MAYO CLINIC

Introduction

Inferior vena cava (IVC) thrombosis remains rare with an incidence of 0.4%.

Successful ultrasonic accelerated thrombolysis, using the EkoSonic Endovascular System (EKOS® Corporation), has been previously reported in patients with iliac vein and lower extremity deep venous thrombosis (DVT).

Objectives

The main objective for this study was to evaluate the use of the ultrasonic accelerated thrombolysis for patients with symptomatic IVC thrombosis.

Methods

All patients diagnosed with symptomatic IVC thrombosis who were treated with ultrasonic accelerated thrombolysis from January 2012 to August 2013 were assessed.

Patient data regarding clinical presentation, thromboembolic risk factors, pertinent imaging, treatment pathway and clinical outcome were recorded.

Patient Demographics: Seven patients presented with lower extremity DVTs (5 males, mean age: 58.1 years). Four patients had a history of neoplastic disease, two patients were current smokers, four patients had a history of previous DVT and six patients a history of pulmonary emboli. All seven patients were previously anticoagulated and had IVC filters in-situ. Work-up for genetic thrombophilia was negative for all seven patients.

Ultrasound duplex imaging identified proximal lower extremity thrombus in four (57%) patients while cross-sectional imaging confirmed thrombus extending from the iliac veins into the IVC in all seven patients (Figure 1).

All seven patients were initially treated with limb elevation and compression hosiery combined with intravenous therapeutic unfractionated heparin infusions. The indication for thrombolytic therapy was significant symptomology in all seven patients despite maximal conservative treatment.



Figure 1: Contrast enhanced coronal CT scans of the abdomen/pelvis demonstrating significant clot burden extending from the both iliac veins superiorly above previously inserted infra-renal IVC filters.

Ultrasonic Accelerated Thrombolysis of Inferior Vena Cava Thrombosis

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Ultrasonic Thrombolysis Procedure: All procedures were performed in the interventional radiology suite under conscious sedation. Patients were placed in the prone position. Ultrasound was used to interrogate both popliteal veins which were then accessed percutaneously, after infiltration of plain 1% lidocaine, with a micropuncture introducer set (Silhouette[™] Transitionless, Cook Medical, Bloomington, IN).

The IVC was accessed using a stiff angled Glidewire® (Terumo, Tokyo, Japan) and Berenstein catheter (Boston Scientific, Natick, MA) via a 7 Fr sheath with sequential contrast administration to confirm intraluminal positioning. Once the Berenstein catheters were placed in the suprarenal IVC, they were exchanged for the 50 cm EKOS® catheters over a Bentson wire (Cook, Bloomington, IN) (Figure 2).



Endovascular System combined with 0.5 mg of tissue plasminogen activator and 35 mLs of normal saline coolant per hour. The sheath

Results

Figure 2: Ultrasonic thrombolysis was commenced using the EkoSonic side-arms were instilled with 500 international units of heparin per hour.

Patient Outcome: After 24-hours the patients returned to the interventional radiology suite for venography. Six patients required mechanical thrombectomy using the Angiojet system (Possis Medical, Minneapolis, MN) and balloon angioplasty as required. One patient required an additional 24-hours of ultrasonic thrombolysis followed by mechanical thrombectomy (Figure 3).

All seven patients are currently well and remain anticoagulated (warfarin=6, rivaroxaban=1) with improvement in lower extremity symptomatology and no recurrence of IVC thrombosis at mean follow-up 7.6 months (range: 1-20 months).



after mechanical thrombectomy.

This is the first reported series of ultrasonic accelerated thrombolysis for IVC thrombosis. These early results suggest this modality may be helpful in treating patients with large IVC thrombus burden and significant clinical symptoms with successful clot dissolution and satisfactory venous flow without patient distress or complications.

Figure 3: (A) Pre-treatment venography demonstrating absent/poor flow in the iliac veins and IVC. (B) Evidence of improved venous flow after 24 hours of ultrasonic accelerated thrombolysis followed by (C) completion venography

Conclusions