

## CASE REPORT

### Innovative Treatment for Inferior Vena Cava Thrombosis without Use of Thrombolytics

Maxwell Isaac<sup>1</sup>, Fnu Marium<sup>2</sup>

<sup>1</sup>William Carey College of Osteopathic Medicine, Hattiesburg, MS

<sup>2</sup>University of Missouri, Columbia, MO

Corresponding author: Maxwell Isaac. 42 Meadowrue Lane, East Northport, NY 11731  
(misaac347539@student.wmcarey.edu)

Received: September 16, 2019 Accepted: March 6, 2020 Published: March 31, 2020

*Am J Hosp Med* 2020 Jan;4(1):2020.002 <https://doi.org/10.24150/ajhm/2020.002>

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**Abstract:** Limb ischemia and pulmonary embolism are devastating complications of deep vein thrombosis. Catheter directed thrombolysis (CDT) and pharmacomechanical thrombolysis are effective treatments, however thrombolytics in these procedures increase the risk of bleeding. Moreover, they lengthen hospital stays and have many contraindications. The Inari ClotTrier is an innovative device for percutaneous mechanical thrombectomy. We present a case of an ileofemoral DVT with extension to the inferior vena cava removed without thrombolytics.

**Keywords:** percutaneous mechanical thrombectomy, thrombosis, inferior vena cava, thrombolytic, ClotTrier

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## INTRODUCTION

As many as 900,000 Americans are affected each year by DVT.<sup>1</sup> Yet, only 4% of patients with lower extremity thrombosis have extension to the inferior vena cava.<sup>2</sup> Risk factors for clot formation are classically explained by Virchow's triad. It states that endothelial injury, venous stasis, and hypercoagulability promote thrombus formation.

Although anticoagulation is the cornerstone of treatment, invasive therapies are used for ileofemoral DVT with severe swelling.<sup>3</sup> CDT is a minimally invasive procedure that delivers a low dose of thrombolytics.<sup>4</sup> It provides an alternative to the larger doses given in systemic treatment. Thrombolytic doses were further reduced by the introduction of pharmacomechanical thrombolysis. Thrombolytics are delivered

into the clot in combination with maceration or aspiration.<sup>5</sup> The emergence of percutaneous mechanical thrombectomy provides a treatment option without thrombolytic use. The Inari ClotTrier is designed to remove clots from large veins using small access sites.

