

Challenging Acute Iliofemoral and IVC Thrombosis

Catheter-directed therapy in the presence of an inferior vena cava filter.

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A 50-year-old woman presented with sudden onset of abdominal pain, intractable nausea, and vomiting. She was found to have a ruptured spleen and an adrenal hemorrhage, both apparently spontaneous as she had no history of trauma or laboratory evidence of vasculitis. Her medical history was significant for hypertension, cholecystectomy, hysterectomy and bilateral oophorectomy for uterine fibroids and ovarian cysts, respectively, and hyperlipidemia. Her medications included metoprolol, lovastatin, and estradiol. She had a history of easy bruising, but no history of nose bleeds, melena, or bright red blood per rectum. She had no significant complications

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related to her cholecystectomy and hysterectomy or oophorectomy.

Her family and social history were unremarkable. The patient was obese and febrile to 39.2°C. She was hypernatremic with a sodium level of 166. Liver function tests yielded normal results. Her white blood cell count was 19,000. Her hematocrit was 30, with a platelet count of 260,000, and her creatinine was 1.1 mg/dL.

DIAGNOSIS AND TREATMENT

The patient was diagnosed with central diabetes insipidus as the cause for her hypernatremia. The etiology for her splenic rupture and adrenal hemorrhage was unclear. The fever and leukocytosis were due to a urinary tract infection.

The patient developed increasing shortness of breath and bilateral pleural effusions during her hospital course. A thoracentesis was performed and demonstrated a hemothorax, requiring placement of a chest tube.

Approximately 2 weeks after admission, she developed shortness of breath, and CT

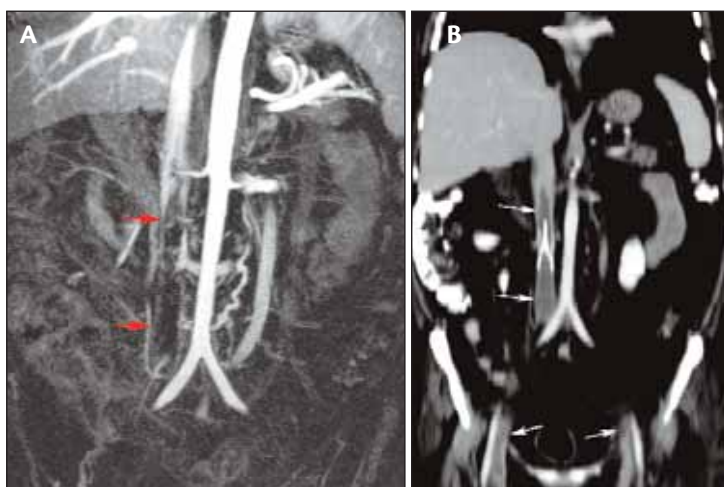


Figure 1. Magnetic resonance angiography demonstrated thrombus (arrows) throughout most of the IVC extending cephalad to the infrarenal IVC filter (A). CT angiography confirmed the findings with better delineation of the thrombus (arrows) cephalad to the filter (B).

pulmonary angiography revealed a pulmonary embolism involving the lingular segment of the left lung. Because of her history of spontaneous rupture of her spleen and adrenal hemorrhage, an inferior vena cava (IVC) filter (Vena Tech LP, B. Braun Corporation, Evanston, IL) was placed. Three days after placement of the IVC filter, the patient developed new leg pain. Bilateral lower-extremity ultrasound revealed no evidence for deep vein thrombosis (DVT). The patient was discharged.

FOLLOW-UP REVEALS DVT

Two months later, a repeat CT scan of the abdomen revealed that the IVC filter was widely patent with no further evidence of splenic or adrenal bleeding. However, 3 months after IVC filter placement, the patient developed bilateral lower-extremity pain and swelling. Duplex ultrasound of the lower extremities revealed bilateral lower-extremity DVT. MR venogram revealed thrombosis of the IVC (Figure 1A) and both iliofemoral veins. A CT angiogram (Figure 1B) confirmed the findings of the MR venogram and excluded any significant retroperitoneal pathology or bleeding.

