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Management of a Giant Renal Arteriovenous Malformation with Endovascular Approach: A Case Report

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Abstract

Renal vascular malformations are rare disease processes that involve renal arteries and veins and include congenital arteriovenous malformations and arteriovenous fistulas. These lesions can present with a variety of clinical symptoms and some of them have the potential to cause serious morbidity if left untreated. We present a case of a 51-year-old patient with a giant right arteriovenous malformation. Excellent outcomes and the preservation of renal function were obtained through an arteriographic study of the right renal vessel combined with coil embolization of the tributary artery branch. Renal artery embolization is an effective and safe treatment in expert hands even in giant arteriovenous malformations.

Keywords: Renal vascular malformations; Arteriovenous malformation; Coil embolization; Endovascular management

Key Note Message

Renal arteriovenous malformations are rare vascular anomalies with heterogeneous manifestations, but can have significant morbidity if unrecognized and untreated. The management of large lesions can be challenging. We present a case of a giant arteriovenous malformation that was successfully and minimally invasively treated by embolization, allowing preservation of the renal unit.

Introduction and Background

Renal vascular malformations are conditions that involve renal veins and arteries and include Arteriovenous Malformations (AVM) and Arteriovenous Fistulas (AVF). They may be acquired, congenital, or idiopathic [1].

Congenital arteriovenous malformations are characterized by abnormal communication between the renal arterial and venous systems, and they are typically diagnosed in the third or fourth decade of life [2]. They are thought to represent focal spontaneous failures of vascular development occurring during the first trimester of pregnancy [2-4]. The right kidney is affected more frequently than the left one, and women are three times more likely to be diagnosed with a renal AVM than men [5].

Three types of congenital renal AVM can be distinguished based on the vessel architecture: The angiomatous type, which is characterized by a single large artery feeding multiple interconnecting distal branches; the cirsoid type, the most common, with multiple arteriovenous interconnecting varix-like vascular communications; and the aneurysmal or cavernosal type, which is more common in elderly patients, occurring typically from a pre-existing arterial aneurysm which has eroded into an adjacent vein [2].

Acquired arteriovenous fistulae resulting from instrumentation or kidney surgery are the most prevalent kind of renal vascular abnormalities. Additionally, they could be caused by pyelonephritis, renal-cell carcinoma, or blunt or penetrating trauma [6].

Clinical manifestations of kidney vascular lesions are varied, and they range from asymptomatic presentation, flank or back pain [7], hematuria, which is the most common presentation [6,8,9], abdominal mass [10,11], hypertension [3], and high output heart failure [12-14]. If left undiagnosed and untreated, these lesions may result in considerable morbidity and mortality [10].

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The ideal course of treatment can be chosen after extensive clinical evaluation and non-invasive imaging and angiographic studies. The preferred initial diagnostic technique for assessing the kidneys is ultrasonography. On Computed Tomography (CT) imaging, AVM appear as masses of vascular density with dilated draining renal veins [14]. The best method for displaying the precise vascular anatomy of a renal vascular abnormality is still angiography, which can define the main arterial supply, the presence of a nidus, the size of the arteriovenous shunt and venous drainage [4,9].

Surgical treatment of these anomalies has been replaced by endovascular embolization, which is considered the procedure of choice, because it allows occlusion of the vascular lesion with preservation of the unaffected renal parenchyma [5,10,14,15].

We present a clinical case, imaging studies and management related to a patient with a giant congenital right renal AVM that was treated with endovascular embolization.

Case Presentation

The case of a 51-year-old woman with no significant medical history other than recurrent Urinary Tract Infection (UTI) is presented.

An ultrasound was requested during follow-up of her urological pathology, and it revealed a mass in the lower pole of the right kidney with a longitudinal axis of approximately 4 cm. It had an irregular morphology and a partially calcified, echogenic wall. Doppler study revealed that it was a vascular structure. The rest of the examination and blood and urine tests were normal. The patient did not report back pain, hematuria or other symptoms derived from the lesion described.

Computed tomography angiography was requested. A right arteriovenous malformation was evident occupying the entire lower third of the kidney. The malformation measured 42 mm × 22 mm × 26 mm and was dependent on an inferior polar artery of hilar origin (Figure 1).

After careful discussion of the case with the local staff and with the patient, the decision was to perform angiography and embolization of the lesion under local anesthesia by interventional radiologists.

Catheterization of the right femoral artery and a selective arteriography of the right kidney were performed with a 7F curved guide catheter, revealing that the inferior polar artery was feeding the aneurysmal sac.

Endovascular treatment was successfully performed by deposition of small caliber fibrous micro-coils until complete occlusion of the aneurysmal sac and nutritional artery (Figure 2).

The patient remained in the hospital ward for 24 h and was discharged with no immediate complications and with stable renal function.

An abdominal CT scan performed 1 month after the procedure showed the embolization material correctly positioned, with no recanalization of the vascular malformation and good perfusion of the remaining renal parenchyma (Figure 3). Serum creatinine was normal (0.9 mg/dL). The CT scans at 3- and 6-months follow-up show no changes.