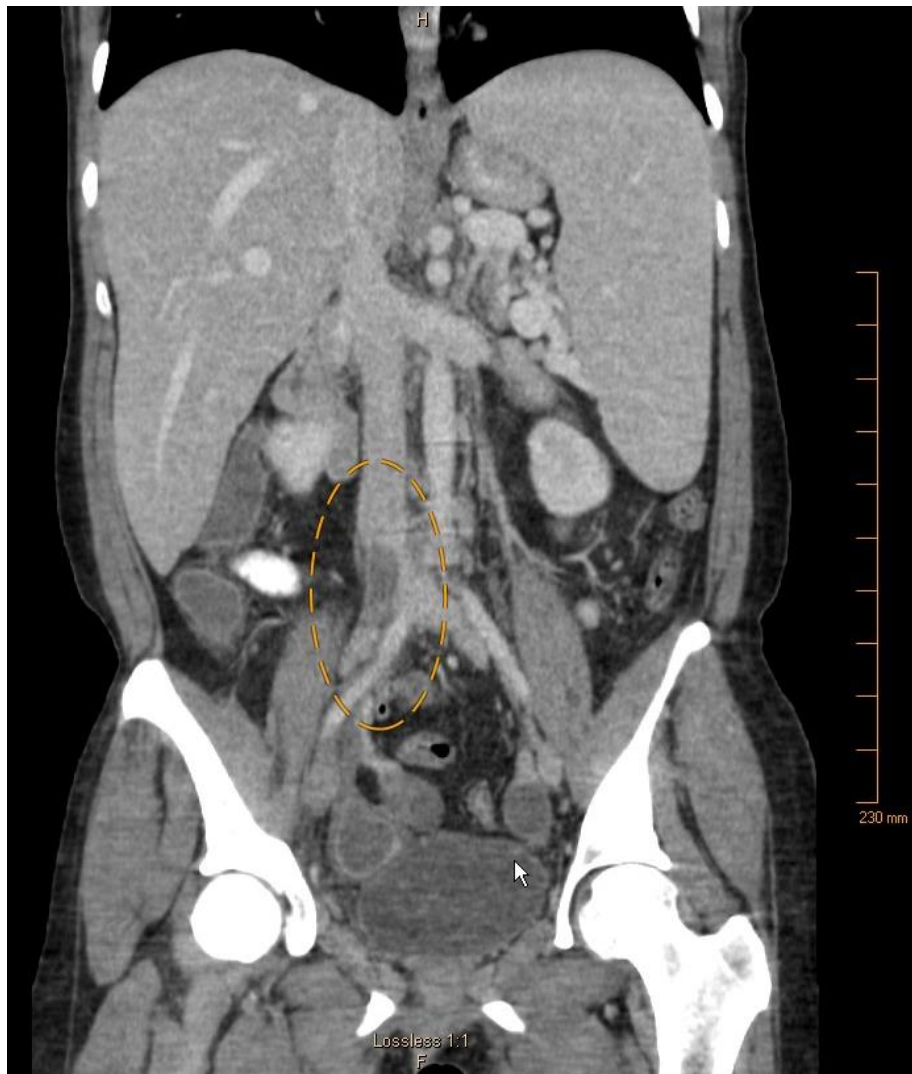
## CASE PRESENTATION

A 34 year old female patient presented with worsening right groin and leg pain for two days. Her past medical history includes common variable immune deficiency, chronic colitis, and bilateral simple ovarian cysts. She described a constant stabbing pain extending towards her calf. There was no recent trauma to the area. Additionally, she reported thigh swelling, night sweats, and a temperature of 100.1 F (37.83 C) beginning two days before presentation. She denied

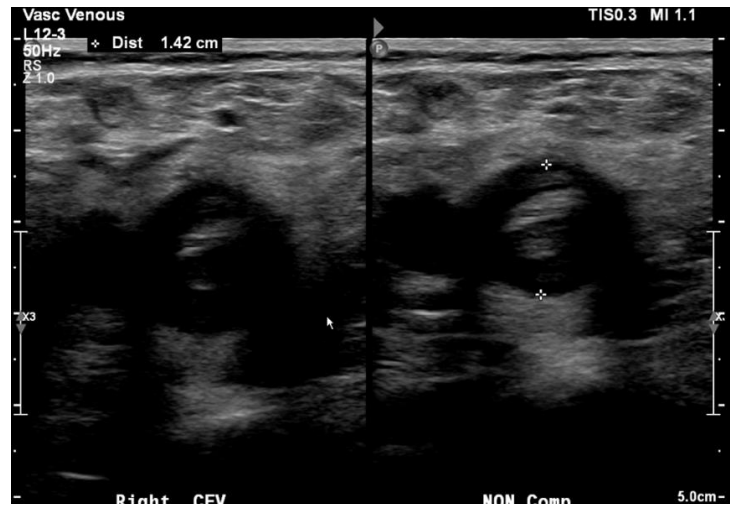
chills, chest pain, dyspnea, oliguria, or IV drug use. There is no personal or family history of clots. Surgical history includes a hysterectomy two years prior, sinus surgery, and one cesarean section. She takes subcutaneous immune globulin weekly to supplement her deficiency.

