From the American Venous Forum

Endovascular treatment of renal vein thrombosis in a young patient with lung transplant

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ABSTRACT

Spontaneous renal vein thrombosis is a rare entity. A 28-year-old woman with a history of a double-lung transplant was admitted with flank pain and found to have acute kidney injury. A magnetic resonance venogram demonstrated isolated left renal vein thrombosis with extension into the inferior vena cava. Initial management with therapeutic anticoagulation and hydration was unsuccessful. Thus, pharmacochemical thrombectomy was performed. A temporary suprarenal inferior vena cava filter was placed for intraoperative pulmonary prophylaxis. The patient's renal function returned to baseline and remained normal 13 months later. Early incorporation of percutaneous pharmacomechanical thrombectomy can improve renal function when medical therapy alone is unsuccessful. (J Vasc Surg Cases Innov Tech 2024;10:101437.)

Keywords: Acute kidney injury; Endovascular therapy; Pharmacomechanical thrombectomy; Renal vein thrombosis

Spontaneous renal vein (RV) thrombosis (RVT) is a rare clinical entity commonly presenting in patients with hypercoagulable comorbidities such as nephrotic syndrome or renal malignancy.[1,2] RVT poses a therapeutic challenge due to the lack of management guidelines. The standard therapy is therapeutic anticoagulation and supportive medical care. However, some studies have demonstrated the superiority of catheter-directed thrombolysis/thrombectomy compared with anticoagulation therapy alone in the acute phase of RVT.[3-5] This report describes the clinical presentation and management of isolated RVT refractory to medical therapy alone in a 28-year-old woman with a double-lung transplant. The patient was treated successfully with pharmacomechanical thrombectomy of the left RV and temporary interruption of the suprarenal inferior vena cava (IVC) for pulmonary protection. The patient provided written informed consent for the report of her case details and imaging studies.

CASE REPORT

A 28-year-old woman with cystic fibrosis and a history of a double-lung transplant presented with a 1-day history of severe left flank pain. The patient's medical history was notable for recurrent bleeding diathesis due to idiopathic thrombocytopenic purpura requiring splenectomy, diabetes due to pancreatic insufficiency, and hypertension. The patient was receiving weekly romiplostim and fostamatinib for refractory idiopathic thrombocytopenic purpura. She reported a history of prior internal jugular vein thrombosis after her lung transplant and had completed a course of therapeutic anticoagulation. At the time, the hypercoagulable workup findings were negative.

A venous ultrasound obtained in the emergency department revealed an occlusive thrombus in the left RV. She was also diagnosed with a nonoliguric acute kidney injury. Her serum creatinine level was 2.07 mg/dL, with an estimated glomerular filtration rate of 40 mL/min/1.73 cm^2 (baseline creatinine, 1.0 mg/dL; glomerular filtration rate, 60 mL/min/1.73 cm^2). Urinalysis was negative for significant proteinuria, her lactic acid concentration was 1.4 mmol/L, and transthoracic echocardiography revealed mild tricuspid regurgitation with no evidence of pulmonary embolism.

A magnetic resonance venogram was obtained to assess the thrombus burden and extent, especially regarding propagation into the IVC, which demonstrated isolated left RVT (Fig 1, *A*) with partial extension into the IVC (Fig 1, *B*). Therapeutic anticoagulation with intravenous heparin and volume resuscitation was initiated. However, after 2 days of therapeutic anticoagulation, there was no improvement in renal function or symptom relief. Thus, she was taken for endovascular intervention.

