Case Reports

Protected Iliofemoral Venous Thrombectomy

in a Pregnant Woman with Pulmonary Embolism and Ischemic Venous Thrombosis

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Although thromboembolism is uncommon during pregnancy and the postpartum period, physicians should be alert to the possibility because the complications, such as pulmonary embolism, are often life threatening. Pregnant women who present with thromboembolic occlusion are particularly difficult to treat because thrombolysis is hazardous to the fetus and surgical intervention by any of several approaches is controversial.

A 22-year-old woman, in her 11th week of gestation, experienced an episode of pulmonary embolism and severe ischemic venous thrombosis of the left lower extremity. The cause was determined to be a severe protein S deficiency in combination with compression of the left iliac vein by the enlarged uterus.

The patient underwent emergency insertion of a retrievable vena cava filter and surgical iliofemoral venous thrombectomy with concomitant creation of a temporary femoral arteriovenous fistula. The inferior vena cava filter was inserted before the venous thrombectomy to prevent pulmonary embolism from clots dislodged during thrombectomy. When the filter was removed, medium-sized clots were found trapped in its coils, indicating the effectiveness of this approach. The operation resolved the severe ischemic venous thrombosis of the left leg, and the patency of the iliac vein was maintained throughout the pregnancy without embolic recurrence. At full term, the woman spontaneously delivered an 8-lb, 6-oz, healthy male infant. ***(Tex Heart Inst J 2002;29:130-2)***

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Key words: *Femoral vein/surgery; heparin/therapeutic use; iliac vein/surgery; pregnancy complications, cardiovascular/surgery; pulmonary embolism/prevention & control; thrombectomy; thrombosis/therapy; vena cava filters; venous thrombosis/therapy*

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Case Report

In April 2000, a 22-year-old woman in her 11th week of gestation presented at an outlying hospital with acute dyspnea, cough, and pleuritic chest pain. These symptoms were associated with rapidly progressing edema, cyanosis, and pain in the left lower extremity, of 2 hours' duration. The patient was not a smoker and she had never taken estrogenic or progestational hormones. She worked in a factory, where she spent about 8 hours a day seated. The patient's mother had been undergoing warfarin therapy because of recurrent thromboembolic complications arising from a protein S (PS) deficit; yet an inherited PS deficiency had never been investigated in this patient before our observation.

On physical examination, the patient had a massively swollen, cyanotic, ecchymotic, rigid, and cold left lower extremity from the toes to the groin. Left femoral and popliteal pulses were present, but the dorsalis pedis pulse was weak, and the posterior tibial pulse was absent. The sensory and motor function of the left lower extremity to the level of the mid-thigh was reduced. The patient was afebrile and her lungs were clear at auscultation. Cardiac examination revealed normal heart sounds, with no gallops or murmurs. The respiratory rate was 32 breaths/min. On room air, arterial pH was 7.40, arterial carbon dioxide partial pressure (PCO_2) was 22 mmHg, and arterial oxygen partial pressure (PO_2) was 61 mmHg. Twelve-lead electrocardiography showed sinus rhythm at a rate of 93 beats/min; T waves were inverted in lead III. Transthoracic echocardiography showed an estimated end-systolic pulmonary artery pressure of 38 mmHg and revealed only moderate right

ventricular dilatation, with septal flattening. Serum D-dimer and fibrin degradation products (FDP) were markedly high. The patient's functional PS activity of 36% (Instrumentation Laboratory Protein S test; normal range, 60%–140%) was markedly low.

The diagnosis of ischemic venous thromboembolism caused by iliofemoral thrombosis was obvious, and a pulmonary embolism was very strongly suspected. The patient did not undergo radiographic or isotopic investigations because of the pregnancy, and she refused magnetic resonance imaging of the lungs because she was claustrophobic. Abdominal ultrasonography showed an abnormal left lateral deviation of the uterus gravidus, which was compressing the left common iliac vein and obstructing it proximally. The patient was treated with heparin and transferred to our institution 6 hours after her initial presentation.