Discussion

Renal arteriovenous malformations are rare vascular anomalies with heterogeneous manifestations. The patient may remain asymptomatic, and AVM are frequently diagnosed incidentally on imaging studies performed for a different reason [6,16]. The most

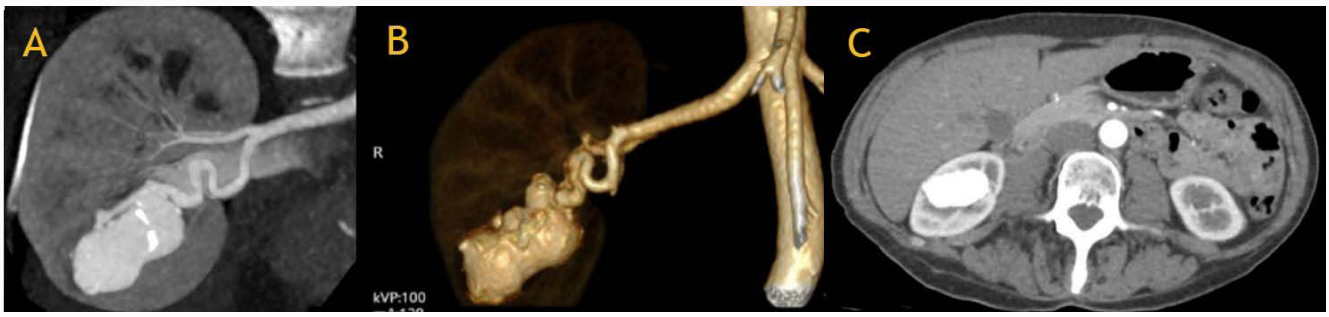

Figure 1: CT scan showing a giant right renal arteriovenous malformation (A: Anterior-posterior axis; B: 3D reconstruction; C: Transverse plane).

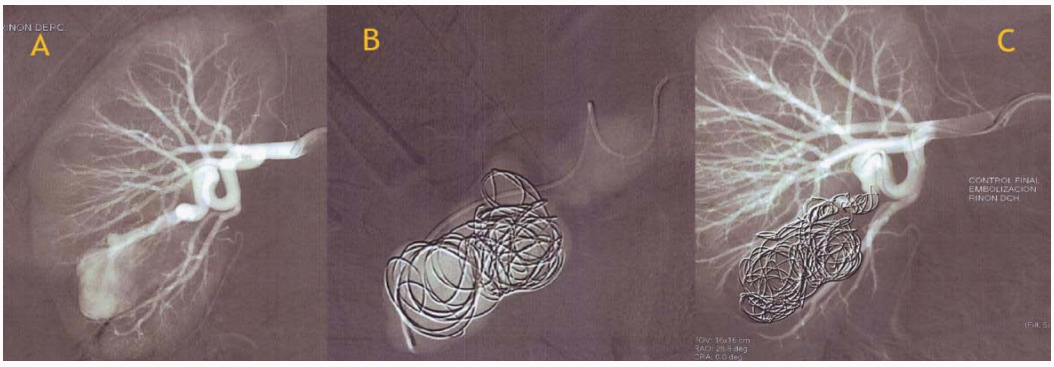

Figure 2: A) Superselective catheterism and localization of the target arterial vessel. B) Endovascular treatment by deposition of microcoils until complete occlusion of the aneurysmal sac. C) Control arteriography with an absence of aneurysmal sac repletion and no blood extravasation.

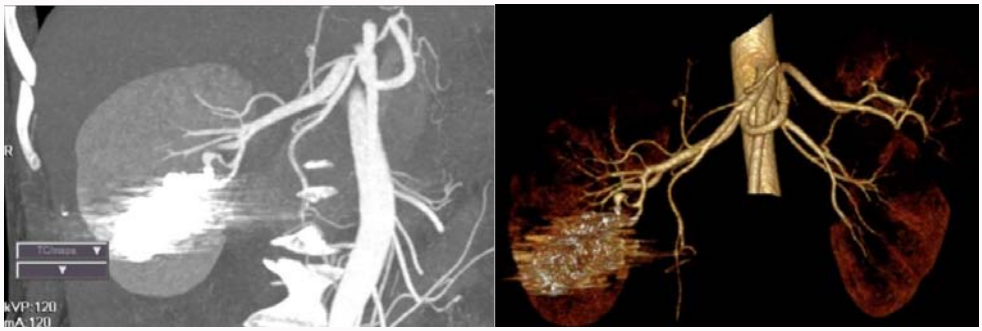

Figure 3: Postembolization CT scan.

common symptom is hematuria, which can even be massive [6] and other symptoms include flank pain, hypertension, headache or congestive heart failure [12-14].

Although selective renal arteriography is the test of choice for the detailed investigation of vascular architecture and hemodynamic parameters of AVM, CT angiography quite reasonably for the diagnosis [14].

Even with large lesions, embolization is the treatment of choice and is a safe and effective approach that preserves healthy renal parenchyma. Multiple materials have been used with excellent results reported [5,14]. Surgery is occasionally necessary for very large anomalies or unstable patients.

Follow-up after endovascular treatment for renal AVM is not well defined. The main endpoint is symptom resolution, if previously present. Furthermore, control of renal function should be performed within the first 48 h after the procedure. Initial worsening with progressive improvement is common. Blood pressure should also be monitored [5].

The imaging test of choice during follow-up is contrast-enhanced CT, which allows to assess the success of the procedure, to determine the existence of a parenchymal infarction and to evaluate the hypothetical coil migration and its consequences [17]. There is some experience with the use of angiography during follow-up to assess parenchymal perfusion, although coils may limit image quality. Imaging tests should be performed prior to discharge and during follow-up within the first 12 months, unless new symptoms occur making earlier testing necessary [5].

Conclusion

Congenital renal AVM are uncommon disorders with a wide range of clinical manifestations. The treatment of large lesions can be challenging. Minimally invasive management by embolization allows treatment of even large lesions while preserving the renal unit.

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