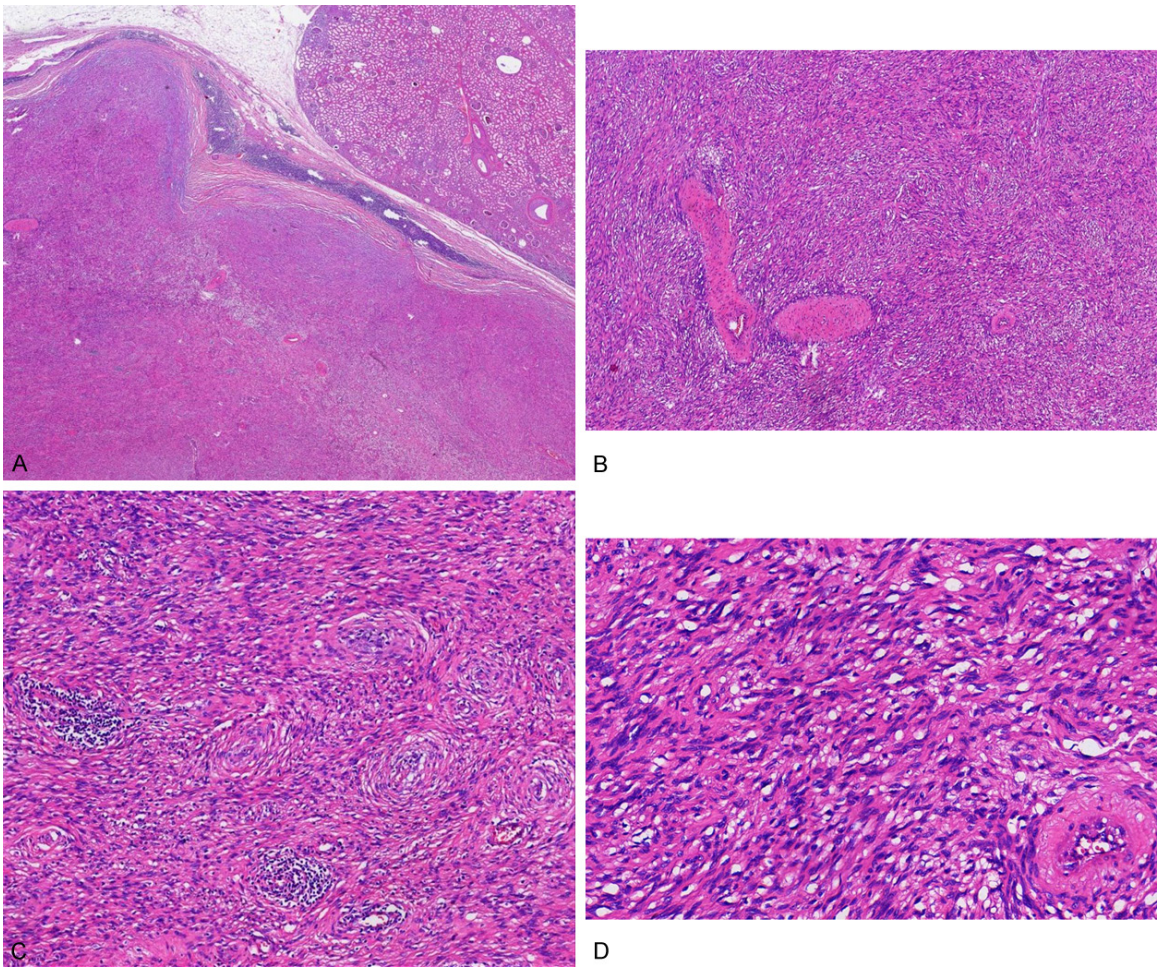

Figure 3. Microscopic features of renal cellular schwannoma. A. The mass was a well-circumscribed, encapsulated spindle cell lesion and surrounded by a discontinuous cuff of benign lymphoid hyperplasia with lymphoid follicle formation (Hematoxylin-eosin [H&E], 25×). B. The mass displayed the histologic features of cellular schwannoma, and the spindle cells were arranged in whorls and intersecting fascicles and thick-walled, hyalinised blood vessels were present (HE, 40×). C. The stroma was infiltrated by lymphoid cells (HE, 100×). D. Interlacing bundles of spindle cells showed mitotic figures were rare, and no nuclear atypia was noted (HE, 200×).