Upon her arrival at our center, the patient's chest pain and dyspnea resolved, her respiratory rate slowed to 22 breaths/min, and her blood gas levels returned to normal. However, the severe ischemic venous thrombosis of the left leg and a new episode of thoracic pain with dyspnea soon required urgent treatment, with the goals of preventing massive pulmonary embolism and of restoring venous drainage. Given the embolic risk of the procedure, we decided to operate with the protection of a self-expanding, adjustable, and retrievable Prolyser® inferior vena cava filter (Cordis, Johnson & Johnson Health Care Systems Inc.; Piscataway, NJ). In order to limit the fetus's exposure to radiation, we used duplex ultrasonography to assist us in determining the appropriate size and positioning of the filter. The filter was introduced through the right internal jugular vein and placed with its proximal end exactly at the level of the confluence of the renal veins, in order to enable collateral perfusion of the filter head in the event of caval thrombosis due to emboli or genuine thrombi. Deployment was checked by fluoroscopy, which was done quickly, with lead shields protecting the uterus gravidus.

Surgical thrombectomy was conducted under local anesthesia. A vertical left inguinal incision was made over the femoral vessels, and the femoral artery, as well as the common femoral, superficial femoral, deep femoral, and saphenous veins, were mobilized and controlled. Upon discovering complete thrombosis of the venous vessels, we administered an additional dose of heparin (50 mg). We then made an oblique venotomy in the distal common femoral vein, just proximal to the saphenofemoral junction, and removed the proximal thrombus with an 8-F venous thrombectomy catheter. To further reduce the risk of embolization during passage of the catheter, we asked the patient to perform Valsalva's maneuver to increase central venous pressure. To prevent passage of the catheter through the filter coils, we used duplex imaging of the vena cava during antegrade Fogarty-balloon thrombectomy.

After the proximal thrombectomy, we extruded the distal thrombus by means of compression with a tight Esmarch's bandage, wrapped from the foot proximally. Patency of the femoral and iliac veins was thereby re-established.

An arteriovenous fistula was then constructed by end-to-side anastomosis of the divided saphenous vein to the superficial femoral artery, to increase blood flow and velocity in the pelvic veins. Over the course of the next several hours, edema and cyanosis of the left lower extremity rapidly decreased and disappeared.

When the caval filter was retrieved 2 days after the operation, medium-sized clots were found entrapped in the device's coils (Fig. 1).

During ambulation, the patient wore an elastic stocking on her left lower extremity. Postoperatively, anticoagulation was maintained with continuous intravenous administration of heparin, at the dosage required to keep the mid-interval prothrombin time at 70 to 80 seconds; shortly before hospital discharge, this was changed to a single daily dose of 6,000 IU of low-molecular-weight heparin given subcutaneously. She was discharged home on the 10th postoperative day.

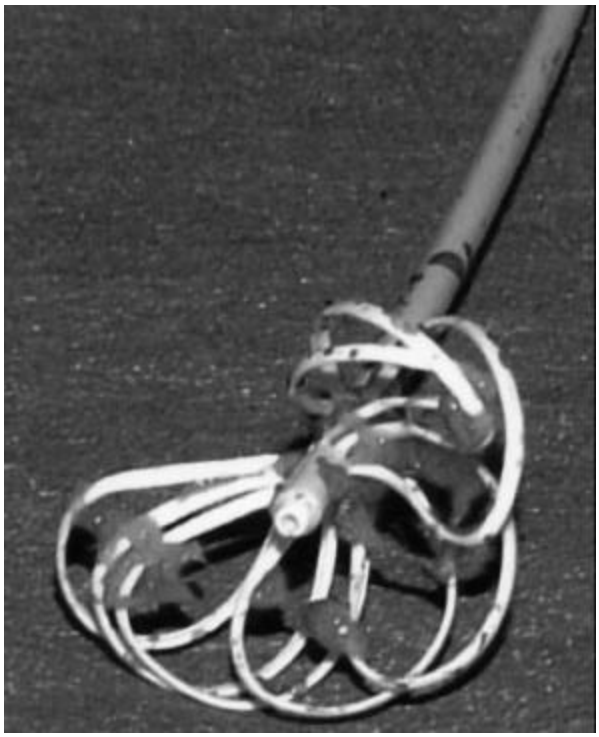

Fig. 1 *Clots are seen to be entrapped in the coils of the retrieved inferior vena cava filter.*

