

Renal Leiomyoma: Ultrasonography and Computed Tomography Features with Histopathologic Correlation

Renal Leomyom: Ultrasonografi ve Bilgisayarlı Tomografi Bulguları İle Histopatolojik Korelasyon

Mehmet Ruhi Onur¹, Mehmet Mustafa Akin², Ahmet Rahmi Onur³

¹University of Firat Faculty of Medicine, Department of Radiology, Elazig, Turkey

²University of Firat Faculty of Medicine, Department of Pathology, Elazig, Turkey

³University of Firat Faculty of Medicine, Department of Urology, Elazig, Turkey

Abstract

Renal leiomyomas are not uncommon mesenchymal neoplasms of the kidney, found in 5% of autopsy specimens and comprising 0.3% of all treated tumors. These tumors arise from the smooth muscle cells of the kidney and are mostly located in the renal capsule. Typical imaging features of renal leiomyomas include a peripheral location, well-defined margins, and hyperattenuation on nonenhanced computed tomography (CT) images. The differential diagnosis of renal leiomyomas includes benign and malignant solid neoplasms of the kidney. Familiarity with typical renal leiomyoma imaging findings may help in the management of these patients and prevent unnecessary surgery.

Key Words: Leiomyoma, kidney, ultrasonography, computed tomography

Özet

Renal leiomyomlar böbreklerin seyrek olmayan tümörlerinden olup otopsi spesimenlerinin %5'inde, tedavi edilen renal tümörlerin %0.3'ünde görülür. Bu tümörler böbreklerde düz kas hücrelerinden gelişirler ve çoğunlukla renal kapsül yerleşimlidirler. Renal leiomyomların tipik görüntüleme özellikleri periferik lokalizasyon, düzgün kontur ve kontrastsız bilgisayarlı tomografi görüntülerinde yüksek atenuasyonlu görünümdür. Renal leiomyomların ayırıcı tanısında böbreğin benign ve malign solid kitleleri yer alır. Renal leiomyomların görüntüleme özelliklerinin bilinmesi bu hastaların izleminde ve gereksiz cerrahi girişimlerin önlenmesinde yardımcı olur.

Anahtar Kelimeler: Leomyom, böbrek, ultrasonografi, bilgisayarlı tomografi

Introduction

While detection of a solid mass in the kidney necessitates excluding renal cell carcinoma, benign renal tumors have been found in 16.1% of patients preoperatively presumed to have renal cell carcinoma (RCC) [1]. Mesenchymal tumors of the kidney include both benign and malignant neoplasms and are usually manifested as a solid mass in the kidney. Benign mesenchymal tumors of the kidney may be treated with less invasive surgery or managed conservatively through follow-up imaging studies.

Renal leiomyomas are not uncommon mesenchymal neoplasms of the kidney, found in 5% of autopsy specimens and comprising 0.3% of all treated tumors. These tumors often detected incidentally secondary to the infrequency of clinical symptoms [2, 3]. Diagnosis of renal leiomyomas is often based on histopathologic assessment of nephrectomy specimens. Familiarity with typical renal leiomyoma imaging

findings may prevent unnecessary nephrectomies. In this case report, we present a case of renal leiomyoma with ultrasonography (US), computed tomography (CT) and histopathologic images.

Case Report

A 64-year-old man presented with a left renal mass incidentally detected on US. No symptoms suggesting renal abnormality were present. Urine analysis revealed no hematuria. Ultrasonographic examination revealed a 21x31 mm hypoechoic solid mass arising from the lower pole of the left kidney and extending to the perirenal area. A hyperechoic component was present within the mass (Figure 1a). No vascular flow was detected on color flow Doppler US (Figure 1b). Nonenhanced CT demonstrated a well-defined hyperattenuating solid mass involving the lower pole of the left kidney (Figure 1c). The density of the mass was measured as 45 HU

Received: March 24, 2013 / **Accepted:** May 5, 2013

Correspondence to: Mehmet Ruhi Onur, Firat Üniversitesi Hastanesi İnönü Caddesi 23270 Elazığ Turkey