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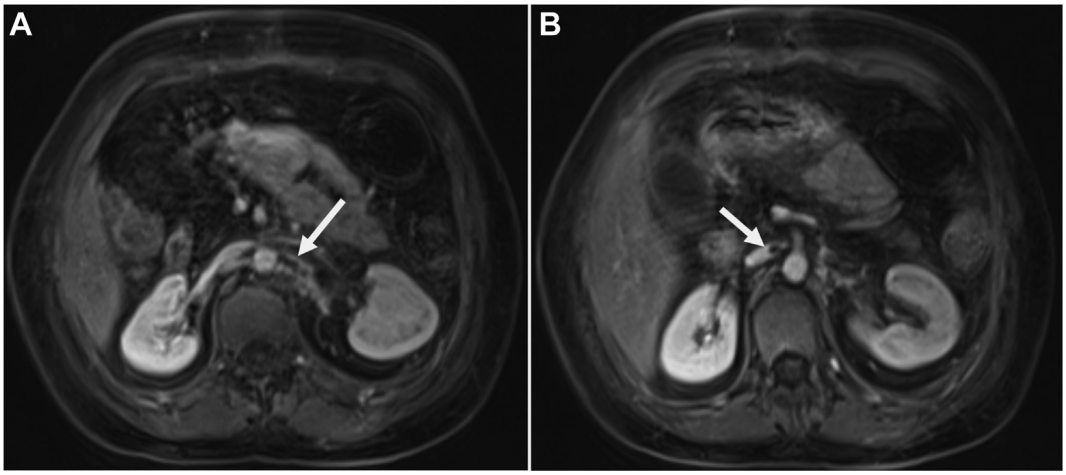

Fig 1. Magnetic resonance venogram demonstrating left renal vein (RV) thrombosis (**A,** *arrow*) with thrombus extending into the inferior vena cava (IVC; **B,** *arrow*).

Venography of the IVC was performed through the left common femoral vein. A retrievable IVC Denali filter (BD Bard) was deployed in the suprarenal position to prevent pulmonary embolization, given her history of a double-lung transplant. A selective left RV venogram showed complete RVT with residual flow into the left ovarian vein (Fig 2, *A*). Pharmacomechanical thrombectomy was performed with the Angiojet system (Boston Scientific), using 10 mg of alteplase. Balloon venoplasty was subsequently performed with a 7- × 60-mm balloon to macerate any residual thrombus. Completion venography revealed successful recanalization of the left RV with robust venous return into the IVC. In addition, collateral circulation, absent in the initial venogram, became apparent. Without thrombectomy, the hemiazygos vein remained unvisualized (Fig 2, *B*). More than 80% of the initial thrombus was cleared; however, residual thrombus and, possibly, spasm at the origin of the RV were observed.

There were no perioperative complications, and the patient had adequate resolution of her symptoms. Her renal function returned to baseline on postoperative day 4 (Fig 3). The patient was discharged home with therapeutic enoxaparin on postoperative day 4. The IVC filter was successfully retrieved 4 months later. Retrieval was performed through a left jugular approach because the right jugular vein was chronically occluded. At the time, concomitant selective venography demonstrated a patent left RV with no residual thrombus (Fig 4, *A*). Access through the left jugular vein made IVC filter retrieval challenging, because the sheath tip was directed to the patient's right side and away from the tip of the IVC filter. A wire loop technique was used, and the filter was successfully retrieved[6] (Fig 4, *B*). The patient remained symptom free with normal kidney function 13 months after the procedure.

DISCUSSION

This report highlights successful pharmacomechanical thrombectomy of left RVT resistant to medical therapy alone. RVT is rare and commonly associated with nephrotic syndrome. Most reports describe a male preponderance, with a bilateral presentation. In unilateral RVT cases, the left RV is most commonly affected.[7] Conventionally, RVT is managed with medical treatment in the form of therapeutic anticoagulation, resulting in adequate resolution of the luminal obstruction and symptoms. However, interventional therapy has a role for patients with RVT refractory to medical therapy alone.

