

ENDOVASCULAR TREATMENT OF RENAL ARTERY ARTERIOVENOUS FISTULA: CASE REPORT AND REVIEW

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Abstract

Renal vascular anomalies represent a heterogeneous group of diseases, which are divided into congenital renal arteriovenous malformations and renal arteriovenous fistulas (AVF). A 42-year-old female patient sought care due to an incidental finding of right renal artery pseudoaneurysm on abdominal ultrasound. A computed tomography scan of the kidneys and urinary tract was performed, which showed a hypodense formation with calcified walls in the renal hilum on the right, but an angiography performed revealed a right renal arteriovenous fistula. Endovascular correction was performed, carried out through embolization of the right renal arteriovenous fistula with 4 controlled-release coils in the venous segment of the fistula and 6 free-release coils in the arterial segment. At the end of the procedure, he presented fistula occlusion with a satisfactory result on control CT angiography. The endovascular procedure is a therapeutic alternative for these patients.

Keywords: Endovascular treatment, arteriovenous fistula, renal artery.

Highlight

Key findings

- In this report, we report

What is known and what is new?

This case reports the correlation of mother with infected COVID-19 in final stage of pregnancy and the newborn presented Klippel-Trenaunay. This is an association that may provide further evidence for new study about pathophysiological mechanisms with maternal viral infection by COVID-19 in relation vascular malformations.

What is the implication, and what should change now?

- Important alert even if the child is negative for Covid-19 and the syndrome is not related, it is necessary to maintain preventive care in the first year together with the mother to avoid the risk of complications and death.

Introduction

Renal vascular anomalies represent a heterogeneous group of diseases, which are divided into congenital renal arteriovenous malformations and renal arteriovenous fistulas (AVF). AVFs correspond to approximately 70 to 80% of renal arteriovenous anomalies and are defined as a single direct communication between a renal artery and an adjacent vein.¹ They can be classified according to their location as intrarenal or extrarenal, and according to its origin in non-acquired (congenital or idiopathic) or acquired.^{1,2}

Acquired AVF represents 70 to 75% of cases,² being caused by trauma and renal procedures, such as nephrectomy and percutaneous renal biopsy, which is the most common cause;³ in addition, pseudoaneurysm can be an associated finding.¹ AVF congenital disease arises as a result of focal failures of vascular development between the fourth and tenth week of embryonic life, with the average age of onset of symptoms being 40 years old, ranging from 21 to 68 years old, with a predominance of women in 75% of cases.⁴ The clinical picture of AVFs includes arterial hypertension, renal

masses, abdominal pain and tenderness in the flank region in 10 to 25% of cases,^{2,4} and the diagnosis are made based on physical examination, Doppler ultrasound and computed tomography.²

AVF treatment aims at complete and permanent obliteration of the fistula with preservation of the renal parenchyma. Endovascular embolization has gained importance due to its effectiveness and because it is a less invasive technique compared to open surgery. However, there is a potential risk of complications, such as kidney infarction and pulmonary embolism.³

Another vascular anomaly is renal artery aneurysm, a rare condition with a natural history that is not yet fully understood. Most of the time, it presents asymptotically, unilaterally, saccular, calcified and on the right, originating from the bifurcation of the renal artery. Symptomatic patients present resistant arterial hypertension, flank pain, hematuria and abdominal pain.⁵

Most renal artery aneurysms occur in female patients over 60 years of age, with systemic arterial hypertension being the main comorbidity.⁶ They were also diagnosed due to an incidental finding on abdominal imaging.⁵

The average diameter of these aneurysms is about 1.22 cm, with an annual growth rate of 0.086 cm.⁶ Endovascular or open surgery are the classic surgical treatments, but today, there is the option of robotic surgery as an alternative treatment.⁷ However, endovascular surgery has been the preferred choice due to lower morbidity, being indicated in cases where the diameter is greater than 2 cm or when growth of the aneurysm is observed.⁸

