

Iatrogenic renal arteriovenous fistula

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Section: Interventional radiology

Area of Interest: Abdomen Abdominal wall

Procedure: Imaging sequences

Procedure: Biopsy

Procedure: Education

Procedure: Contrast agent-intravenous

Procedure: Diagnostic procedure

Imaging Technique: CT

Imaging Technique: CT-Angiography

Imaging Technique: Ultrasound-Colour Doppler

Imaging Technique: Ultrasound-Spectral Doppler

Imaging Technique: Catheter arteriography

Special Focus: Dilatation Blood Fistula Case Type: Clinical Cases

Authors: Nersesyan N, Cuñat-Romero A, Rengel-Ruiz M, Sanchis-Garcia JM, Bosca-Ramon A, Chicote-Huete H.

Patient: 60 years, female

Clinical History:

A 60-year-old patient presenting with haematuria and decreasing Hb levels was evaluated in the emergency department to rule out active bleeding. The patient had undergone US-guided biopsy of the kidney one week before.

Imaging Findings:

Abdominal CT was performed without (Fig. 1 a, b, c) and with contrast administration in the arterial (Figure 1d) and venous (Figure 1e) phases ruling out active bleeding. Blood clots in the bladder could be seen (Figure 1c). After careful examination of the renal vascularisation, no abnormal communications were identified.

Due to a high degree of clinical suspicion, the patient was evaluated with Doppler US (Fig. 2) where, after careful examination, abnormal spectral waveforms were identified (Fig. 2 d), accompanied by low resistive index in the segmental arteries of the inferior aspect of the left kidney (Fig. 2c).

The patient was then referred for vascular interventional examination, identifying small vascular pseudoaneurysms feeding on the inferior interlobar arteries (Fig. 3a) with early enhancement of the draining vein (Fig. 3b).

As the findings were consistent with a renal arteriovenous shunt, a treatment with coil embolisation (Fig. 3c) was proposed, rendering the following resolution of the lesion (Fig. 3d).

Discussion:

Renal arteriovenous shunts (AVS) are abnormal direct connections of an artery to a vein without an intervening capillary bed. Considered rare in the general population, their actual prevalence might be higher because many patients remain clinically asymptomatic. [1]

Attending to aetiology, AVS can be classified as traumatic and non-traumatic. Most renal AVS are iatrogenic and frequently occur after renal biopsy. [2] A reported incidence of up to 11% has been observed in some studies. [3] Patients may present with symptoms such as haematuria and flank pain, although most would remain asymptomatic. [2] Iatrogenic AVS are frequently solitary involving a single direct communication between the renal artery and adjacent vein. [1]

Colour Doppler US is a useful screening tool for renal AVS, especially following renal biopsy.

The characteristic findings of Doppler US are the presence of decreased resistive index of the feeding artery with the presence of arterial waveforms in the outflow vein. [4]

In both CT angiography and MR angiography, renal AVS are characterised by a single dilated feeding artery and early enhancement of a dilated draining vein. CT images without contrast administration can reveal renal bleeding and the presence of calcifications.

We believe that in our case, the small renal AVS was missed due to an inappropriate (too early) scanning time. At least 32 detectors for multi-detector CT is preferable for the detection of small AV because high-flow shunt may be missed in the case of inappropriate scan timing. [1]

DSA remains the definitive procedure for evaluating the detailed vascular anatomy and haemodynamics of renal AVS. DSA should be used for pretherapeutic evaluation or in cases where renal AVS is suspected but has not been detected with other modalities. [1]

Although most renal AVS resolve spontaneously without treatment, transcatheter coil embolisation is the treatment of choice for symptomatic cases. [2] The successful embolisation of renal AVS requires a complete occlusion of the shunted vessel while preventing the migration of embolic materials and preserving natural renal arterial branches. [1]

Pseudoaneurysms are usually present in AVS of traumatic origin; those coils can be used to achieve the obliteration of the AVS and the associated small pseudoaneurysm. [1]

Renal infarction and thrombosis are the two main complications of coil embolisations. Heparin administration is recommended in some studies at least until the first evaluation with follow-up US or CT. [5]

Surgical treatment may be of use in larger renal AVS. [2]

Differential Diagnosis List: Iatrogenic renal arteriovenous shunt, Renal arteriovenous malformation, Renal aneurysm

Final Diagnosis: Iatrogenic renal arteriovenous shunt

References:

Maruno M et al. (2016) Renal Arteriovenous Shunts: Clinical Features, Imaging Appearance, and Transcatheter Embolization Based on Angioarchitecture. Radiographics Mar-Apr;36(2):580-95. doi: 10.1148/rg.2016150124. Epub 2016 Feb 12. (PMID: [26871987](#))

