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CASE REPORT

Renal artery stenosis in a single-kidney patient with flash pulmonary edema: A case report

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ABSTRACT

BACKGROUND: Atherosclerotic renal artery stenosis (RAS) is a well-known cause of secondary hypertension and progressive renal insufficiency. In patients with a solitary functioning kidney, it is uncommon but high-risk, posing a dilemma between revascularization and medical management.

CASE REPORT: We report the case of a 54-year-old woman with hypertension, ischemic heart dis-ease, and superficially invasive squamous cell carcinoma of the cervix, who was admitted with acute kidney injury and recurrent episodes of flash pulmonary edema. Computed tomography angiography revealed occlusion of the left renal artery with a hypotrophic kidney and severe (~90%) stenosis of the right renal artery. After a multidisciplinary evaluation and consideration of flash pulmonary edema secondary to RAS, renal endovascular revascularization with stent placement in the right renal artery was performed, restoring renal perfusion, leading to recovery of renal function and improved blood pressure control.

CONCLUSION: In selected high-risk patients, according to current clinical guidelines, endovascular revascularization with stent placement can be clinically relevant and provide meaningful benefit, highlighting the importance of individualized assessment and an integrated approach in the man-agement of complex renovascular disease.

BACKGROUND

Atherosclerotic renal artery stenosis (RAS) is a known cause of secondary hypertension and progressive renal insufficiency.[1,2]

In patients with a solitary functioning kidney, RAS is uncommon but associated with greater morbidity and mortality, presenting a therapeutic dilemma between revascularization and conservative medical management.[3] In general, revascularization is reserved for selected high-risk cases or niche indications.[4]

CASE REPORT

A 54-year-old woman, former smoker, with hypertension (diagnosed seven years before and under treatment with three antihypertensive drugs; poor adherence to medical follow-up due to socio-economic limitations, which limited prior investigations for secondary causes of hypertension), ischemic heart disease (myocardial infarction in 2022 treated by coronary revascularization with two stents), and superficially invasive squamous cell carcinoma of the cervix. She had a solitary functioning kidney. The patient was admitted with acute kidney injury (AKI) KDIGO III, anuria, and hyperkalemia, requiring urgent hemodialysis.

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During hospitalization in the intermediate care unit, she presented multiple episodes of flash pulmonary edema, requiring non-invasive ventilation. Computed tomography angiography (CTA) revealed occlusion of the left renal artery with a hypotrophic kidney and significant (~90%) stenosis of the right renal artery, Figure 1. After multidisciplinary evaluation and considering flash pulmonary edema secondary to renal artery stenosis (RAS), renal endovascular revascularization with stent placement in the right renal artery was decided.

Figure 1. Computed tomography angiography prior to revascularisation - 3D reconstruction.

An ultrasound-guided percutaneous puncture of the left common femoral artery in a retrograde fashion was performed. A 7 Fr introducer was inserted. A 0.035 SplashWire™ hydrophilic guidewire was advanced to the suprarenal aorta under fluoroscopy with a 5 Fr Terumo Vertebral hydrophilic catheter. The guidewire was advanced across the lesion, but catheter advancement was not achieved; therefore, it was exchanged for a 4 Fr hydrophilic Vertebral catheter (Merit Medical), successfully crossing the stenosis, Figure 2. The wire was exchanged for a 145 cm V-14™ hydrophilic guidewire (Boston Scientific, USA). A rapid-exchange 3.5 mm angioplasty balloon was advanced and inflated, achieving a partial result, Figure 3, followed by deployment of a balloon-expandable Express™ SD 5 × 19 mm stent, Figure 4.

Postoperatively, the patient had an excellent clinical course, with improved blood pressure and recovery of renal function. It should be noted that although some authors prefer device navigation via brachial access,[5] our patient had left subclavian artery occlusion, making this approach unfeasible.