Renal artery pseudoaneurysm, a rare vascular complication with an etiology associated with partial nephrectomy, percutaneous procedures, penetrating traumatic injuries or contusions and iatrogenic injuries.⁹ By definition, a pseudoaneurysm is a pulsatile hematoma that forms with the injury of one or more layers of the arterial wall,⁹ with a risk of rupture of 14 to 30%.¹⁰ As in an aneurysm, it usually presents with macroscopic hematuria, lumbar and flank pain, hypertension and a palpable abdominal mass or may be asymptomatic.^{9,10}

Pseudoaneurysms are commonly incidental findings, being diagnosed through ultrasound with Doppler using the "yin-yang" sign, arteriography, angiography and magnetic resonance imaging.^{9,10} Treatment is carried out if the size is greater than 3 cm, in women in the fertile period or in patients with hypertension refractory to medication. The most common therapeutic option is the placement of an endovascular stent or embolization, with a high success rate, ranging from 93 to 96%.¹⁰ The objective of the present study is to report the endovascular treatment of an arteriovenous fistula of the renal artery.

Case report

A 42-year-old female patient sought care due to an incidental finding of right renal artery pseudoaneurysm on abdominal ultrasound, measuring 7.5 x 6.1 x 6.1 cm in an incidental finding. She is asymptomatic, but previously had systemic arterial hypertension, as well as anxiety.

On physical examination, she did not present significant changes, with palpable femoral, popliteal and anterior tibial pulses, without lesions, cyanosis or coldness. A computed tomography scan of the kidneys and urinary tract was performed, which showed a hypodense formation with calcified walls in the renal hilum on the right, measuring 7.5 x 6.1 x 6.1 cm. On angiography, she presented a right renal arteriovenous fistula (figure 1-4).

Endovascular correction was performed, carried out by means of embolization of the right renal arteriovenous fistula with 4 controlled release coils (5 mm x 20 cm, 6 mm x 12 cm and 2 of 10 mm x 20 cm) in a venous segment of fistula and 6 free release coils in the arterial segment (3 measuring 8 mm x 14 cm, 2 measuring 10 mm x 14 cm and 1 measuring 12 mm x 14 cm), figure 5. At the end of the procedure, the fistula was occluded with a satisfactory result in control CT angiography (figure 6). The study was approved Ethical Committee Faculdade de Medicina de Sao Jose do Rio Preto-FAMERP-Brazil#5.339.174. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration. Written informed consent was obtained the patient for publication of this case report included image exams. The local ethics committee requires a document signed for patient to approve the process.

Discussion

The present study reports the endovascular approach in the treatment of arteriovenous fistula of the renal artery in a female, hypertensive patient, as an incidental finding. The patient was asymptomatic with no reports of procedures or trauma in the region. The literature reports several cases, and the therapeutic approach may vary according to each case and may be clinical in cases smaller than 3 cm, surgical or endovascular.³⁻⁸

The diagnosis, in this case, was incidental during an abdominal ultrasound and was proportional to the treatment of this patient. At first, the Doppler diagnostic hypothesis was pseudoaneurysm and then arteriography made the diagnosis of renal arteriovenous fistula.

One of the complications is rupture, which can expose the patient to mortality. Despite her size, she was asymptomatic, where the main symptoms listed in the literature are renal masses, abdominal pain and tenderness in the flank region in 10 to 25% of cases,^{2,4} resistant arterial hypertension, flank pain, hematuria and abdominal pain and the diagnosis is made based on physical examination, doppler ultrasound and computed tomography.^{2,5}

Regarding the therapeutic approach, endovascular procedures have been the new option in recent years, with success in over 90% of cases. In the present study, the option was endovascular with coil embolization and it occurred without complications. The diagnosis was incidental in this patient, however in symptomatic patients an imaging test becomes essential in the diagnosis and tracking of this complication, which is not rare, but worrying.

Conclusion

The endovascular approach can be a safe and effective option in the treatment of renal artery arteriovenous fistulas.

Author's contribution

Design and conduct of the study: Neto FR, Furlan FC, Villa MA, de Matos MPA, Santos HA, Godoy JMP

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Decision to submit the manuscript for publication: Neto FR, Furlan FC, Villa MA, de Matos MPA, Santos HA, Godoy JMP

All authors agree the manuscript.