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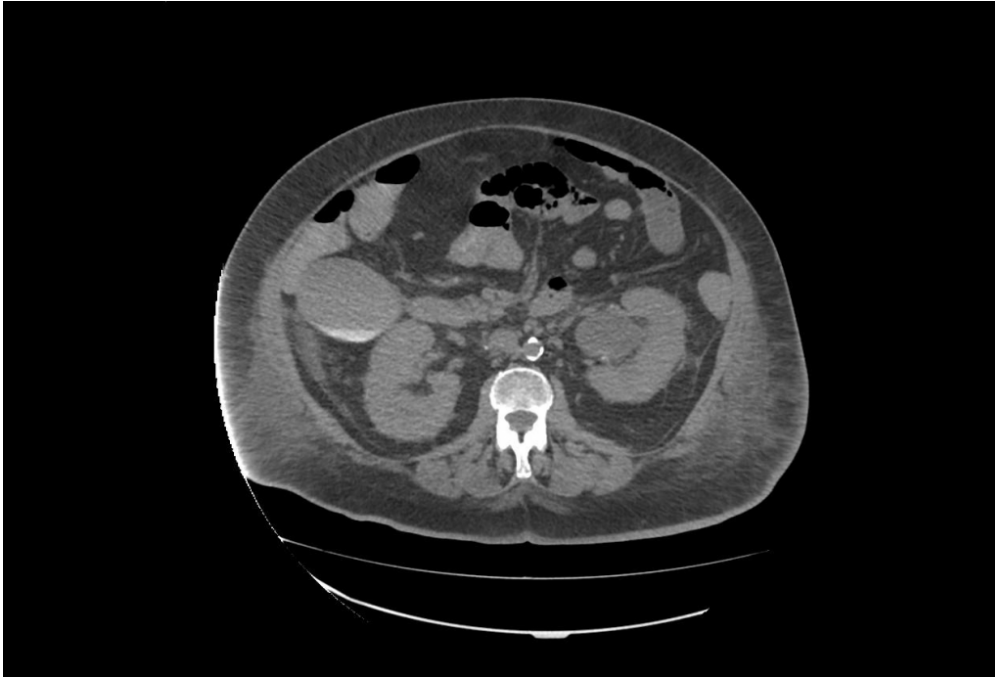
Gülcü A. et al (2013) Doppler US evaluation of renal biopsy complications in children. Diagn Interv Radiol Jan-Feb;19(1):15-9. doi: 10.4261/1305-3825.DIR.5968-12.1. Epub 2012 Dec 21. (PMID: [23266967](#))

Naganuma H. et al (2001) Renal arteriovenous malformation: sonographic findings. Abdom Imaging Nov-Dec;26(6):661-3. (PMID: [11907735](#))

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Figure 1

a



Description: Axial CT slide without contrast administration showing dilated left-sided renal pelvis. Incidental colelithiasis can be appreciated. **Origin:** Nerses Nersesyan, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

b



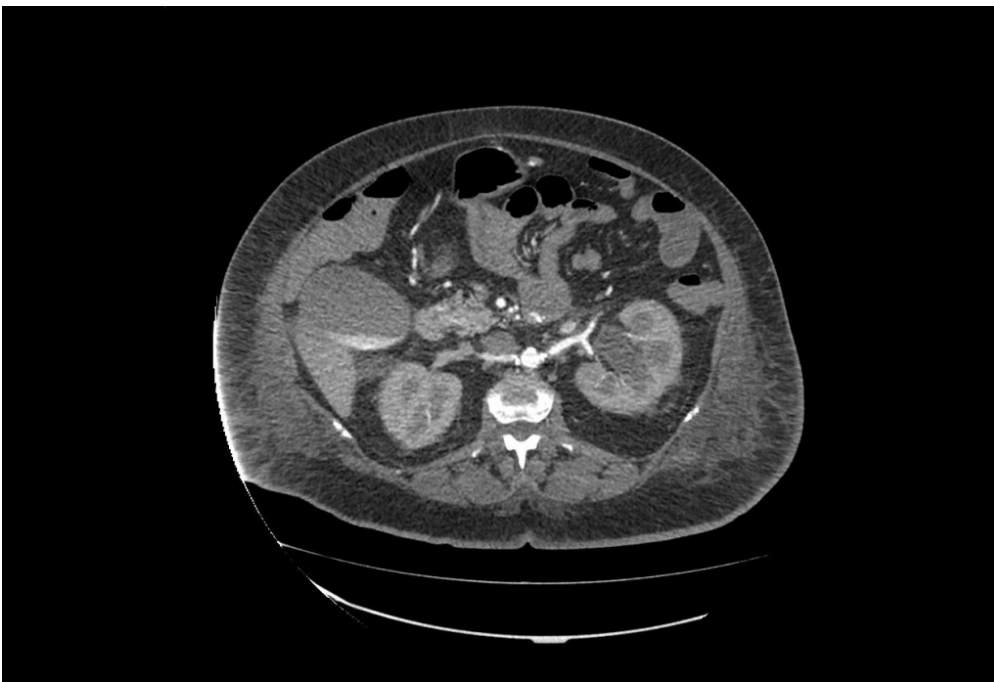
Description: Axial CT slide without contrast administration showing post-biopsy changes on the inferior aspect of the left kidney. **Origin:** Nerses Nersesyan, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