Interventional radiology was consulted, and a retrievable suprarenal IVC filter was placed (Tulip, Cook Medical, Bloomington, IN). Bilateral popliteal vein

access was achieved, and thrombosis of both popliteal, femoral, and iliac veins and the IVC was confirmed (Figure 2). Using an AngioJet Xpeedior 6-F mechanical thrombectomy catheter (Possis Medical Inc., Minneapolis, MN), the power-pulse spray technique was performed in both iliofemoral segments and the IVC.^{1,2} Ten milligrams of tissue plasminogen activator (tPA) (Genentech Corporation, South San Francisco, CA) was diluted in 100 mL of normal saline and used throughout the thrombosed segments. Dwell time for the solution was 10 to 15 minutes on each side. Power-pulse spray administration of tPA was subsequently followed by traditional AngioJet mechanical thrombecto-

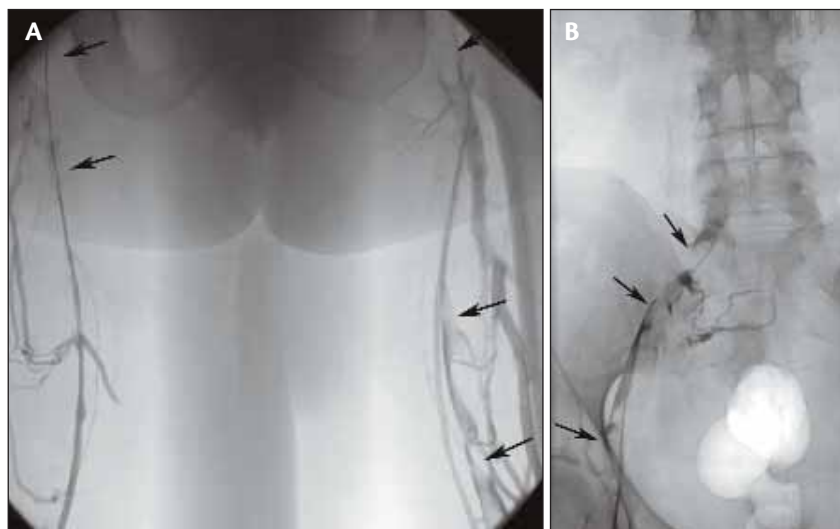


Figure 2. Bilateral lower-extremity venograms demonstrated thrombus (arrows) involving the popliteal, femoral (A), and iliac (B) veins, and the IVC.

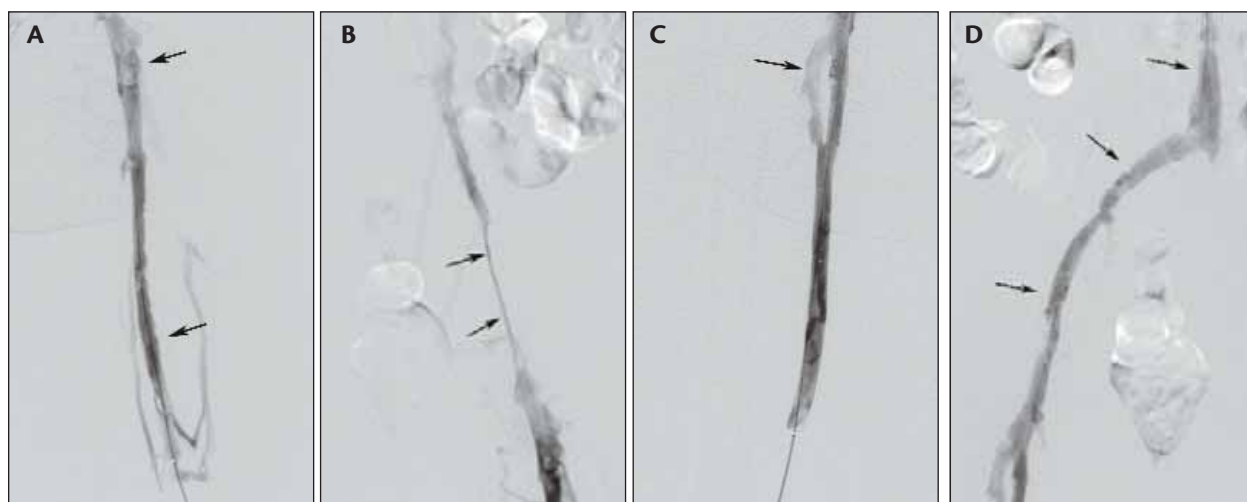


Figure 3. Venography at 20 hours showed significant reduction in thrombus burden in the right superficial femoral vein (arrows) (A), right common iliac vein with a stenosis involving the external iliac vein (arrows) (B), left superficial femoral vein with an incidentally seen partial duplication (arrow) (C), and left iliac veins and IVC (arrows) (D).