Follow-up throughout pregnancy, by means of serial noninvasive testing, demonstrated good patency of the pelvic veins despite the compression of the left iliac vein by the enlarged uterus. The flow velocity at the level of the left iliofemoral axis was 3- to 4-fold that at the right axis. In addition to these serial antenatal ultrasonograms, the patient underwent Doppler color-flow examination of the uterine and umbilical arteries and the umbilical vein to evaluate the influence of the arteriovenous fistula and iliac compression on the uteroplacental circulation. No consequence to the uterine or placental circulation was detected.

The patient delivered at term, with a vaginal delivery of an 8-lb, 6-oz healthy male infant; she was switched to an oral anticoagulant 3 weeks after delivery, when breast-feeding ceased. A ventilation-perfusion (V/Q) scan confirmed multiple V/Q mismatched defects, compatible with residual peripheral embolism. Extensive evaluation of the patient's coagulation system confirmed a protein S deficiency. An arteriovenogram performed 2 months after childbirth showed continued patency of the pelvic and femoral veins. The fistula was then ligated under local anesthesia. The patient remained on oral anticoagulation at last follow-up, 18 months after delivery.

Discussion

Acute iliofemoral venous thrombosis is 6 times more frequent among pregnant than nonpregnant women.[1] Pregnancy may increase the risk of thrombosis through a number of factors, singly or in combination: mechanical obstruction of venous drainage by the enlarging uterus and descending fetal head, decreased activity in late pregnancy and especially intrapartum, intimal injury from vascular distention or surgical manipulation, and abnormal levels of procoagulant or anticoagulant plasma factors.

Moreover, a wide spectrum of pathologic abnormalities, the more common of which are the presence of anticardiolipin and lupus anticoagulant antibodies and pathologic deficiencies of proteins C and S, may further increase the risk of thrombotic disease. Protein S serves as a cofactor for activated protein C, which has anticoagulative activity. Protein S deficiency leads to spontaneous, recurrent thromboembolic complications in adulthood. Protein S levels are substantially reduced during pregnancy and puerperium and during use of oral contraceptives.

In the presented case, the combination of iliac vein compression and PS deficiency led to a potentially fatal episode of pulmonary embolism.

The treatment options for deep venous thrombosis of a lower extremity during pregnancy remain controversial,[2] and the surgical treatment of acute iliofemoral venous thrombosis is a matter of debate.[3] However, in patients with contraindications to thrombolytic therapy, surgery is the most reasonable option in the presence of acute ischemic venous thrombosis and impending venous gangrene of the lower extremities.[3]

The use of the Fogarty balloon catheter to extract clots may cause the clots to fragment, thereby resulting in pulmonary embolization.[4-6] To prevent this complication, many techniques have been described, including interruption of the inferior vena cava by a right extraperitoneal approach or temporary caval occlusion with an inflated Foley catheter inserted from the contralateral, uninvolved femoral vein.[4] The disadvantage of the extraperitoneal approach is the need for extensive dissection. Passage of the Foley catheter may itself dislodge clots extending into the lower vena cava and does not prevent the possibility of pulmonary embolism after the procedure unless it is followed by the insertion of a cone filter.[7]

Insertion of an inferior vena caval filter through the right internal jugular vein—previous to or simultaneous with iliofemoral venous thrombectomy—is a technique 1st described by Olearchyk[7] in 1987 and is clearly advantageous, especially in pregnant women. It is simple, requires no extensive dissection, and prevents pulmonary embolization during and after the procedure. Local anesthesia, retrievable vena-cava filters, and ultrasound guidance of filter placement can be regarded as advantageous adjuncts to this technique in the effort to reduce both maternal and fetal risks.

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