Vacuum-Assisted Thrombectomy Device (AngioVac) in the Management of Symptomatic Iliocaval Thrombosis

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ABSTRACT

Three patients with complete iliocaval thrombosis causing symptomatic leg swelling failed initial treatment with standard pharmacomechanical techniques. The occluded segments of the inferior vena cava and iliac veins were subsequently treated with the AngioVac Cannula (AngioDynamics, Latham, New York) and extracorporeal venous bypass circuit. In each patient, symptoms improved after treatment. This report discusses potential benefits and ancillary techniques of using the AngioVac device for iliocaval venous thrombosis.

ABBREVIATIONS

DVT = deep venous thrombosis, IVC = inferior vena cava, rtPA = recombinant tissue plasminogen activator

In recent years, pharmacologic and combined pharmacologic and mechanical techniques for treating venous thrombus and for recanalizing large thrombosed veins have been reported (1–5). The AngioVac Cannula (AngioDynamics, Latham, New York) is a mechanical suction device that is designed for removal of intravascular material such as thrombus, tumor, foreign bodies, and vegetation, while maintaining flow during extracorporeal circulation. The suction cannula is a 22-F device that can be advanced over a wire using an internal dilator. The device has an expandable tip that opens up to 48-F. This tip serves as the suction end of a venovenous nonoxygenating bypass circuit that filters removed blood and returns it to the venous system via a separate reinfusion cannula or sheath (6). We report three cases in which the AngioVac device was used as an adjunct to standard pharmacologic and pharmacomechanical techniques for removal of iliocaval thrombus and recanalization.

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MATERIALS AND METHODS

Institutional review board approval was obtained for gathering and reporting the following data. After failure of initial pharmacologic or pharmacomechanical techniques, each patient gave consent for the AngioVac procedure. Each procedure was performed under general anesthesia, and a bypass circuit was run and supervised by a certified perfusionist. The bypass circuit was established using a ROTAFLOW centrifugal pump (MAQUET Cardiovascular, Wayne, New Jersey) with in-line filters. Activated coagulation time was maintained at $>$ 300 seconds with intravenous heparin, and full anticoagulation was resumed after the procedure. For the procedures, 26-F sheaths (DrySeal Sheath; W.L. Gore & Associates, Flagstaff, Arizona) were placed in the right internal jugular vein and one or both common femoral veins for passage of the device. At the conclusion of each case, the sheaths were removed after placement of purse-string sutures with 2-0 silk. Manual compression was held for 10 minutes.

Case 1

A 61-year-old woman with a prior history of placement of a Bard G2 inferior vena cava (IVC) filter (C.R. Bard, Murray Hill, New Jersey) presented with a 3-day history of progressive leg swelling and pain. Ultrasound performed on admission showed occlusive bilateral deep

venous thrombosis (DVT) extending from both common femoral veins through the popliteal veins. A hypercoagulability panel confirmed the presence of a lupus anticoagulant antibody. After several days of bed rest and anticoagulation with heparin, she began to develop a left calf ulcer related to continued leg swelling. We were consulted for evaluation and management of the DVT, and we proceeded to initiate catheter-directed thrombolysis.

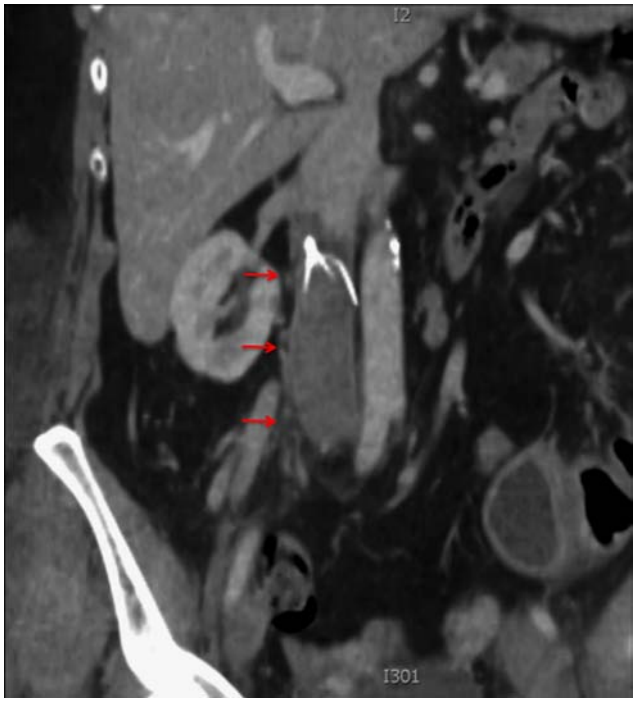

Figure 1. Patient 1. Coronal CT image of the abdomen and pelvis shows thrombus (arrows) extending up to and above the IVC filter. (Available in color online at *www.jvir.org*.)