Microscopically, the mass displayed the histological features of cellular schwannoma with a well-circumscribed, encapsulated spindle cell lesion. The spindle cells were arranged in whorls and intersecting fascicles. The mass displayed relatively uniform cellularity, but the characteristic histologic findings of a schwannoma, a highly ordered cellular component (Antoni A) that palisades (Verocay bodies) with a plus myxoid component (Antoni B), were not identified. Thick-walled, hyalinised blood vessels and foamy histiocytes were present. Interlacing bundles of spindle cells showed mitotic figures were rare, and no nuclear atypia was noted. Note worthily, the mass was surrounded by a discontinuous cuff of benign lymphoid hyperplasia with lymphoid follicle formation (**Figure 3**).

Immunohistochemical staining showed the neoplastic cells were positive for S-100 (**Figure 4A**), NSE (**Figure 4B**), Vimintin, CD99; the neoplastic cells were negative for HMB-45, Melan-A, CD117, Dog-1, bcl-2, SMA, CD34, Desmin, EMA and CKpan. Ki-67 nuclear proliferation index was positive about 5%. The final histological diagnosis was primary cellular schwannoma of the kidney.

Discussion

The majority of renal neoplasms are of epithelial origin, whereas renal mesenchymal tumors

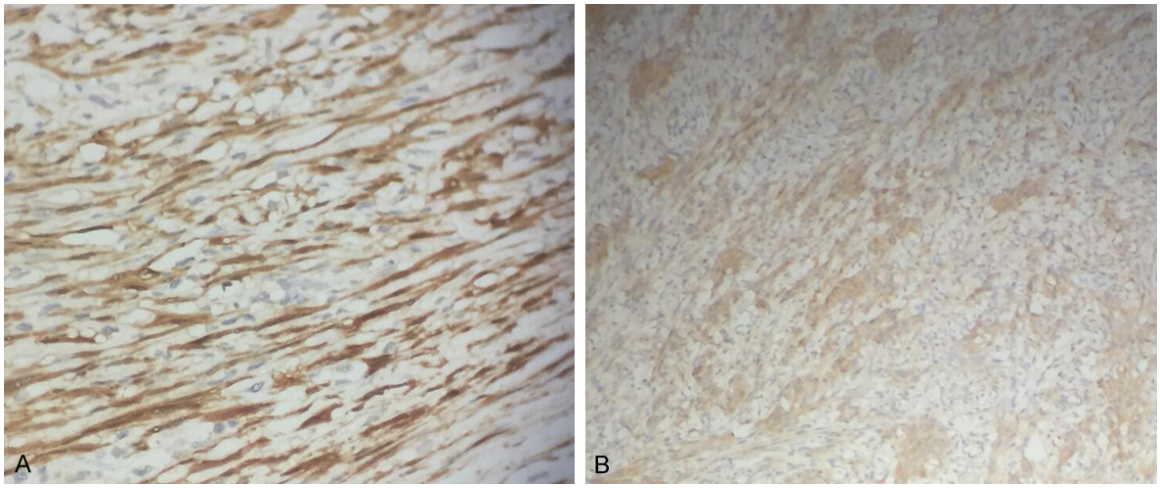

Figure 4. Immunohistochemically, neoplastic cells were diffuse positivity for S-100 (A, EnVision×50), NSE (B, EnVision×25).

are far uncommon, with angiomyolipoma is the most common benign mesenchymal neoplasm [3], but nerve sheath tumors of the kidney seem to be particularly rare, with only 29 cases have been previously reported in the English-language literature [4-25]. The clinicopathological features of all reported renal schwannomas are summarized in **Table 1** together with the current case. Most renal schwannomas were located in the renal hilum (35%) because sympathetic and parasympathetic nerve fibers of the kidney accompany the renal artery entering into the renal hilum. However, the tumor can arise from the renal cortex (34%), renal pelvis (17%) and renal capsule (14%) with similar ratio in upper and lower pole. The age of patients range from 18 to 89 years (average, 53 years), indicating that the tumor has been principally found in elderly adults. Significant differences from peripheral schwannomas, which is identical incidence rate for males and females, the renal schwannomas were greater prevalence in women. However, Yang (6) research literature showed renal schwannomas occurred predominantly in males (male: female ratio, 5:3). Our literature review revealed significant sex predominance (18 women and 12 men). Renal schwannomas are usually slow growing and asymptomatic, therefore they are often found incidentally in patients presenting with vague and nonspecific symptoms. The most common symptoms of a renal schwannoma were flank pain (31%) and a palpable mass (17%).