c



Description: Axial CT slide without contrast administration showing the presence of blood clots in the bladder. **Origin:** Nerses Nersesyan, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

d



Description: Axial CT slide after contrast administration in the arterial phase without relevant findings in the left renal artery. **Origin:** Nerses Nersesyan, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

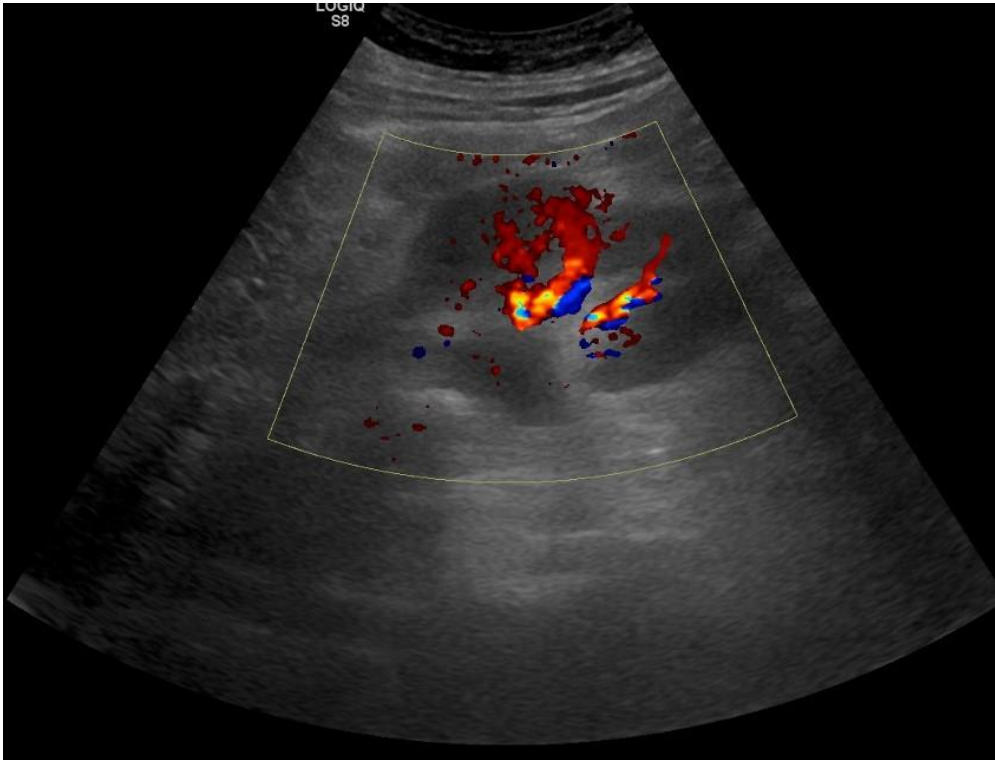
e



Description: Coronal CT slide after contrast administration in the late arterial phase without showing abnormal vascularisation in the inferior aspect of the left kidney. **Origin:** Nerses Nersesyan, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

