Iliofemoral deep venous thrombosis in kidney transplant patients can cause graft dysfunction

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ABSTRACT

We present a series of kidney transplant dysfunction secondary to lower extremity deep venous thrombosis (DVT). A 70-year-old man underwent living unrelated kidney transplantation and presented 2 months postoperatively with acute kidney injury (AKI) secondary to external iliac vein thrombosis. Graft function improved after endovascular intervention. A 43-year-old man underwent living unrelated kidney transplantation and presented 3 years postoperatively with AKI secondary to external iliac vein thrombosis. Graft function recovered after thrombolysis. A 42-year-old woman underwent simultaneous pancreas and kidney transplantation. Four weeks postoperatively, she had AKI secondary to common femoral vein DVT. Her graft function improved after common iliac vein stenting. A 67-year-old man underwent living unrelated kidney transplantation and presented a week later with lower extremity DVT and AKI. His graft function improved with anticoagulation. Iliofemoral DVT can cause allograft dysfunction. The cause may be multifactorial. Endovascular intervention is safe and feasible when anticoagulation fails. (J Vasc Surg Cases and Innovative Techniques 2019;5:7-11.)

Keywords: Renal transplant; Iliofemoral deep vein thrombosis; Graft dysfunction

Kidney transplantation remains the best treatment for end-stage renal disease (ESRD).[1,2] The allograft is commonly anastomosed to recipient iliac vessels. As such, high-risk patients being evaluated for kidney transplantation commonly undergo imaging of the abdominopelvic arterial system.[3] This allows surgeons to detect possible iliac artery disease before surgery.

Several vascular and nonvascular complications can precipitate allograft dysfunction. Vascular complications in particular can be detrimental to both graft and patient.[4,5] Among vascular complications, late venous thrombotic events are uncommon compared with early arterial or venous thrombosis or stenosis.[6] They present a challenge for the health care provider in diagnosis and management because signs and symptoms may be limited to isolated worsening graft function. We present a series of four kidney transplantations complicated by graft dysfunction secondary to deep venous thrombosis (DVT) in the iliofemoral system. All patients consented to publication of case reports.

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CASE REPORTS

Case 1. A 70-year-old man with ESRD secondary to hypertension underwent an uncomplicated living unrelated kidney transplantation with immediate function. The graft was placed in the left iliac fossa, and the patient was discharged with a creatinine (Cr) concentration nadir of 0.8 mg/dL. Two months postoperatively, the patient developed left lower extremity (LE) swelling and pain. Initial workup did not demonstrate any DVT on duplex ultrasound examination, and he was monitored as an outpatient. The patient returned 10 weeks postoperatively with worsening LE edema, elevated serum Cr concentration of 1.35 mg/dL, and hydroureteronephrosis of the allograft with elevated resistive indices. He underwent pelvic magnetic resonance angiography and venography, which demonstrated a proximal occlusive thrombus extending from the left external iliac vein (EIV) below the renal vein anastomosis (Fig 1, *A*). After extensive discussion of risks and benefits, the patient consented for operative intervention. Initial ascending venography and cavography through the left popliteal vein access confirmed a thrombus extending from the left common femoral vein to the EIV. An 8F AngioJet (Boston Scientific, Marlborough, Mass) was used to lace the thrombus with 10 mg of tissue plasminogen activator, which was allowed to dwell for 20 minutes. Thrombectomy mode was then employed to clear the EIV of the bulk of thrombus (Fig 1, *B* and *C*). This was followed by 10-mm balloon angioplasty of the EIV. On intravascular ultrasound (IVUS) and venography, the iliac vessels were found to be small and fibrotic. The common iliac vein was treated with a 16- × 60-mm self-expanding Wallstent (Boston Scientific) above the anastomosis, and a second 14- × 40-mm self-expanding Wallstent was placed in the left EIV below. The stents were several millimeters away from the renal allograft anastomosis, and they were dilated with a 10-mm balloon, followed by a 14- × 40-mm angioplasty balloon for the upper stent. Postoperatively, the patient was transitioned from unfractionated heparin drip and

