Case Report

INTRODUCTION

Neurinoma or more precisely schwannoma is a benign nerve sheath tumor, which involves Schwann cells mostly found in the head, neck, posterior mediastinum and extremities. Schwannoma develops rarely in the retroperitoneum; thus, renal schwannoma is extremely uncommon. Differentiation of renal schwannoma from renal cell carcinoma is difficult with radiologic analysis. A few cases of these tumors have been reported in literature, and little has been described regarding imaging appearances. In this study, we present a rare case of a renal schwannoma, resembling renal cell carcinoma, with radiologic correlations.

Index terms
Kidney
Neurilemmoma
Nerve Sheath Neoplasms

CASE REPORT

A 66-year-old male patient was presented with abdominal pain of 1-month duration. He was referred to our hospital for further examination of solid masses in the liver and upper pole of the right kidney found in an outside abdominal computed tomography (CT) and ultrasonography (US). He had been on medications for ulcerative colitis for 7 years. He had a normal heart rate of 70 beats per minute, with a blood pressure of 130/84 mm Hg. His respiratory rate was 18 breaths per minute and the body temperature was in normal range. The results of laboratory studies, which included a complete blood count, a blood chemistry analysis, urinalysis, and a urine culture, were within normal range except for showing elevated aspartate aminotransferase, alanine aminotransferase (130, 49 IU/L), and protein induced vitamin K antagonist-II (26773 mAU/mL). Serologic examination on admission was negative for hepatitis B surface antigen, hepatitis B and C virus antibodies.
The US, performed at the previous hospital, revealed circumscribed and heterogeneously echogenic mass in the segment eight of the liver without evidence of liver cirrhosis. On CT, a large and heterogeneously enhanced mass with cystic and necrotic portions measuring about 11.2 cm in diameter was detected in the upper pole of the right kidney (Fig. 1A). The renal vessels were deviated due to the mass effect of the large mass. Presence of vascular invasion was not definite.

After his hospital admission, magnetic resonance imaging (MRI) with contrast material (Primovist, Bayer Healthcare, Berlin, Germany) was performed using 3T system (Skyra, Siemens Healthcare, Erlangen, Germany) to evaluate the mass lesion in the liver and the kidney. MRI revealed a large mass in the right kidney with heterogeneously hypersignal intensity on T2-weighted images and heterogeneously hyposignal intensity on T1-weighted images. Multifocal hypersignal intensities in the mass on T1-weighted images suggested hemorrhagic portions and central necrosis was shown as ill demarcated hypersignal intensity in the mass on T2-weighted images. Contrast-enhanced T1-weighted imaging showed inhomogeneous enhancement in the renal mass on portal phase. Diffusion weighted imaging showed hypersignal intensity with a high b-value (800 s/mm²) but a low apparent diffusion coefficient value at the solid portion of the mass (Fig. 1B). Taken together, the imaging features of a mass in the kidney on CT and MRI suggested a renal cell carcinoma or renal metastasis from the hepatocellular carcinoma.

The imaging features of a mass in the liver on CT and MRI suggested a hepatocellular carcinoma. The patient underwent a right anterior sectionectomy and right radical nephrectomy, which was performed without complication.

Gross pathological evaluation of the right nephrectomy specimen revealed an ill-demarcated, yellow multilobulated mass with cystic degeneration, measuring 12.2 cm in maximal dimension (Fig. 1C). On microscopic evaluation, the section from the renal mass is mostly composed of spindle cells (Fig. 1D). Tumor cells were immunoreactive with S-100 protein and non-immunoreactive for smooth muscle actin and Human Melanoma Black-45. Ki-67 labeling index was less than 1%. Based on these findings, a diagnosis of intrarenal schwannoma was determined. In addition, the mass in the liver was pathologically proven to be hepatocellular carcinoma.

**DISCUSSION**

A schwannoma is a benign tumor that arises from the myelinated nerve. Retroperitoneal schwannomas are rare, accounting for 3% of all schwannomas (4). Its presence in the kidneys is extremely uncommon. In many cases, it originates from renal hilum because parasympathetic nerve fibers of the kidney accompany the renal artery, which enters into the renal hilum (3, 5). Sometimes renal schwannomas are located in renal parenchyma and mimic renal cell carcinoma (3). Renal schwannomas oc-

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**Fig. 1.** Renal schwannoma in a 66-year-old man.

A. Axial, coronal and sagittal contrast-enhanced computed tomography images reveal heterogeneously enhanced mass with cystic portions (white arrows) measuring approximately 11.2 cm in diameter in the upper pole of the right kidney. Renal vessels are deviated due to mass effect of the large mass (arrowheads). The heterogeneously enhanced mass in the liver is pathologically proven to be hepatocellular carcinoma (black arrow).
cur most commonly in patients between 40 and 60 years of age, predominantly in females (5, 6). They are slowly growing and asymptomatic, and renal schwannomas are often found incidentally in patients presenting with nonspecific symptoms including abdominal pain, microhемaturia, fever, palpable mass (3).