Phone: +90 424 2333555-1381 Fax: 904242388096 e-mail: ruhionur@yahoo.com

doi:10.5152/eajm.2013.42



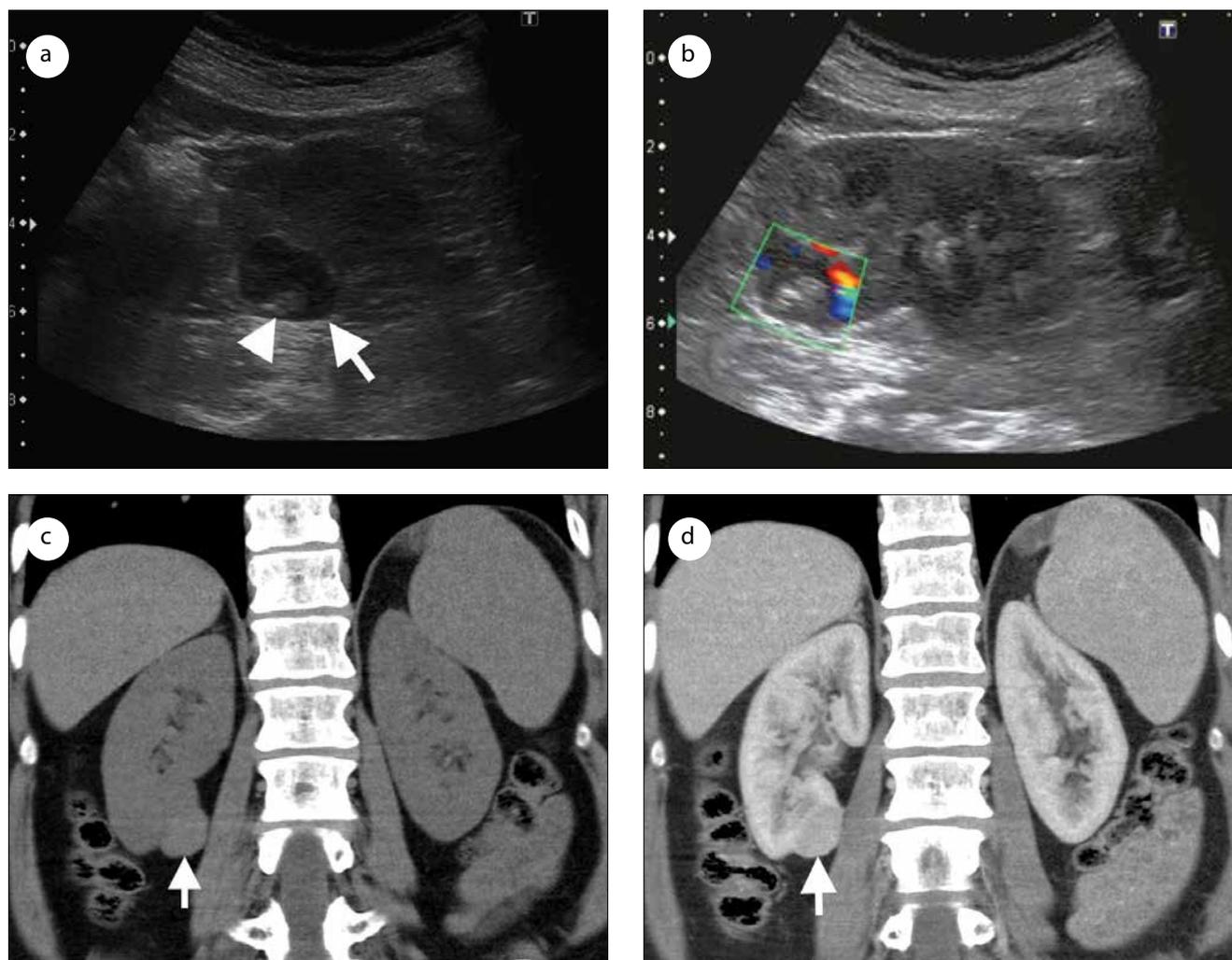


Figure 1. a-d. Renal leiomyoma. Gray scale ultrasound demonstrates an exophytic, solid, well-defined hypoechoic mass (arrow) arising from the kidney. A hyperechoic solid component (arrowhead) is observed within the mass (a). Color flow Doppler ultrasound reveals no vascular flow in the mass (b). Coronal nonenhanced CT image demonstrates an exophytic, well-defined, hyperattenuating mass (arrow) in comparison to renal parenchyma (c). Renal leiomyoma enhances (arrow) less than adjacent normal renal parenchyma on contrast enhanced CT image obtained at nephrographic phase (d).

on unenhanced CT. Contrast enhanced CT images obtained during the nephrographic phase (100 s after intravenous contrast enhancement) revealed homogeneously enhanced solid mass, slightly less dense than normal renal parenchyma, with a density unit of 142 HU (Figure 1d). The patient underwent surgery because RCC could not be ruled out. A partial nephrectomy to remove the mass was performed and histopathologic examination of a frozen section of the mass during the procedure revealed no malignant cells. Final histopathologic examination ruled the removed specimen a renal leiomyoma adjacent to renal capsule. Microscopic examination of the mass revealed interlacing bundles of smooth muscle cells without the nuclear pleomorphism or mitotic figures characteristic of renal leiomyoma (Figures 2a and 2b).