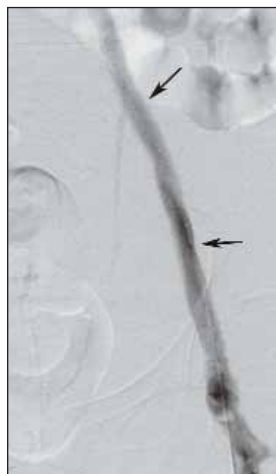


Figure 4. Right external iliac vein after placement of two overlapping 12-mm X 60-mm, self-expanding nitinol stents and 10-mm balloon dilation showed no residual stenosis and excellent flow (arrows).



Figure 5. An inferior venacavogram at 44 hours showed residual thrombus within the infrarenal Vena Tech filter (arrows) and a small amount of thrombus trapped within the apex of the suprarenal Tulip filter (arrowhead).

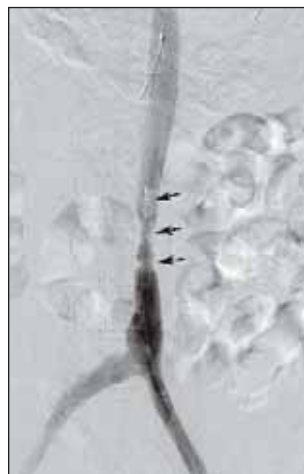


Figure 6. Persistent filling defect (arrows) within the infrarenal Vena Tech filter due to thrombus. At this time, no thrombus was identified within the suprarenal filter.

late the patient with a plan to remove the suprarenal IVC filter in 4 weeks.

Four days later, the patient developed lower-extremity swelling, nausea, and vomiting, and repeat duplex ultrasound of both lower extremities demonstrated rethrombosis of both iliofemoral veins. In addition, the platelet count had abruptly decreased from 196,000 to 30,000. A tentative diagnosis of heparin-induced thrombocytopenia was made. This diagnosis was later confirmed by antibody studies. All heparin therapy was terminated, and an Argatroban

my. Multi-sidehole infusion catheters (MicroTherapeutics, Irvine, CA) with 50 cm of infusion lengths were placed, and 0.5 mg per hour of tPA per infusion catheter was started. In addition, tPA was infused via both popliteal venous access sheaths at a rate of 0.25 mg per hour; therefore, the patient received a total of 1.5 mg of tPA per hour. Systemic heparin was administered at rate of 500 U per hour.

Follow-up venography of both lower extremities after 20 hours of thrombolysis demonstrated >90% decrease in clot burden within both iliofemoral segments (Figure 3). The tPA infusions were continued. At 44 hours, there was further clot lysis, which revealed an underlying left external iliac vein stenosis. After a suboptimal balloon angioplasty, two overlapping 12-mm-diameter X 60-mm-long self-expanding Protégé nitinol stents (ev3, Minneapolis, MN) were placed, with an excellent result (Figure 4).

After stent placement, repeat bilateral lower-extremity venography revealed excellent antegrade flow bilaterally. Greater than 95% clot lysis was demonstrated. A small amount of clot was noted within the Vena Tech LP filter and within the suprarenal IVC filter (Figure 5). The decision was made to terminate thrombolysis and fully anticoagu-

(GlaxoSmithKline, Philadelphia, PA) drip was started at a rate of 180 mcg/min and titrated to a target aPTT of 60 to 80 seconds.