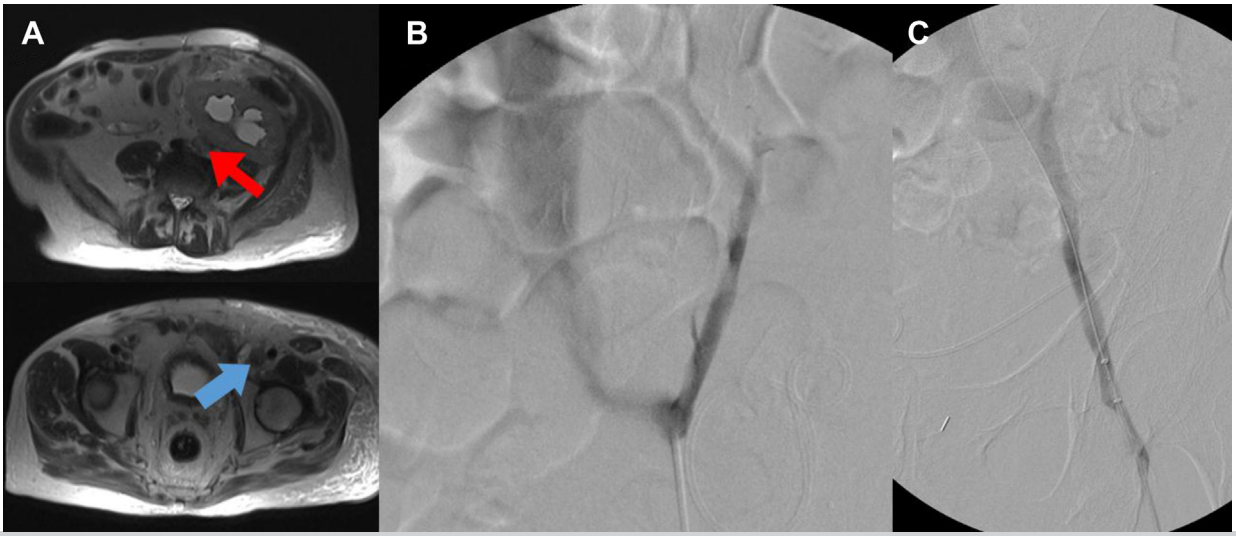

Fig 1. A, Magnetic resonance venogram demonstrating external iliac vein (EIV) thrombus (*red arrow*) extending below renal allograft venous anastomosis at the common femoral vein (*blue arrow*). **B,** Initial venogram demonstrating patent renal allograft vein patency with thrombus distally. **C,** Post-thrombolysis venogram demonstrating restoration of patency.

maintained on warfarin. LE swelling and pain resolved. Kidney transplant function improved postoperatively, with Cr concentration returning to 0.8 mg/dL on 2-year follow-up.

Case 2. A 43-year-old man with history of type 1 diabetes and hypertension suffered from failed kidney transplantation 4 years after simultaneous pancreas and kidney transplantation. The patient had suffered from a provoked DVT after blunt trauma 20 years before presentation. He was suffering from an acute hemorrhage and underwent placement of VenaTech permanent inferior vena cava (IVC) filter (B. Braun, Bethlehem, Pa). He received a living unrelated kidney transplant, which was placed in the right iliac fossa and had immediate function (nadir Cr concentration, 1.7 mg/dL). He presented 3 years later with acute kidney injury (AKI), rise in serum Cr concentration to 2.94 mg/dL, and elevated resistive indices. Extensive workup demonstrated DVT starting in the common femoral veins bilaterally and propagating to the distal IVC on duplex ultrasound. Laboratory evaluation for thrombophilia diseases did not yield any diagnosis. Ascending venography and cavography through right popliteal vein access confirmed the presence of acute-on-chronic thrombus from right femoral veins to the IVC (Fig 2, *A*). An 8F AngioJet catheter was then used to lace the thrombus with 10 mg of tissue plasminogen activator. This was allowed to dwell for approximately 30 minutes, followed by multiple thrombectomy mode passes. Completion venography demonstrated resolution of the thrombus; however, there was persistent narrowing of the IVC secondary to chronic scarring and the filter (Fig 2, *B*). We decided to treat the contralateral DVT with anticoagulation after removing the IVC filter. The IVC filter was retrieved during a second procedure, and 14-mm balloon angioplasty addressed the chronic fibrosis (Fig 2, *C*). Postoperatively, renal function gradually improved, with Cr concentration returning to baseline of 1.82 mg/dL at 1-year follow-up. The patient was prescribed lifetime warfarin because of his high risk for thrombosis.