There are no tumor markers or imaging characteristics that allow a preoperative diagnosis, and all cases have been diagnosed after surgical resection. The diagnosis is based entirely on histopathological and immunohistochemical evaluations. Microscopically, the classic schwannoma is characterized by a mixture of Antoni A and Antoni B patterns. Antoni A areas consist of hypercellular spindle cell arranged in the palisading fashion (Verocay bodies), and Antoni B pattern is characterized by areas of less cellular and loosely textured [13]. Many distinct variants of schwannoma have been described: ancient, plexiform, cellular, melanotic, microcystic, and epithelioid. Cellular schwannoma is characterized by almost entirely Antoni A pattern growth and the absence of Verocay bodies [26]. Cellular schwannoma occurs in a similar age group as classic schwannoma but occurs most often in the retroperitoneum and display histopathologic features that may result in their misdiagnosis as sarcoma or sarcomatoid carcinoma. However, histopathologic features that allow for the correct diagnosis include the presence of ectatic, hyalinized blood vessels; small areas of less cellular Antoni B-type areas; clusters of foamy macrophages, and peripheral aggregates of lymphoid cells. Alymphoid cuff feature with germinal centers typically surrounded tumor was often presented in the gastrointestinal tract schwannomas, but involvement of the kidney have been rarely reported. In the limited reported renal schwannomas (**Table 1**), five cases were classified as cellular schwannomas, and two cases with a lymphatic cuff feature presented in the tumor marginal zone. The tumor of our patient showed a typical cellular schwannoma with hyalinised

Table 1. Summary of renal schwannoma cases reported in the English literature

Author/References	Patient Age/Gender	Location	Clinical Symptoms	Diagnosis	Treatment	Follow-up
Current case	62Y/F	Rt renal Intraparenchymal	Incidental finding	Cellular schwannomawith a lymphatic cuff feature	nephrectomy	5-month
Hanshima [4] 2015	56Y/F	Lt renal hilum	Incidental finding	Schwannoma	Tumorectomy	5-month
Verze [5] 2014	59Y/M	Rt Intraparenchymal upper pole	Asymptomatic	Melanotic schwannoma	nephrectomy	1-year
Yang [6] 2012	40Y/F	Lt renal pelvis	Flank pain	Schwannoma with a lymphatic cuff feature	nephrectomy	N/S
Sfoungaristos [7] 2011	55Y/F	Lt renal hilum	Flank and abdominal pain, nausea	Schwannoma	nephrectomy	6-month
Gobbo [8] 2008	35Y/F	Lt renal hilum	Abdominal pain, nausea	Schwannoma	nephrectomy	4-month
Gobbo [8] 2008	27Y/F	Rt Intraparenchymal mild-lower pole	Incidental finding	Ancient schwannoma	nephrectomy	8-month
Gobbo [8] 2008	59Y/F	Lt renal hilum	Asymptomatic	Schwannoma	nephrectomy	N/S
El-Bahrawy [9] 2008	55Y/M	Rt Intraparenchymal	Lower urinary tract symptoms	Cellular schwannomawith a lymphatic cuff feature	Tumorectomy	N/S
Hung [1] 2007	36Y/F	Lt Intraparenchymal	Palpable mass, flank pain	Schwannoma	nephrectomy	6-month
Singh [10] 2005	35Y/M	Rt renal pelvis	Flank pain, gross hematuria	Schwannoma	nephrectomy	24-month
Singh [10] 2005	40Y/M	Lt renal hilum	Renal colicky pain, vomiting	Schwannoma	nephrectomy	36-month
Cachay [11] 2003	74Y/F	Rt renal capsule	Asymptomatic	Malignant schwannoma	nephrectomy	5-month
Tsurusaky [12] 2001	69Y/F	Lt renal capsule	Incidental finding	Schwannoma	Tumorectomy	N/S
Alvarado-Cabrero [13] 2000	45Y/M	Lt Intraparenchymal	Flank and abdominal pain	Ancient schwannoma	nephrectomy	60-month
Alvarado-Cabrero [13] 2000	40Y/F	Lt Intraparenchymal	Flank pain, fever, abdominal mass, anemia	Cellular schwannoma	nephrectomy	12-month
Alvarado-Cabrero [13] 2000	84Y/M	Rt Intraparenchymal	Incidental finding	Cellular schwannoma	nephrectomy	54-month
Alvarado-Cabrero [13] 2000	18Y/F	Rt Intraparenchymal	Flank pain	Schwannoma	nephrectomy	42-month
Pantuck [14] 1996	50Y/F	Rt renal capsule	Palpable mass	Malignant schwannoma	nephrectomy	42-month
Singer [15] 1996	70Y/F	Lt hilum	Asymptomatic	Schwannoma	nephrectomy	18-month
Ikeda [16] 1996	89Y/M	Rt pelvis	Abdominal pain	Schwannoma	nephrectomy	N/S
Romics [17] 1992	52Y/M	Rt renal capsule	Back and flank pain, fever, anemia	Malignant schwannoma	nephrectomy	3-month
Naslund [18] 1991	50Y/F	Lt Intraparenchymal upper pole	Anemia, mild abdominal discomfort, weight loss	Malignant schwannoma	nephrectomy	15-month
Ma [19] 1990	67Y/M	Rt Intraparenchymal	Epigastric pain	Cellular schwannoma	nephrectomy	1-year
Kitagawa [20] 1990	51Y/M	Lt hilum	Upper abdominal pain and high fever	Cellular schwannoma	nephrectomy	N/S
Somers [21] 1988	55Y/F	Lt Intraparenchymal upper pole	Incidental finding	Schwannoma	nephrectomy	18-month
Steers [22] 1985	50Y/F	Rt hilum	Microhematuria, palpable mass	Schwannoma	Tumorectomy	N/S
Bair [23] 1978	56Y/M	Rt hilum	Hypertension, microhematuria	Schwannoma	nephrectomy	5-month
Fein [24] 1965	51Y/F	Rt pelvis	Recurrent pyelonephritis, palpable mass, pyuria	Schwannoma	nephrectomy	24-month
Phillips [25] 1955	56Y/M	Lt pelvis	Generalized malaise, weight loss, fever, flank pain, mild anemia	Schwannoma	nephrectomy	N/S