Bilateral popliteal vein access was once again achieved. Power-pulse spray was again performed on both iliofemoral segments, as described previously. After mechanical thrombectomy, the clot burden had

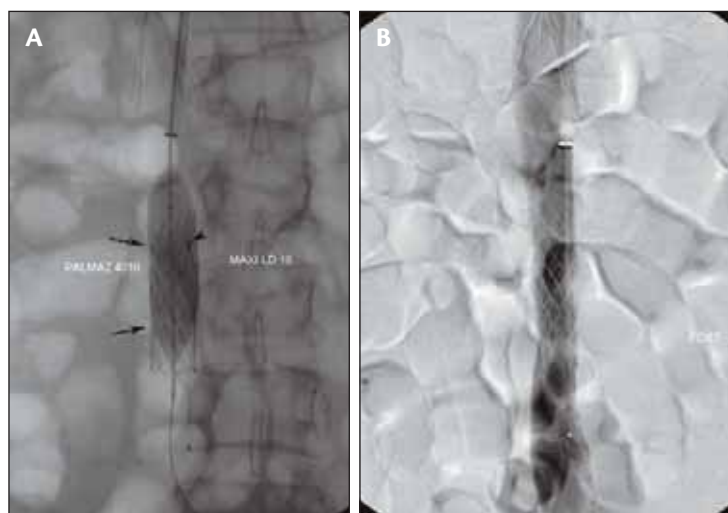


Figure 7. Two 4010 Palmaz balloon-expandable stents (arrows) were deployed through the Vena Tech filter (arrowhead) and dilated to 18 mm with a Maxi LD balloon (Cordis Endovascular) (A). An inferior venacavogram after stent placement shows good flow through the IVC filter (B).

decreased by approximately 50%. Multi-sidehole infusion catheters (50-cm infusion length) were inserted bilaterally. Infusion wires (Prostream, MicroTherapeutics) 12 cm in length were also placed coaxially through both infusion catheters, providing a total infusion length of 62 cm bilaterally. The tPA infusion was started at a rate of 0.5 mg/h per infusion catheter and 0.25 mg/h per infusion wire, for a total of 1.5 mg/h.

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After 23 hours of thrombolysis, venography demonstrated >90% decrease in clot burden; however, there was residual clot within the popliteal vein and narrowing within the Vena Tech LP IVC filter from a wall-adherent clot. The infusion systems were repositioned across the Vena Tech LP filter, and thrombolysis continued for an additional 24 hours. Repeat venography demonstrated effective elimination of almost all clot within the femoral and popliteal venous segments and both iliac veins. However, sluggish flow through the Vena Tech LP filter was noted with persistent wall-adherent thrombus within the filter. At this time, no clot was identified within the suprarenal filter (Figure 6). Right internal jugular venous access was obtained, and an 11-F, 35-cm-long sheath was inserted. Using an 18-mm-diameter balloon, two overlapping, large Palmaz stents (4010, Cordis Endovascular, a Johnson & Johnson Company, Warren, NJ) were deployed through the Vena Tech LP filter, with markedly improved flow (Figure 7).³ All sheaths were removed, and hemostasis was achieved. Subsequently, the suprarenal IVC filter was removed without difficulty, and the IVC was noted to be widely patent (Figure 8).



Figure 8. Before removal of the suprarenal filter, an inferior venacavogram performed 4 days after placement of the IVC stents showed a widely patent IVC and excellent antegrade flow.

DISCUSSION

The patient was converted from Argatroban to warfarin and discharged. At her 3-month clinical follow-up, her swelling was markedly improved, and she was ambulating with minimal pain. At this time, it appeared that her diabetes insipidus had resolved. No clear etiology for her diabetes insipidus, splenic rupture, adrenal hemorrhage, DVT, or pulmonary embolism was identified. However, rethrombosis after the initial thrombolysis was believed to be due to platelet clumping related to heparin-induced thrombocytopenia. The platelet count returned to normal within 2 weeks after discontinuing the heparin.

CONCLUSION

This patient represents a complex clinical scenario in which there was a transient contraindication to anticoagulation necessitating placement of an IVC filter. IVC filter thrombosis ensued. After successful thrombolysis, repeat IVC thrombosis occurred likely due to heparin-induced thrombocytopenia, precipitated by the residual/persistent thrombus within the filter. Repeat thrombolysis/thrombectomy was performed; however, it became evident that it was necessary to stent open the infrarenal IVC filter to improve antegrade flow within the IVC and reduce the likelihood of rethrombosis. The patient will remain on anticoagulation at least 1 year and then undergo repeat evaluation for a hypercoagulable state. ■

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