Case 3. A 42-year-old woman with ESRD secondary to type 1 diabetes and hypertension underwent simultaneous pancreas and kidney transplantation, with the renal graft placed in the left iliac fossa. She had immediate graft function, with Cr concentration decreasing from 4.34 mg/dL to 1.24 mg/dL on day of discharge. She presented 4 weeks postoperatively with AKI (Cr concentration, 2.15 mg/dL) and left LE edema. Extensive workup revealed an acute DVT extending from the left popliteal vein to the common femoral vein (Fig 3, *A*). She was started on unfractionated heparin, but renal function did not improve. Because of clinical suspicion of May-Thurner syndrome on computed tomography venography, the vascular surgery service was consulted for operative intervention. Ascending venography through the left popliteal vein confirmed the diagnosis of May-Thurner syndrome and resolution of the thrombus on anticoagulation (Fig 3, *B* and *C*). A 16- × 40-mm Wallstent was deployed in the left common iliac vein above the allograft anastomosis and dilated with a 14- × 30-mm balloon. This improved the flow of contrast material significantly (Fig 3, *D*). Postoperatively, she was started on warfarin, and her Cr concentration decreased to a nadir of 0.75 mg/dL on 6-month follow-up.

Case 4. A 67-year-old man with ESRD secondary to hypertension and diabetes was admitted for a scheduled living unrelated kidney transplant, which was placed in the right iliac fossa. He tolerated the procedure well and had immediate graft function with serum Cr concentration dropping postoperatively from 4.49 mg/dL to 1.28 mg/dL. The patient returned a week after discharge to the outpatient clinic with left LE edema and

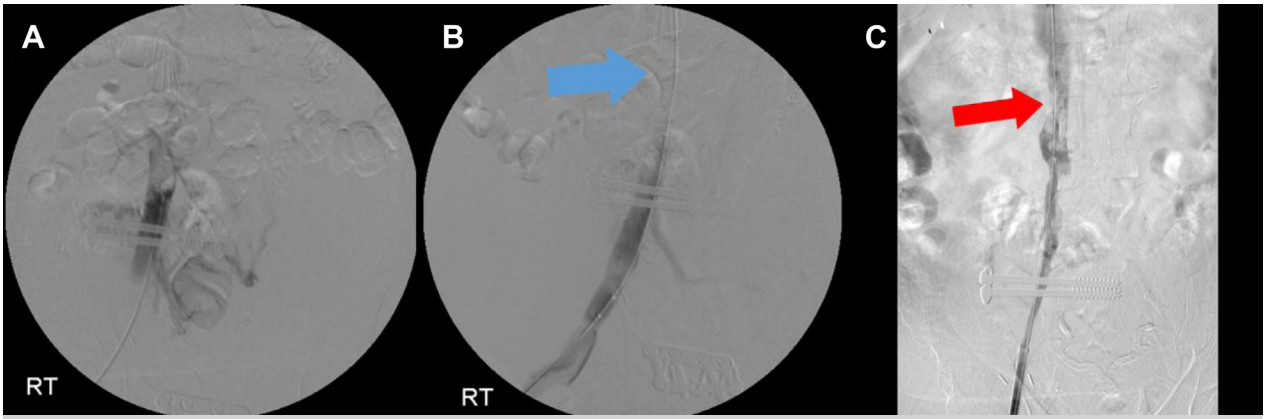

Fig 2. A, Initial cavogram demonstrates thrombus from distal inferior vena cava (IVC) to right iliofemoral veins. **B,** After thrombolysis, persistent IVC stenosis near IVC filter (*blue arrow*). **C,** After IVC filter retrieval and angioplasty, cavogram demonstrates adequate flow despite residual stenosis (*red arrow*).