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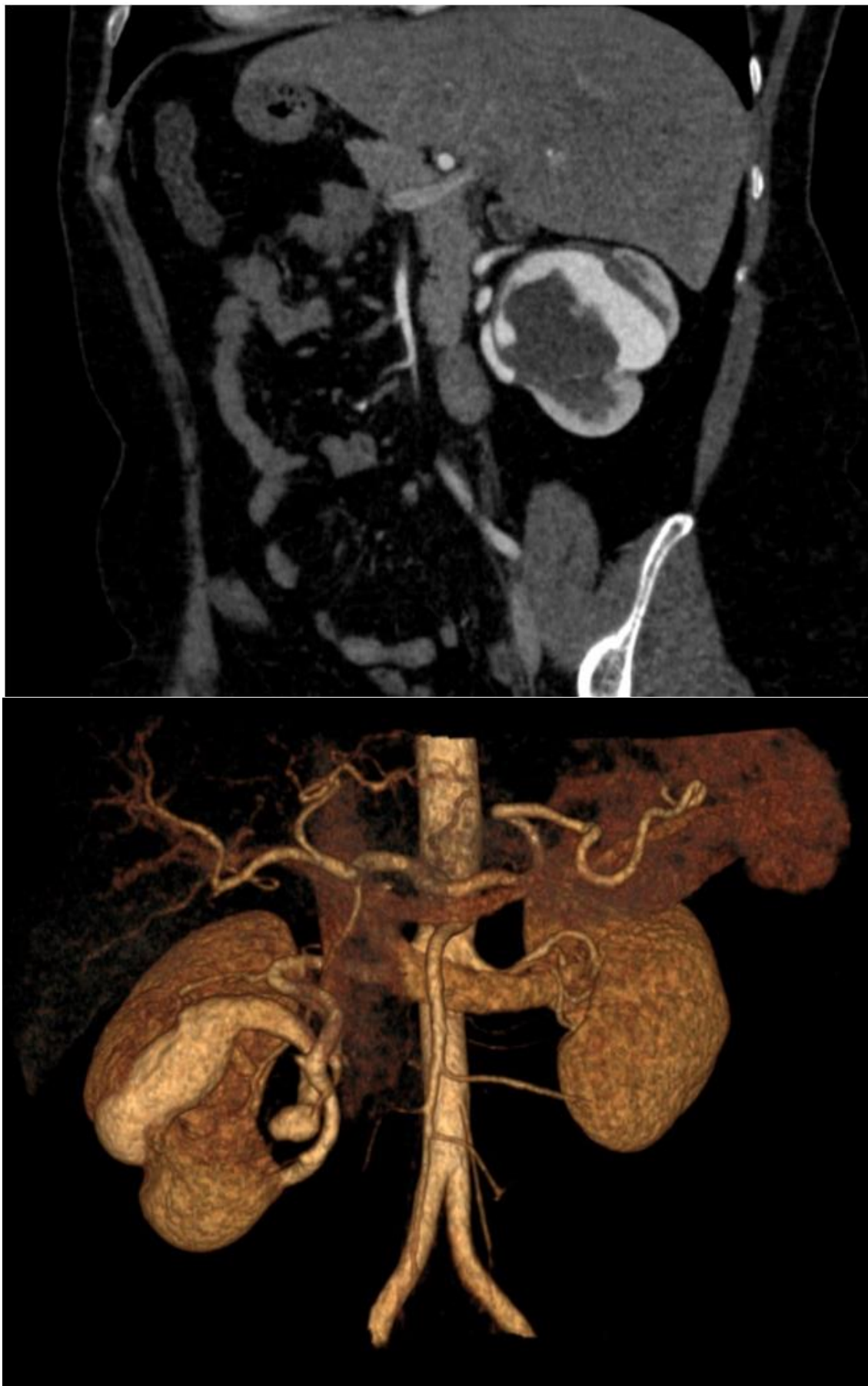
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Figure Legend



Figures 1 to 4: pseudoaneurysm and renal fistula in pre-treatment CT angiography, respectively, in the sections: axial, coronal, sagittal and 3D reconstruction.



Figure 5: Initial angiography revealing pseudoaneurysm with arteriovenous fistula in the right kidney.



Figure 6: Control angiography with satisfactory occlusion of pseudoaneurysm and renal fistula.