Managing iliofemoral deep venous thrombosis of pregnancy with a strategy of thrombus removal is safe and avoids post-thrombotic morbidity

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Background: **Extensive deep venous thrombosis (DVT) during pregnancy is usually treated with anticoagulation alone, risking significant post-thrombotic syndrome (PTS) in young patients. Catheter-directed thrombolysis (CDT) and operative venous thrombectomy have been safely and effectively used in nonpregnant patients, demonstrating significant reduction in post-thrombotic morbidity. This report reviews short- and long-term outcomes of 13 patients with extensive DVT of pregnancy treated with a strategy of thrombus removal.**

Methods: **From 1999 to 2013, 13 patients with iliofemoral DVT during pregnancy were offered CDT, pharmacomechanical thrombolysis (PMT), and/or venous thrombectomy. Gestational age ranged from 8 to 34 weeks. Fetal monitoring was performed throughout hospitalization. Radiation exposure was minimized with pelvic lead shields, focal fluoroscopy, and limited angiographic runs. Follow-up included objective vein evaluation using venous duplex and PTS assessment using the Villalta scale.**

Results: **CDT and/or PMT were used in 11 patients. Two patients underwent venous thrombectomy alone, and one patient had operative thrombectomy as an adjunct to CDT and PMT. Each patient had complete or near-complete thrombus resolution and rapid improvement in clinical symptoms. Eight of 11 having CDT or PMT underwent venoplasty and stenting of the involved iliac veins. Twelve of the 13 delivered healthy infants at term. One patient opted for termination of her pregnancy. Mean patient and gestational ages were 26 years and 26 weeks, respectively. Mean follow-up was 1.3 years, with only one recurrence. Duplex ultrasonography demonstrated patent veins in all but one patient and normal valve function in 10 patients. Eleven patients had Villalta scores <5 (considered normal), with a mean score of 0.7.**

Conclusions: **Extensive DVT of pregnancy can be effectively and safely treated with a strategy of thrombus removal, resulting in a patent venous system, normal valve function in many, prevention of PTS, and reduction in recurrence. (J Vasc Surg 2014;59:456-64.)**

Deep venous thrombosis (DVT) is a significant cause of morbidity during pregnancy and the postpartum period. Venous thromboembolic disease complicates approximately 1 to 2 per 1000 pregnancies, with maternal age, comorbidities, and mode of delivery influencing the risk.[1-3] Treatment options range from management with heparin anticoagulation alone until delivery to catheter-based thrombolytic techniques or operative thrombectomy. However, extensive DVT during pregnancy is usually treated with anticoagulation alone, risking significant post-thrombotic morbidity.[4,5]

A recent systematic review of anatomic distribution of DVT in 124 pregnant patients reported that 87 (71%) patients had proximal thrombosis, and of these, 56 (64%) had thrombus involving the iliofemoral veins.[6] Iliofemoral DVT is associated with a high risk of post-thrombotic syndrome (PTS),[4,5,7] a debilitating condition that reduces quality of life and often worsens over time. The prospect of post-thrombotic morbidity in this cohort of young and otherwise healthy women should motivate physicians to consider a strategy of thrombus removal.

Adopting a strategy of thrombus removal and restoring patency to the iliofemoral segment reduces short- and long-term morbidity in iliofemoral DVT patients.[8,9] The combination of early clot removal with catheter-based techniques or contemporary venous thrombectomy, correction of underlying residual stenosis with balloon venoplasty and/or stenting, and systemic therapeutic anticoagulation is becoming the preferred treatment option for iliofemoral DVT in the nonpregnant patients in centers with appropriate expertise.[10-12]

DVT of pregnancy is uniformly treated with only anticoagulation, regardless of its extent. Even when pregnant patients present with phlegmasia cerulea dolens, the most common clinical presentation of iliofemoral DVT, vascular surgeons fail to offer venous thrombectomy, and interventionalists avoid catheter-based techniques of thrombus removal for fear of treatment-related pregnancy complications.

We have observed that patients with extensive DVT of pregnancy who have persistent pain and edema with

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Fig 1. A 24-year-old patient, 32 weeks pregnant, presented with a 2-week history of left iliofemoral deep venous thrombosis (DVT) causing severe pain and swelling of her left leg, unresponsive to low-molecular-weight heparin (LMWH) and leg elevation. Venography revealed iliofemoral DVT from the proximal femoral vein and common femoral vein to the vena cava. **A,** Ascending venogram shows the thrombosed proximal femoral and common femoral veins and **(B** and **C)** a patent vena cava with compression by a gravid uterus.

anticoagulation and leg elevation can be managed safely and effectively with a strategy of thrombus removal. The purpose of this report is to objectively describe the treatment and outcome of 13 consecutive patients treated with either catheter-based techniques or operative thrombectomy for iliofemoral DVT of pregnancy.

METHODS

Between 1999 and 2013, 13 patients were referred for management of extensive DVT during pregnancy. All patients were initially managed with systemic anticoagulation and leg elevation and had persistent pain and edema after 2 to 14 days of treatment. After failing initial anticoagulation and elevation, patients were offered a strategy of thrombus removal. Patient data were collected and retrospectively reviewed to evaluate treatment and pregnancy outcomes. The study was approved by the institutional review board.

All patients presented with extensive lower extremity DVT involving the iliofemoral venous segments and had swollen limbs from the inguinal ligament distally that were painful and had bluish discoloration, classically known as *phlegmasia cerulea dolens.* All were offered a strategy of thrombus removal, which included catheter-directed thrombolysis (CDT), pharmacomechanical thrombolysis (PMT), or operative venous thrombectomy. Percutaneous interventions were all performed using conscious sedation with fentanyl and midazolam, with midazolam used cautiously during the third trimester. All patients were monitored with electrocardiography, pulse oximetry, and vital signs by experienced interventional nurses. Obstetrical nurses oversaw the fetal monitors measuring fetal heart rate and uterine contractions during the procedures. Radiation exposure was minimized. The patient's abdomen and pelvis were shielded with a lead apron when possible, and low-frame (four to six frames per second) pulse fluoroscopy with fluoro-save were used during all interventions. Digital subtraction angiographic runs were kept to a minimum and confined to the inferior vena cava (IVC) and iliac veins. The field of fluoroscopy was tightly collimated. Fluoroscopic image hold was used for documenting and filming. Foley catheters were used in all patients.

Most patients were able to tolerate a prone or semi-decubitus position. The preferred access site for percutaneous interventions was the ipsilateral popliteal vein, but two patients required additional posterior tibial vein access at the ankle level due to DVT extending below the popliteal vein into the calf veins. Internal jugular or contralateral common femoral vein access was used when IVC filter placement was required, which occurred when free-floating clot protruding into the vena cava was noted during venography. Optional Gunther-Tulip filters (Cook Medical, Bloomington, Ind) were placed in the suprarenal IVC, with retrieval performed after delivery.

All access sites were prepped with 4% chlorhexidine and draped in the usual fashion. Veins were accessed using ultrasound guidance and 4-F micropuncture needles (Cook Medical). Following venography, a 6- to 8-F access sheath was placed in the popliteal vein, and the clot was traversed with a hydrophilic guidewire. An intravascular ultrasound catheter (Volcano, San Diego, Calif) was occasionally used to evaluate the extent of central venous thrombosis or to guide stent placement.

PMT was performed using an 8-F Trellis catheter (Covidien, Mansfield, Mass) to perform isolated segmental PMT or a 6-F AngioJet catheter (Medrad, Warrendale, Pa) used for rheolytic thrombectomy, occasionally supplemented