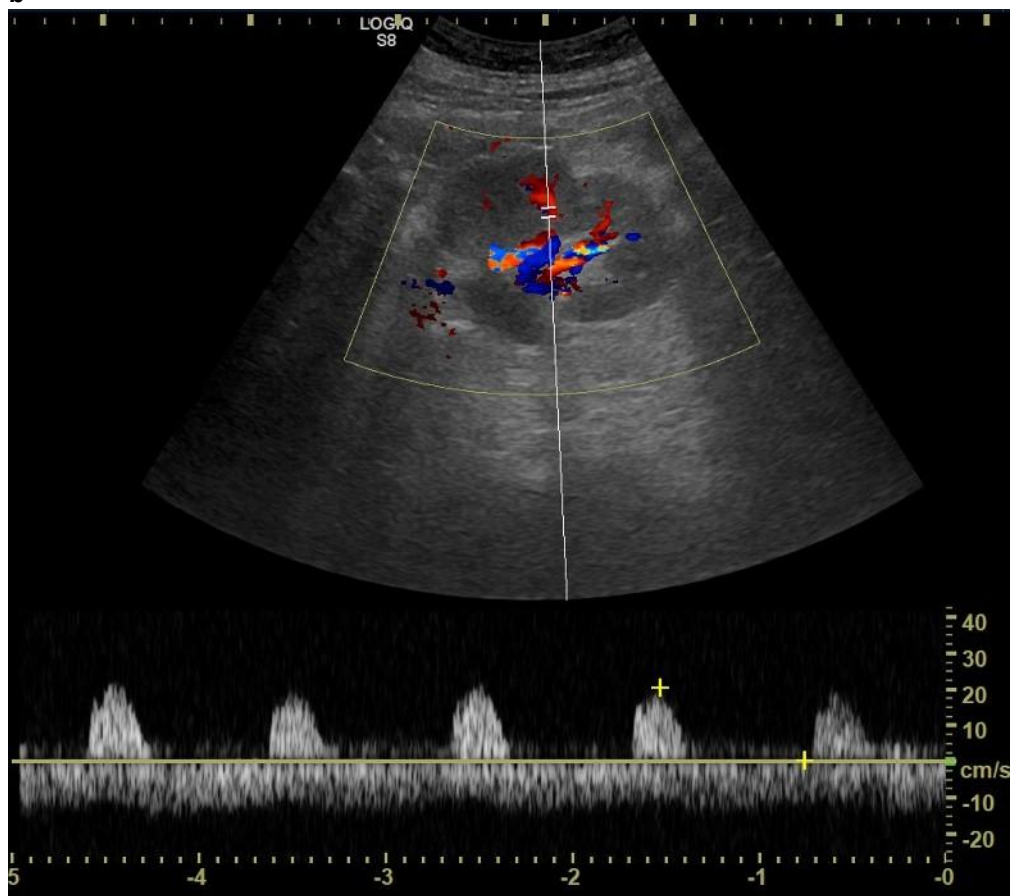
Figure 2

a



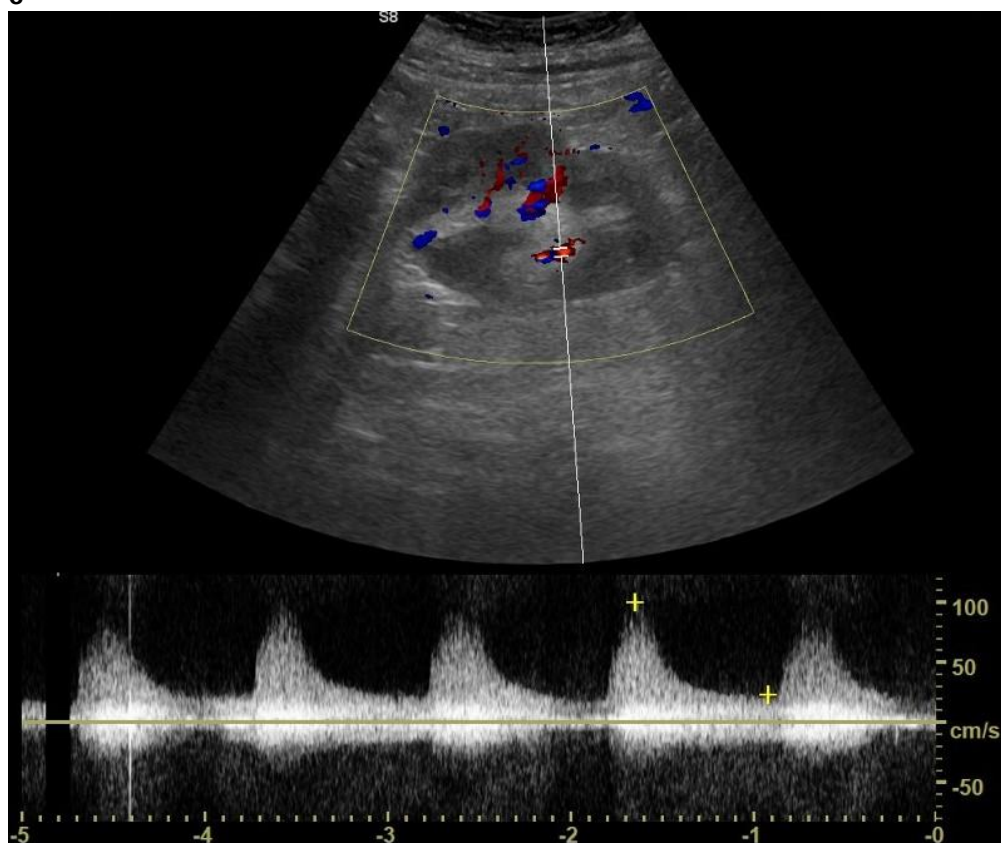
Description: US of the left kidney showing hydronephrosis and the presence of Doppler signal. **Origin:** Alberto Cuñat, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

