Case Report

Successful removal of an acute deep vein thrombosis by the INARI ClotTriever system

Erina Quinn, BA⁴*, Mary Arndt, BS, MSc⁴, James Capanegro, BS, MMS⁵, Douglass Sherard, MD⁶

⁴Lake Erie College of Osteopathic Medicine, Bradenton, FL, USA
⁵Mcclow, Clark and Berk Radiologists, Jacksonville, FL, USA

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A B S T R A C T
Pulmonary embolism is most feared sequela of a proximal deep vein thrombosis (DVT). Currently, first-line DVT treatment is anticoagulation to prevent post-thrombotic sequelae like pedal edema as well as a life threatening pulmonary embolism. Advanced therapy considerations for limb- or life-threatening DVT include catheter-directed thrombolysis and thrombectomy. Thrombectomy is necessary when thrombolytics are contraindicated secondary to increased bleeding risk. The authors present a DVT case treated with the mechanical thrombectomy device, ClotTriever (INARI Medical, Irvine, CA), resulting in the efficient and effective removal of thrombus with near-complete resolution of venous symptoms and prompt hospital discharge.

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Introduction

Venous thromboembolism is a major cause of preventable morbidity and mortality in the United States, accounts for >100,000 deaths and >250,000 hospital admissions per year [1,2]. DVT is the formation of blood clots in the deep veins of the extremities, usually the lower extremities. Distal DVT occurs in the deep veins of the legs, while proximal DVT continues into the thighs via the popliteal and femoral vein or pelvic via the iliac veins [2]. Clinical signs of DVT include local unilateral lower extremity edema, warmth, erythema, and progressive tenderness [3,4]. Risk factors for DVT are classically described by Virchow’s triad which includes hypercoagulable states such as pregnancy, malignancy or thrombophilia, venous stasis such as immobilization and obesity, and lastly, endothelial damage such as surgery, age over 60, hypertension, smoking or previous DVT [5]. Anticoagulation is the main treatment of DVT after confirmation of diagnosis with compression ultrasound. The treatment sequence addresses the underlying cause of DVT, evaluates and treats associated PE, and assesses bleeding risk prior to initial parenteral anticoagulation. Further long-term anticoagulation is often indicated due to the risk of post-thrombotic sequelae [2–4,6].

Catheter-directed thrombolysis (CDT), mechanical thrombectomy, or surgical thrombectomy are utilized in cases where timely alleviation of DVT symptoms are prioritized to prevent gangrene or post-thrombotic syndrome (PTS) [1–4,6]. Indications for CDT and thrombectomy include severe
life-threatening proximal or iliofemoral DVT and or symptomatic swelling indicating limb-threatening ischemia, with the former often leading to the later [2,3]. Thrombectomy is an alternative to CDT when patients are determined to be at a high risk for bleeding along with other contraindications to thrombolysis including active bleeding, recent surgery, severe hypertension, prior intracranial hemorrhage, and bleeding disorders [1,2].

The ClotTriever is a sheathed catheter system that uses a self-expanding nitinol mesh funnel to optimally remove clots. The sheath also has a hemostasis valve for catheter insertion and a stopcock for aspiration. The catheter has a nitinol coring element and a braided collection bag which extracts the clot from the sheath. The primary indication for this device is the removal of DVT’s that have a large clot burden [3,4] This case report explores a successful removal of a DVT using the ClotTriever System.

**Case description**

A 50-year-old male with a past medical history hypertension, MI, and migraines presented to the ER complaining of three days of atraumatic proximal left thigh pain. He denied any other risk factors for DVTs such as cancer history, recent surgery, history of VTE, recent immobilization, or long plane or car rides. He denied chest pain, shortness of breath, headache, dizziness, fever, or coughing. On physical exam, the patient was found to have focal tenderness to his proximal medial left thigh from the inguinal region distally to just above his left knee. There was no overlying erythema or rash. His left leg was noted to appear mildly more edematous compared to his right leg, although non pitting. On ultrasound a large occlusive left lower extremity thrombus was identified in his common femoral down to his left popliteal vein and he was started on a heparin drip (Fig. 2-3).

His labs showed a white blood cells of 7.5 K/mcl, His FT was slightly elevated at 13.4 seconds, INR was 1.2, PTT normal at 30.8 seconds, and D-dimer was elevated at 3.53 μg/mL. His blood chemistry and was normal.