Typically, renal schwannomas appear as solitary, well-circumscribed, rounded masses with occasional lobulation and are associated with hemorrhage, cystic degenerations and calcifications (2, 7). The average size of this tumor has been reported as 10 cm and the masses varied in color from tan to yellow (3, 7).

Histologically, renal schwannoma is similar to that seen in other organs. The tumor consists of compact spindle cellular lesions (Antoni A tissue) and loosely arranged, hypocellular, myxoid lesions with microcystic spaces (Antoni B tissue) (2, 6–8). Tumor cells are immunohistochemically reactive with S-100 protein (2, 6–8). The current case had typical patterns of a schwannoma and

Fig. 1. Renal schwannoma in a 66-year-old man.
B. Axial T2-weighted turbo spin-echo and axial T1-weighted turbo spin-echo magnetic resonance images revealing a well-circumscribed, large mass with heterogeneously T2 hyperintensity and heterogeneously T1 hypointensity. Cystic portions (arrows) are shown in the mass on T2WI. Multifocal hyperintensities (arrowheads) in the mass on T1WI suggest hemorrhagic portions. Axial contrast-enhanced T1-weighted magnetic resonance imaging reveals inhomogeneous tumoral enhancement on portal phase. DWI (b-value = 800 s/mm²) reveals hyperintensity in solid portion of the mass. The mass demonstrates low ADC value.

ADC = apparent diffusion coefficient, DWI = diffusion weighted imaging, T1WI = T1-weighted image, T2WI = T2-weighted image
was positive for S-100 on immunostaining.

Image findings of renal schwannoma are documented in previous studies (3, 6, 8, 9). Ultrasound demonstrates renal schwannomas as hypoechoic and complex cystic lesions (8). Contrast-enhanced CT has been used to demonstrate renal schwannoma as well circumscribed, homogeneous or inhomogeneous, enhancing soft tissue mass (3, 6, 8, 9). It can also have areas of cystic degeneration, hemorrhage or calcification as can renal cell carcinoma. MRI has revealed that it has iso-intensity on T1-weighted images and hypersignal intensity on T2-weighted images. On Gadolinium-enhanced T1-weighted images, they can show a strong and homogeneous enhancement in the solid part of the tumor (3, 6, 8).

However, these image findings are not disease specific and cannot distinguish a renal schwannoma from other renal neoplasms. Differential diagnostic considerations include renal cell carcinoma, low-grade malignant peripheral nerve sheath tumor, sarcomatoid carcinoma, solitary fibrous tumor, leiomyoma, rhabdomyosarcoma, and angiosarcoma (5). Renal schwannoma in our case showed relatively well-demarcated margin and multinodular appearance. Despite large size of the tumor, invasion of renal vessels and tumor thrombosis, which may be relatively common in renal cell carcinoma, were not identified in our case.

Pathologic examination using fine-needle aspiration or renal biopsy would be the proper preoperative tools to differentiate renal masses. However, renal biopsy can be of limited value in the clinical practice mainly due to the possibility of tumor spread and false negative results (2).

Partial or radical nephrectomy is the treatment of choice for these tumors because these tumors are usually thought to be renal cell carcinoma before surgery (2, 3). Local recurrence and malignant changes are possible with benign schwannomas de-

![Image](image_url)

**Fig. 1.** Renal schwannoma in a 66-year-old man.

C. Gross specimen reveals a multilobulated mass, measuring 12.2 × 9.0 cm. On section, the cut surface reveals a yellowish to tan inhomogeneous appearance with cystic degeneration.

D. Histologic specimen reveals the section from the renal mass is mostly composed of spindle cells (hematoxylin and eosin stain, × 200). Tumor cells reveal diffuse positivity to S-100 immunostain (x 40).
spite a prior benign diagnosis (10). Therefore, complete resection of the tumor is very crucial and post-surgery follow-ups are necessary (2, 3).

In conclusion, we report a rare case of renal schwannoma with CT and MRI findings. Renal schwannoma presents as a well circumscribed, inhomogeneously enhancing soft tissue mass with cystic degeneration and hemorrhages on CT and MRI. Since these imaging features of renal schwannoma are nonspecific, proper pathologic examinations are important to distinguish a renal schwannoma from other renal neoplasms reliably.

REFERENCES

신장 신경초종의 영상 소견: 증례 보고 및 문헌 고찰

황성태1 · 성득재1* · 심기춘1 · 한나연1 · 박범진1 · 김민주1 · 이정현2

신경초종은 양성 신경막 종양으로 신경막 세포로 구성되어 있으며, 주로 두경부, 전종직동, 상·하지에서 발생한다. 신경초종은 후복막강에서도 발견되지만, 특히 신장 신경초종은 매우 희귀하며 영상검사만으로는 신장세포암과 감별이 어렵다. 신장 신경초종에 대한 문헌 보고는 많지 않으며, 특히 영상 소견을 중심으로 기술된 경우는 드물다. 이번 증례에서 신장 세포암과 유사하게 보일 수 있는 신장 신경초종에 대하여 기술하고, 영상의학적 특징에 대한 문헌고찰을 함께 하고자 한다.

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