The risk factors for the development of RVT include vascular injury, diminished vascular flow, increased blood viscosity, dehydration, and thrombophilia. The incidence of RVT in patients with identifiable risk factors can reach ≤60%.[8] However, the incidence of spontaneous RVT is unknown. Regarding our patient's medication history, thrombopoietic agents such as romiplostim are not associated with a significantly increased thrombotic risk,[9,10] and fostamatinib has even shown a reduced risk of venous thrombosis.[11]

RVT poses a therapeutic challenge due to the lack of guidelines and the lack of randomized trial data. The treatment of choice depends on the clinical presentation, extent of the thrombosis, and renal function.[12] Generally, medical therapy with therapeutic anticoagulation is the standard initial modality for patients with normal renal function. It can result in recanalization or complete resolution of RVT and reduce the risk of recurrent thromboembolic complications.[2,7,13] Initially, unfractionated or low-molecular-weight heparin is used, followed by warfarin for 6 to 12 months or until renal function has been restored.[3,13] Although phase III trials for patients with venous thrombosis in unconventional sites did not incorporate direct anticoagulant drugs, small studies have indicated favorable results.[7,14] Importantly, patients with normal renal function without symptom resolution could benefit from endovascular

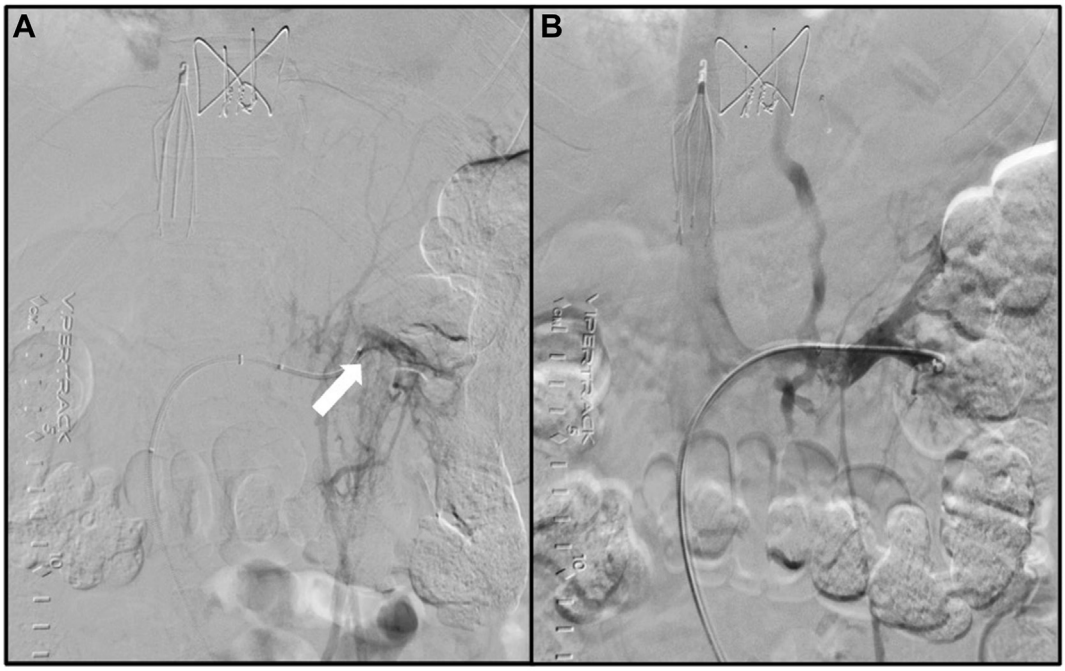

Fig 2. Intraoperative venography. **A,** Selective venography showing complete left renal vein (RV) thrombosis (RVT; *arrow*) and flow into the ovarian vein. **B,** A patent left RV after intervention.

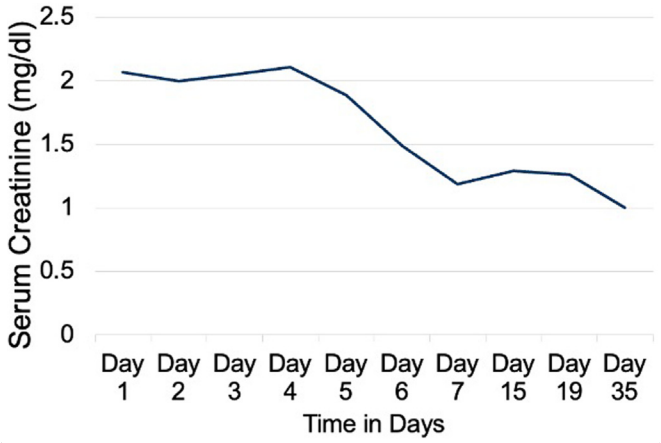

Fig 3. Serum creatinine during admission. Intervention was performed on day 3.

therapy. Nonetheless, a consensus on the optimal timing of invasive interventions remains an area for future research.