Y, years; M, male; F, female; Rt, right; Lt, light; N/S, not specified

growth pattern, and scattered lymphocytes and thick-walled, hyalinised blood vessels were typically seen, but no mitosis, necrosis and significant nuclear atypia. The tumor cells were positive for S-100, vimentin, NSE and CD99 expression, and negative for HMB-45, Melan-A, CD117, Dog-1, bcl-2, SMA, CD34, Desmin, EMA and CKpan. Ki-67 nuclear proliferation index was positive about 5%. Therefore, the final diagnosis was cellular schwannoma of the kidney with peripheral lymphocytic cuffing.

The differential diagnosis include low-grade malignant peripheral nerve sheath tumor, angiomyolipoma, sarcomatoid renal cell carcinoma, leiomyoma, low-grade leiomyosarcoma, and angiosarcoma. The distinctive clinical, histologic, and immunohistochemical findings usually permit a definitive diagnosis. S-100 immunostaining has been proposed to be a useful tool in the differential diagnosis and specific for the neoplasm arising from neural crest [13]. Distinguishing PEComa (angiomyolipoma) might be easy, because the tumor label for melanocytic markers, human melanoma black (HMB-45) and melan A, however, not for S-100 protein. Cellular schwannoma is mainly distinguished from malignant peripheral nerve sheath tumor by well-circumscribed, the smaller cell size, presence of thick-walled blood vessels or foamy histiocytes, infrequent mitotic figures and lack of significant cytologic atypia, nuclear pleomorphism, and necrosis [11]. The most important distinction is with sarcomatoid renal cell carcinoma, which may have extensive areas with a spindled growth pattern, but careful inspection should reveal focal areas of more typical appearing carcinoma [3]. Moreover, sarcomatoid renal cell carcinomas are destructive and infiltrative and do not show the well-defined capsule seen in schwannoma. Again, immunohistochemistry may be valuable, as sarcomatoid carcinomas should show at least focal areas of cytokeratin expression and would not be expected to strongly express S-100 protein. Different markers were used to exclude other spindle cell lesions. SMA and desmin (Markers for smooth muscle differentiation) were negative excluding a leiomyomatous lesion, and CD34 was used to exclude angiosarcoma, whereas NSE expression confirmed neural differentiation.

Tumorectomy or radical nephrectomy seems to be the only definite treatment for renal schwannoma, as it is impossible to distinguish between benign and malignant schwannomas given the similarity in their appearance. Furthermore, these tumors are usually thought to be renal cell carcinoma before surgery, radical nephrectomy is commonly performed. Open or laparoscopic methods are equally effective approaches. For small renal masses and specific location, a tumorectomy for the preservation of the healthy renal parenchyma is the standard of treatment [27]. Almost all the patients described in the reviewed literature (including the present case) underwent nephrectomy; only 4 reported cases underwent tumorectomy.

Conclusion

We reported a case of renal cellular schwannoma with peripheral lymphocytic cuffing and reviewed all of the previously published cases. Although cellular schwannoma arising from the kidney is extremely rare and clinically behave in a benign fashion, it must be considered in the differential diagnosis of spindle cell lesions of the kidney. There are no useful preoperative diagnostic hallmarks of renal schwannoma on imaging studies, but it is easy to differentiate from other real tumors by histopathological examination based on immunohistochemical expression of S-100 protein. Given the benign clinical course, nephron-sparing surgery would be an option if this diagnosis could be established before radical surgery.

Disclosure of conflict of interest

None.

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