b



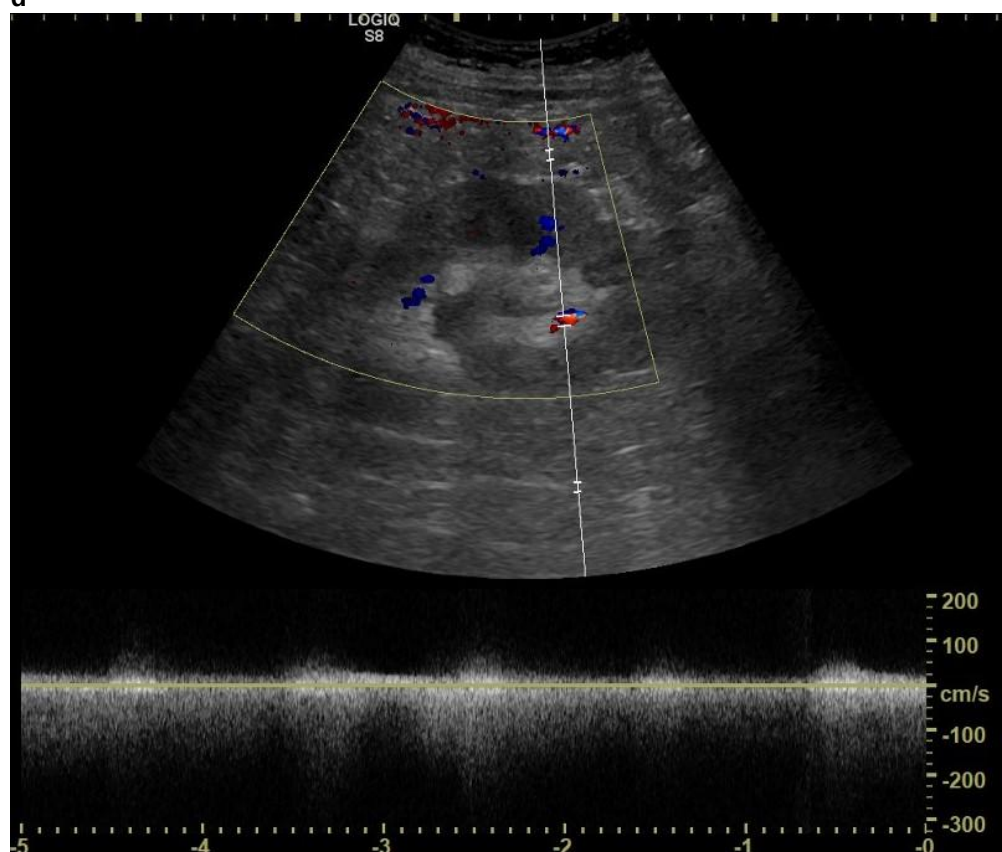
Description: Normal arterial morphology spectrum can be appreciated in the lobar arteries. **Origin:** Alberto Cuñat, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

C



Description: Normal arterial morphology spectrum can be appreciated in the interlobar arteries. **Origin:** Alberto Cuñat, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

d



Description: Abnormal spectral morphology in the inferior interlobar and segmental vessels, raising suspicion for small renal arteriovenous communication. **Origin:** Alberto Cuñat, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain.

Figure 3

a



Description: DSA of the inferior aspect of left kidney where a small rounded vascular lesion can be observed (red arrow). **Origin:** Marcelo Rengel, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain

b



Description: DSA of the inferior aspect of left kidney where a small rounded vascular lesion can be observed (red arrow). Early enhancement of venous drainage is noted (yellow arrow). **Origin:** Marcelo Rengel, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain

c



Description: Placement of coils in the segmental and interlobal inferior renal arteries. **Origin:** Marcelo Rengel, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain

d



Description: Placement of coils in the segmental and interlobal inferior renal arteries with resolution of the renal arteriovenous fistula. **Origin:** Marcelo Rengel, Department of Radiology, Hospital Clinic Universitari de Valencia, Valencia, Spain