A CT angiogram showed a filling defects within the pulmonary arteries to both lower lobes along with the right middle lobe compatible with bilateral pulmonary embolism without evidence of heart strain. An Echo was performed showing an ejection fraction of 55% along with mild mitral regurgitation and mild tricuspid regurgitation and an estimated pulmonary pressure of 25 mm Hg.

The Interventional Radiology team was consulted for possible intervention and he was deemed a candidate for a left lower extremity mechanical thrombectomy using the INARI ClotTriever as his pulmonary embolism was deemed low risk. Under moderate sedation, his left popliteal vein was accessed under direct ultrasound guidance to the level of the femoral vein. The microcatheter was removed and an 8 French introducer sheath was advanced into the popliteal vein. Multiple left lower extremity venograms were performed demonstrating an acute thrombus throughout the femoral vein to the level of the common femoral vein (Fig. 1). The catheter was advanced to the level of the common femoral vein, and venograms were performed demonstrating a patent left common iliac vein and inferior vena cava.
Over the guidewire, mechanical thrombectomy was performed using a ClotTriever device with the removal of a significant amount of acute/subacute thrombus. Multiple passes were performed to extract all the thrombus (Fig. 4). Post thrombectomy venograms demonstrated no residual thrombus with a patent femoral vein (Fig. 5). Restoration of valvular function was noted. The access sheath was removed from the popliteal site, and hemostasis was achieved with manual compression along with a purse string suture. The total procedure time was one hour. The patient tolerated the procedure well and there were no complications noted. A heparin bolus was administered after the operation, and the patient was subsequently transitioned to Eliquis. The next day, the patient’s leg pain and edema had resolved, and he had a smooth recovery without postoperative complications and discharged home. IRB approval was not required for this report.

Discussion

The following case demonstrates the ClotTriever system’s effectiveness and organized removal of DVT’s. The patient presented with an acute DVT with no history of hematologic issues and sought immediate treatment. The options for occlusive VTE of the lower extremities include local thrombolytics but that does come with risk as thrombolytics have been associated with significant complications related to increased bleeding risk and treatment can take up to 72 hours for thrombolysis to be achieved [7,8]. The ClotTriever system offers an advantage to patients who have increased bleeding risk or contraindications for thrombolytics. In our case, a more proximal femoral vein thrombus was preventing venous return from collaterals of the lower extremities and prompt removal of the bulky LLE DVT was an important treat-
ment to prevent the feared complications of a large occlusive VTE [9].

Although the patient did have a multiple bilateral PE’s, he had no symptoms. He was evaluated for the possible use and removal with the Inari FlowTriever device. But upon further imaging review prior to the procedure, the pulmonary embolism was dislodged further down the vascular tree not making him a candidate. His left femoral DVT was removed that fully restored the venous return of his left lower extremity. The patient had a smooth recovery without complications and was discharged the next day. This case demonstrates a significant advantage in select patients to reduce hospital expenses with use of the ClotTriever system. Therapeutic thrombolysis has been found to accrue more costs than mechanical thrombectomy in the treatment of peripheral arterial disease [10]. Similarly, the ClotTriever is designed for definitive results from single session clot removal whereas thrombolysis requires observation, often in the ICU [4]. The use of this product may reduce the duration of time spent in the Intensive Care Unit (ICU). Extended time spent in the ICU has imposed an economic burden on patients and the United States economy [10,11].

Fig. 5 – Venograms of the lower limb before intervention. A. Flow through the common femoral vein is restored and no use of collaterals is shown. B. Blood flow is restored in the femoral vein after removal of the DVT.

Conclusions

The ClotTriever is a novel mechanical thrombectomy system used in the removal of a deep venous thrombosis. This case highlights a patient with an acute occlusive DVT that was successfully removed with the ClotTriever without complication. The ClotTriever system as a mechanical thrombectomy device can service patients with contraindications to thrombolitics like tPA or serve as an alternative to those without contraindications to thrombolitics. Further research is indicated to determine the full extent of this product’s efficacy and long-term effects and follow up in the prevention of post thrombotic complications.

Consent

Written informed consent was not obtained from the patient for publication of this case report and accompanying images since there are no patient identifying characteristics.

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