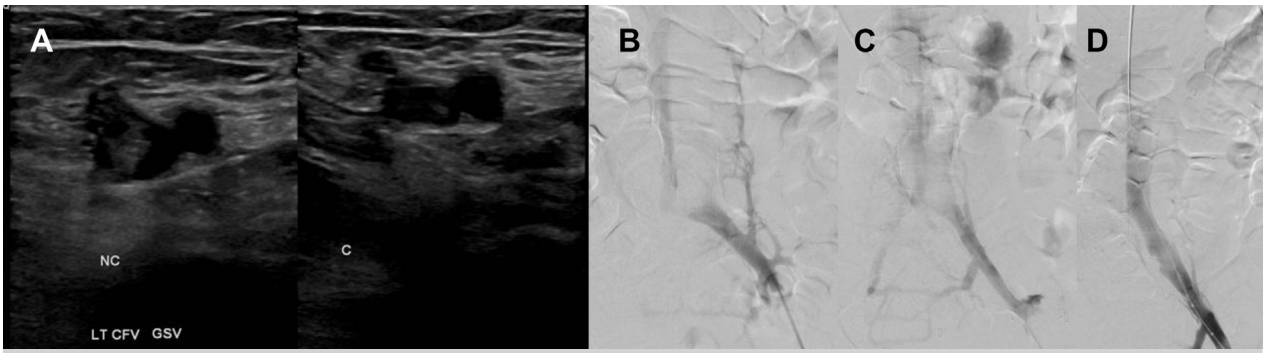

Fig 3. A, Ultrasound demonstrates an acute deep venous thrombosis (DVT) in left common femoral vein (*LT CFV*) with noncompressibility. *C,* Compression; *GSV,* great saphenous vein; *NC,* no compression. **B,** Initial venogram demonstrates resolution of thrombus. **C,** Persistent left iliac vein stenosis despite thrombus resolution, confirming May-Thurner syndrome. **D,** Improved outflow after iliac vein angioplasty and stenting.

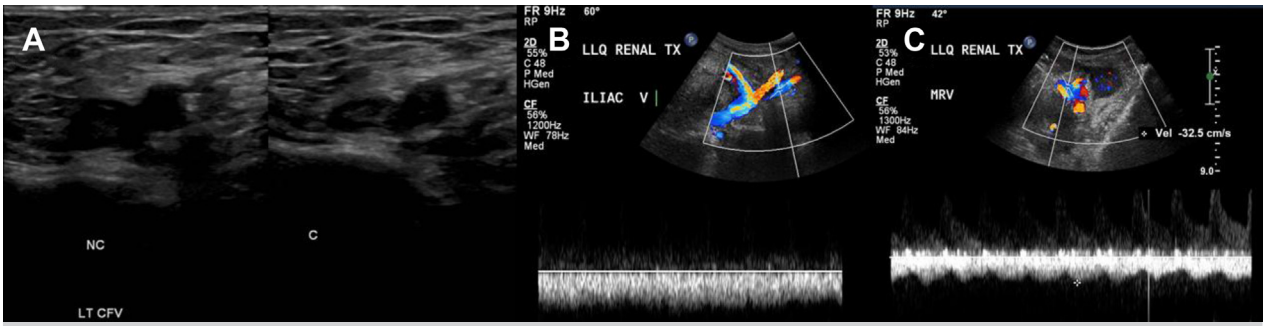

Fig 4. A, Ultrasound demonstrates left common femoral vein (*LT CFV*) thrombus. *C,* Compression; *NC,* no compression. **B,** Left external iliac vein (EIV) patent with adequate flow. **C,** Renal allograft venous anastomosis patent with adequate flow.

evidence of DVT extending from the left common femoral vein to the left EIV (Fig 4, *A*). In addition, he was found to have transplant hydronephrosis with AKI (serum Cr concentration, 2.14 mg/dL) and elevated resistive indices, with patent allograft vessels (Fig 4, *B* and *C*). He was managed medically with unfractionated heparin bridge to warfarin anticoagulation, and Cr concentration decreased to 1.17 mg/dL at 6-month follow-up.