Discussion

Benign renal neoplasms are classified into renal cell, metanephric, mesenchymal, mixed epithelial and mesenchymal, neuroendocrine, and germ cell tumors [4, 5]. Benign mesenchymal tumors consist of angiomyolipomas, leiomyomas, hemangiomas, lymphangiomas, juxtaglomerular cell tumors, renomedullary interstitial cell tumors (medullary fibromas), lipomas, solitary fibrous tumors, and schwannomas. Malignant mesenchymal tumors of kidney include leiomyosarcomas, rhabdomyosarcomas, angiosarcomas, osteosarcomas, synovial sarcomas, fibrosarcomas, malignant fibrous histiocytomas, and solitary fibrous tumors [6].

Renal leiomyomas are benign neoplasms of the kidney. While these neoplasms arise most frequently from the renal

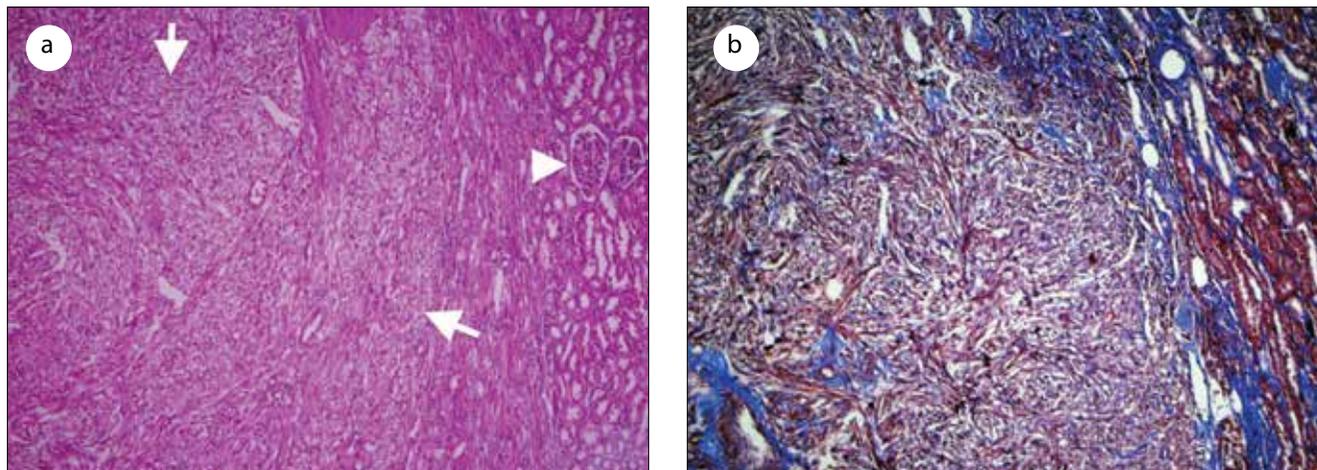


Figure 2. a, b. Renal leiomyoma. Photomicrograph (original magnification, x40; hematoxylin-eosin stain) of a renal leiomyoma reveals sheets of spindle cells (arrows) adjacent to normal renal parenchyma (arrowhead) (a). Smooth muscle cells of leiomyoma and stromal tissue appear with red and blue colors respectively. Masson trichrome stain was performed (b).

capsule, they can also originate from the muscularis of the renal pelvis or from cortical vascular smooth muscles [2]. Renal leiomyomas typically manifest as a small asymptomatic renal mass, although large renal leiomyomas may cause pain, a palpable flank mass and hematuria. Small renal leiomyomas appear as homogeneous enhancement on CT and magnetic resonance imaging (MRI) while large renal leiomyomas may show areas of hemorrhage and cystic or myxoid degeneration on imaging [2, 7]. Typical imaging features of renal leiomyomas include hyperattenuation on nonenhanced CT images, peripheral location, well-defined margins and associated buckling of the renal cortex [7]. Calcification occurs uncommonly in renal leiomyomas [2]. On MRI, renal leiomyomas manifest with low signal intensity on T1- and T2-weighted images.

The differential diagnosis of renal leiomyomas includes benign and malignant solid masses. Angiomyolipomas and lipomas may be differentiated from renal leiomyomas by determination of lipid content on CT and MRI. Monotypic epithelioid angiomyolipomas may mimic renal leiomyomas with overlapping features including soft tissue attenuation and lipid-poor appearance on CT. Typical imaging features of renal hemangiomas include localization to the renal pelvis or medulla in ninety percent (90%) of cases, presence of phleboliths and calcifications within the mass and characteristic enhancement pattern on CT [6]. Lymphangiomas manifest as cystic masses. Juxtglomerular cell tumors present as hypoattenuating cortical masses on nonenhanced CT images and as hypovascular masses in the arterial phase of enhanced CT images due to renin-induced vasoconstriction [4, 8]. Renomedullary interstitial tumors, also referred to as medullary fibromas, arise from the renal

medulla and appear as nonenhancing hypoattenuating solid mass on CT [4]. Large medullary fibromas may protrude into the renal pelvis. Solitary fibrous tumors of the kidney are spindle cell neoplasms which may arise from the renal sinus or capsule. The imaging features solitary fibrous tumors of kidney include large size, a well-circumscribed lobulated appearance and relatively homogenous enhancement after intravenous contrast administration.