Figure 2. Intra-operative fluoroscopy image showing wire access to the right renal artery

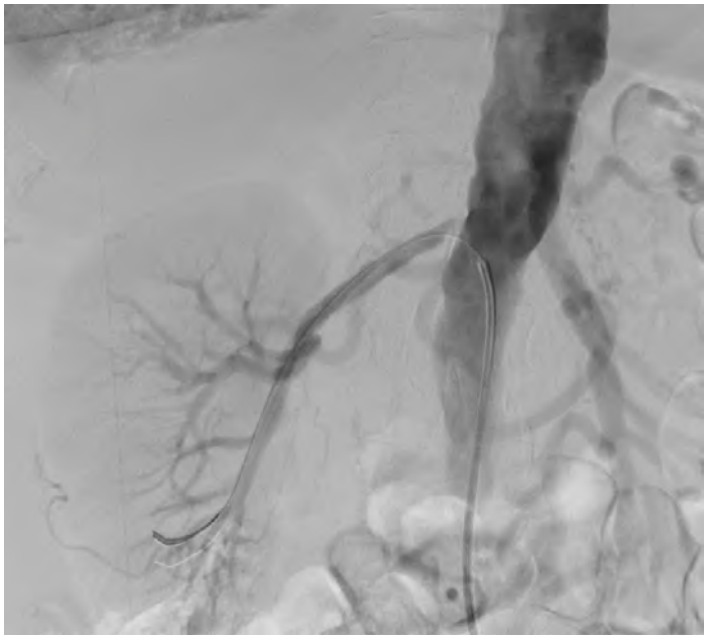


Figure 3. Intra-operative fluoroscopy image showing balloon angioplasty of the right renal artery

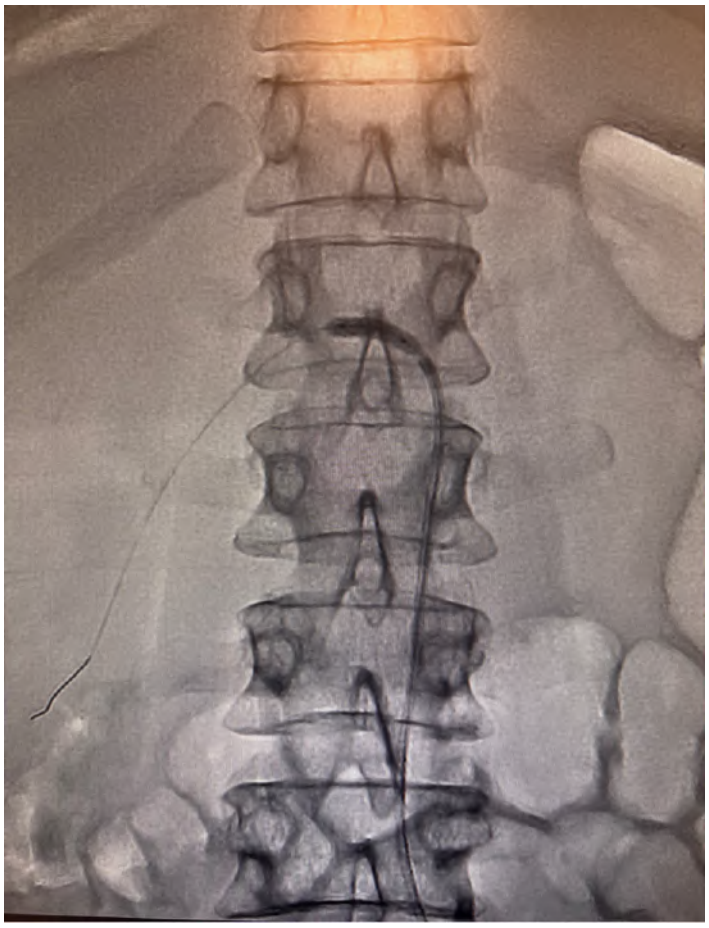
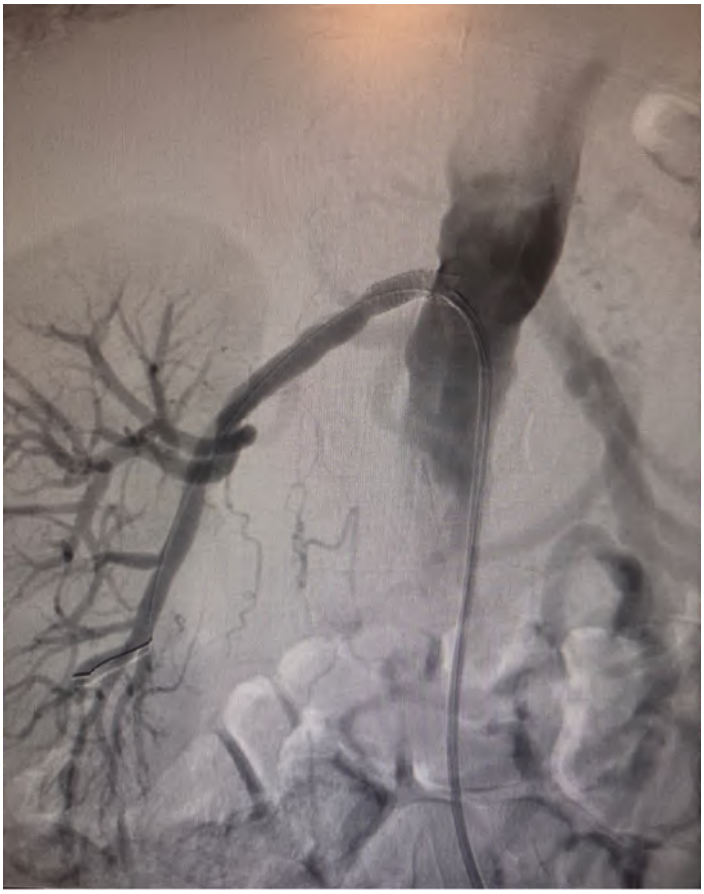