DISCUSSION

Kidney transplantation remains the optimal and most cost-effective management for ESRD. It provides better quality of life and has less morbidity and mortality.[1,2] Allograft dysfunction and complications can be harmful to patient outcomes.[7] Vascular complications are one of the most detrimental complications.[4] In addition,

diseased iliofemoral arteries have been shown to affect both patient and graft outcomes.[8] As such, high-risk kidney transplantation candidates at our institution undergo abdominopelvic computed tomography for evaluation of aortoiliac calcification. Other institutions start with screening pelvic radiography and pursue further imaging if there is extensive calcification.[3] We believe that additional attention to the venous system is warranted in these high-risk kidney transplantation candidates. This may involve either a screening venous duplex ultrasound examination or possibly venography with IVUS. If the iliofemoral venous system is deemed inappropriate for allotransplantation, several reports have described alternative venous drainage, such as the portal venous system.[9,10]

All patients in our series presented with AKI anywhere from 1 week to 3 years postoperatively. They all had uneventful transplant surgeries with standard end-to-side running vascular anastomosis. Patients who have immediate graft function do not require postoperative imaging. Rejection, infection, and obstruction were ruled out on initial presentation as common causes. In addition to ultrasound with Doppler evaluation, all patients underwent biopsy that ruled out rejection. Although the thrombus did not involve the allograft vein in three patients, it appears that it is the only culprit causing the injury. This is corroborated by transient worsening of calculated resistive indices,[11] in addition to the improvement in serum Cr concentration after therapy. All patients underwent laboratory evaluation for thrombophilic disorders; the result was negative in all cases.

Iliofemoral and iliocaval thromboses after kidney transplantation that required surgical intervention are described in the literature.[12-22] Patients presented anytime from 1 day to 16 years postoperatively, and presenting symptoms were LE edema and AKI. In a case series comparing patients who underwent anticoagulation with those who had open thrombectomy, thrombectomy patients had better long-term outcomes in regard to chronic venous disease.[14] More recently, reported cases described endovascular approaches for DVT therapy and graft salvage.[13,15,17,22]

There are few data in the literature to suggest causative factors for occurrence of LE DVT after kidney transplantation. Some reports implicate mechanical causes, such as May-Thurner syndrome,[23] graft compression of the iliac vessels,[24] clamp injury during anastomosis, multiple allograft veins,[25] or iliocaval scarring from previous procedures and IVC filters. We speculate that these patients suffer from chronic venous insufficiency and fibrosis secondary to ESRD, that it is burdened with venous outflow from a renal allograft. This has been reported before as transient LE edema after kidney transplantation.[26] Furthermore, burdening a diseased iliocaval venous system with venous return can cause contralateral DVTs at the site of previous venous injury.

Iliofemoral DVTs appear to affect renal allograft function despite sparing the allograft vein. Anticoagulation is a reasonable initial approach if the allograft vein is not involved. If anticoagulation fails or if the allograft vein is involved, immediate endovascular intervention offers both diagnostic (by means of venography or IVUS) and interventional abilities, such as thrombectomy, angioplasty, or stenting.

CONCLUSIONS

Iliofemoral DVT after kidney transplantation is an uncommon cause of allograft dysfunction. Multiple factors may play a role in the formation of the thrombus; however, clinical suspicion and early recognition permit graft salvage. Some high-risk patients may benefit from early screening before kidney transplantation. If the thrombus does occur, the endovascular approach is feasible and has reported graft survival.

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