A coronal computed tomography (CT) scan of the abdomen and pelvis showed thrombus extending up to and above the IVC filter (Fig 1). Initial venography showed chronic occlusion of the right femoral vein (Fig 2a) and abrupt thrombotic occlusion of the left iliac venous system (Fig 2b). Pharmacomechanical thrombectomy using a 120 cm × 30 cm Trellis-8 catheter (Covidien, Mansfield, Massachusetts) and recombinant tissue plasminogen activator (rtPA; alteplase) was performed, followed by catheter-directed rtPA thrombolysis of the IVC, iliac venous system, and both legs at a total dose of 1 mg/h. After 24 hours, reestablishment of venous flow was achieved in the left leg, but minimal change was observed in the right iliocaval thrombus. Also, the patient's fibrinogen level decreased to 104 mg/dL after 24 hours of infusion. Despite temporary cessation of the thrombolytic and subsequent thrombolytic dose reduction to 0.5 mg/h, the fibrinogen level remained < 150 mg/dL, and rtPA administration was stopped.

After discussion with the patient and a multidisciplinary team, a plan was made to proceed with AngioVac thrombectomy. Under ultrasound guidance, 26-F sheaths (DrySeal Sheath) were placed in the right internal jugular and left common femoral veins. An 8-F vascular sheath was placed in the right common femoral vein for venographic guidance and help with cannula manipulation. The suction cannula of the AngioVac

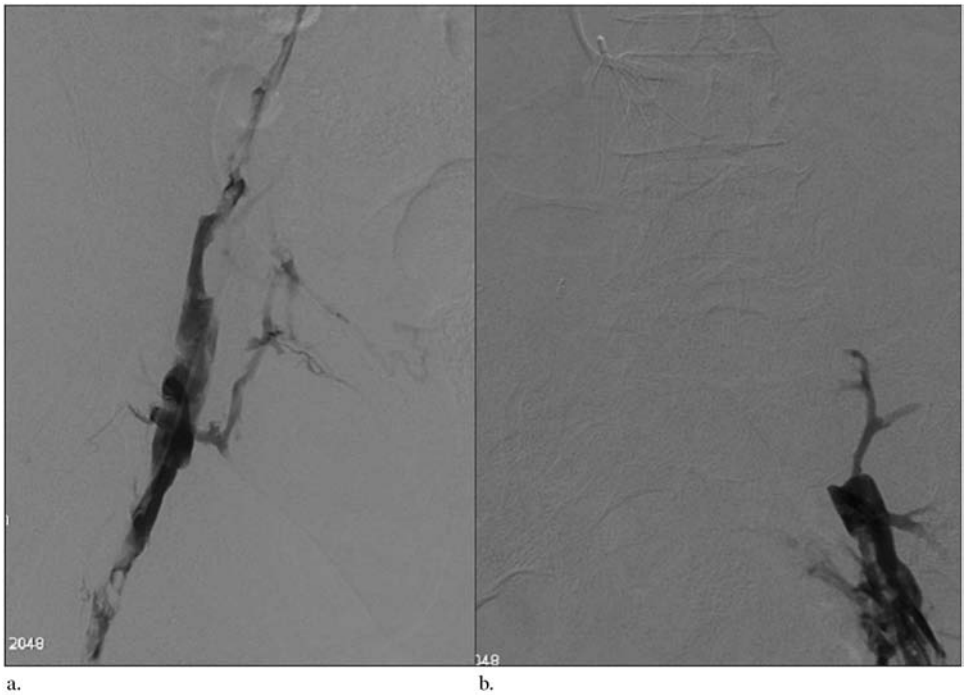

Figure 2. Patient 1. Right iliofemoral venogram **(a)** shows acute and chronic changes in the femoral, external iliac, and common iliac veins. Left iliofemoral venogram **(b)** shows abrupt iliac venous occlusion.

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