Figure 4. Intra-operative digital subtraction completion angiography showing good patency of the right renal artery, with no residual stenosis.



DISCUSSION

The assessment of the indication for revascularization in this patient requires careful consideration of the individual clinical context and the limitations of the available evidence. While the most relevant randomised trials - ASTRAL[6] and CORAL[7] - did not demonstrate an overall benefit of percutaneous transluminal renal angioplasty with stenting (PTRAS) over optimal medical therapy, both studies evaluated populations that differ significantly from the clinical profile observed in our case. In ASTRAL, 41% of patients had stenosis <70%, and most did not have resistant hypertension, representing a cohort with lower hemodynamic impact; moreover, the inclusion criteria, based on clinical equipoise, favored the enrollment of patients with a low likelihood of benefiting from revascularization. CORAL had similar limitations, with a considerable proportion of patients having moderate stenosis (<80%) and blood pressure controlled with only two antihypertensive agents, again reflecting a population very different from that of the present case.

In contrast, the clinical features of the case presented here include a solitary functioning kidney, critical stenosis (~90%), hypertension resistant to three antihypertensive drugs, and recurrent episodes of flash pulmonary edema—a condition which pathophysiology is related to marked activation of the renin–angiotensin–aldosterone system, acute sodium and water retention, and paroxysmal elevations of blood pressure, leading to abrupt increases in left ventricular filling pressures and pulmonary congestion despite preserved systolic function. This clinical profile corresponds to a formal indication for renal artery angioplasty and stenting according to the 2025 ESVS guidelines[8], which recommend revascularization in cases of severe renal deterioration, resistant hypertension, and/or flash pulmonary edema. In this context, the decision to proceed with endovascular treatment is fully justified by the underlying hemodynamic compromise and current recommendations for high-risk scenarios.

In conclusion, we treated a patient presenting with a high-risk clinical profile, characterised by recurrent episodes of flash pulmonary edema secondary to severe renal artery stenosis in a solitary functioning kidney. Based on the available evidence and current recommendations, percutaneous transluminal angioplasty with stent placement was performed, resulting in a favorable clinical evolution with recovery of renal function and improved blood pressure control. This case highlights that, in carefully selected situations, intervention can be clinically relevant and provide meaningful benefit, underscoring the importance of individualized assessment and an integrated approach in the management of complex renovascular disease.

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