In contrast, patients with elevated creatinine levels deserve more attention, and management should be more aggressive because the risk of short- and long-term complications is higher.[15] Previously, the recommended treatment of RVT was open thrombectomy.[16] Catheter-directed therapy is increasingly becoming the preferred approach, because recent data elucidated that pharmacomechanical thrombectomy and/or catheter-directed thrombolysis improves renal function and exhibits superior efficacy to anticoagulant therapy alone.[3] Successful treatment with mechanical thromboaspiration systems such as the Indigo system (Penumbra) has also been described.[17] These minimally invasive endovascular options have proved efficacious at recanalization, symptom alleviation, and renal function improvement when initiated in the acute phase.[3,4]

Notably, the extension of the thrombus into the IVC and the laterality significantly influence the management strategy. Bilateral RVT, thrombus extension into the IVC, and a lack of symptomatic and radiologic responses to medical management demand a combined approach of thrombolytic therapy with thrombectomy.[18,19] Endovascular treatment also allows for potential additional therapies, such as venoplasty or stent placement, for significant venous stenosis.[4] The risk of pulmonary embolism during endovascular treatment should be assessed. A previous study reported pulmonary embolism in 20% of patients.[3] Therefore, when appropriate, a temporary IVC filter should be used for patients with anticoagulation complications or planned endovascular interventions.[3,5]

CONCLUSIONS

Endovascular pharmacomechanical thrombectomy is a safe and effective minimally invasive therapeutic option for the treatment of RVT in conjunction with medical therapy. Early incorporation of this modality for patients with acute renal injury can facilitate recovery of renal function and symptomatic relief.

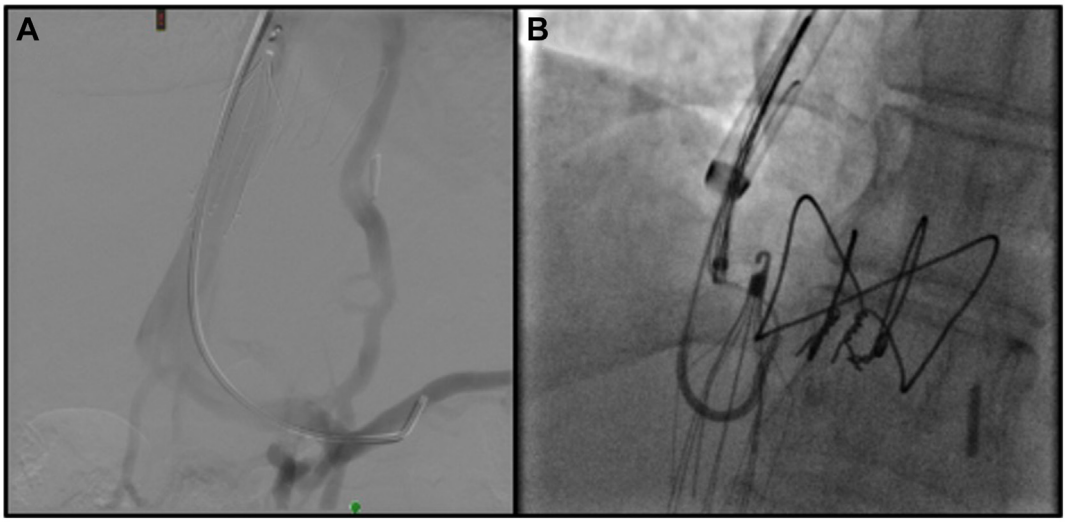

Fig 4. A, Patent left renal vein (RV) with no residual thrombus 4 months after the initial intervention. **B,** Wire loop technique for inferior vena cava (IVC) filter retrieval.

DISCLOSURES

None.

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