Malignant mesenchymal tumors of the kidney may also mimic renal leiomyomas. Leiomyosarcomas may arise from the renal capsule, renal parenchyma, renal pelvis, or the main renal vein. Leiomyosarcomas differ from renal leiomyomas on CT by their expansile appearance and heterogeneous enhancement after intravenous contrast administration. The fibrous stroma of renal leiomyosarcomas manifests with delayed enhancement on CT. The main differences between histopathologic findings of renal leiomyoma and renal leiomyosarcoma are the presence of nuclear pleomorphism, mitoses and necrosis. Renal fibrosarcomas are an extremely rare malignancy of the kidney, arising from the renal capsule and presenting as a large, heterogeneously enhanced tumor commonly extending to the perirenal or retroperitoneal space.

The hyperattenuating appearance of renal leiomyoma on nonenhanced CT is an important clue in differential diagnosis. Hyperattenuating solid renal masses on CT include hematomas, benign and malignant renal cysts, angiomyolipomas, RCC, and metanephric adenomas [9]. Renal leiomyomas tend to enhance continuously and homogeneously on dynamic CT images in contrast to RCCs, which often show marked and heterogeneous enhancement at the corticomedullary phase, decreasing at the nephrographic phase. Frequent occurrence of hemorrhage and necrosis, presence of calcification

in 20% of patients and presence of slightly high intensity on T2-weighted MR images differentiates metanephric adenoma from renal leiomyoma [10].

In conclusion, improvements in renal surgery provided organ sparing surgery (partial nephrectomy) and less invasive interventions (ablation of renal masses). These alternative treatments and follow-up of renal masses highlighted the importance of characterizing renal masses as benign or malignant. With advances in histopathology, immunocytochemistry, and cytogenetics, percutaneous renal mass biopsy has been increasingly used resulting in increased accuracy in characterizing renal masses. Familiarity with typical renal leiomyoma imaging findings may help in management of these patients and prevent unnecessary surgery.

Conflict of interest statement: The authors declare that they have no conflict of interest to the publication of this article.

References

1. Kutikov A, Fossett LK, Ramchandani P, et al. Incidence of benign pathologic findings at partial nephrectomy for solitary renal mass presumed to be renal cell carcinoma on preoperative imaging. *Urology* 2006; 68: 737–40. [\[CrossRef\]](#)
2. Steiner M, Quinlan D, Goldman SM, et al. Leiomyoma of the kidney: presentation of 4 new cases and the role of computerized tomography. *J Urol* 1990; 143: 994–8.
3. Romero FR, Kohanim S, Lima G, Permpongkosol S, Fine SW, Kavoussi LR. Leiomyomas of the kidney: emphasis on conservative diagnosis and treatment. *Urology* 2005; 66: 1319. [\[CrossRef\]](#)
4. Prasad SR, Surabhi VR, Menias CO, Raut AA, Chintapalli KN. Benign renal neoplasms in adults: cross-sectional imaging findings. *AJR Am J Roentgenol* 2008; 190: 158-64. [\[CrossRef\]](#)
5. Tamboli P, Ro JY, Amin MB, Ligato S, Ayala AG. Benign tumors and tumor-like lesions of the adult kidney. Part II: Benign mesenchymal and mixed neoplasms, and tumor-like lesions. *Adv Anat Pathol* 2000; 7: 47-66. [\[CrossRef\]](#)
6. 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: 1525-40. [\[CrossRef\]](#)
7. Nagar AM, Raut AA, Narlawar RS, Bhatgadde VL, Rege S, Thapar V. Giant renal capsular leiomyoma: study of two cases. *Br J Radiol* 2004; 77: 957-8. [\[CrossRef\]](#)
8. Tanabe A, Naruse M, Ogawa T, et al. Dynamic computer tomography is useful in the differential diagnosis of juxtaglomerular cell tumor and renal cell carcinoma. *Hypertens Res* 2001; 24: 331-6. [\[CrossRef\]](#)
9. Silverman SG, Morteale KJ, Tuncali K, Jinzaki M, Cibas ES. Hyperattenuating renal masses: etiologies, pathogenesis, and imaging evaluation. *Radiographics* 2007; 27: 1131-43. [\[CrossRef\]](#)
10. Cong Z, Gong J, Wang Y. Radiological findings of renal leiomyomas: a report of five surgically confirmed cases. *Abdom Imaging* 2011; 36: 604-8. [\[CrossRef\]](#)