Physical exam revealed a warm, tender right leg with soft compartments. There was moderate swelling and erythema without phlegmasia. Hip and knee flexion were reduced secondary to pain and pulses were present. Abdominal exam showed pain in the right lower quadrant. No rebound tenderness was appreciated and the patient

had normoactive bowel sounds. The remainder of the exam was unremarkable. Abdominal and pelvic CT scans revealed a thrombus in the IVC (Image 1). Fat stranding was noted from the IVC confluence spreading continuously down into the right groin and partially imaged femoral vessels. Ultrasound illustrated a thrombus from the common femoral vein to the saphenofemoral junction (Image 2). The popliteal and calf veins were patent. During this admission, hypercoagulability testing uncovered a heterozygous prothrombin 20210G>A mutation.



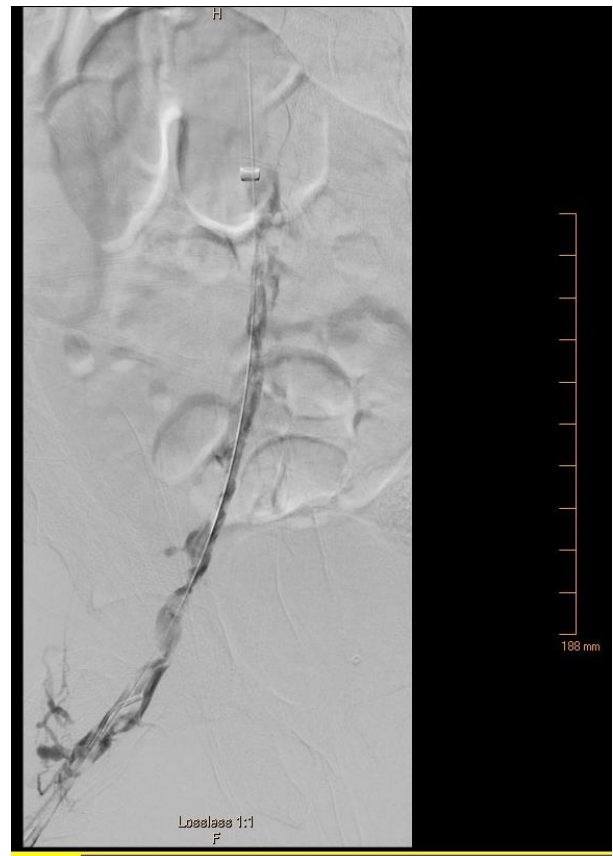
**Image 1.** CT scan of abdomen and pelvis demonstrating IVC extension of ileofemoral thrombus (dashed oval) through the right common iliac vein.



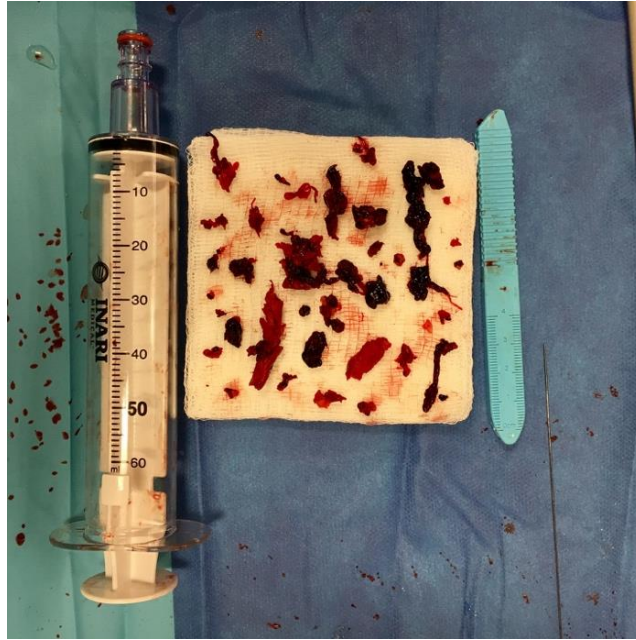
**Image 2.** Ultrasound of lower extremity with intramural thrombus in right common femoral vein.

## THERAPEUTIC INTERVENTION

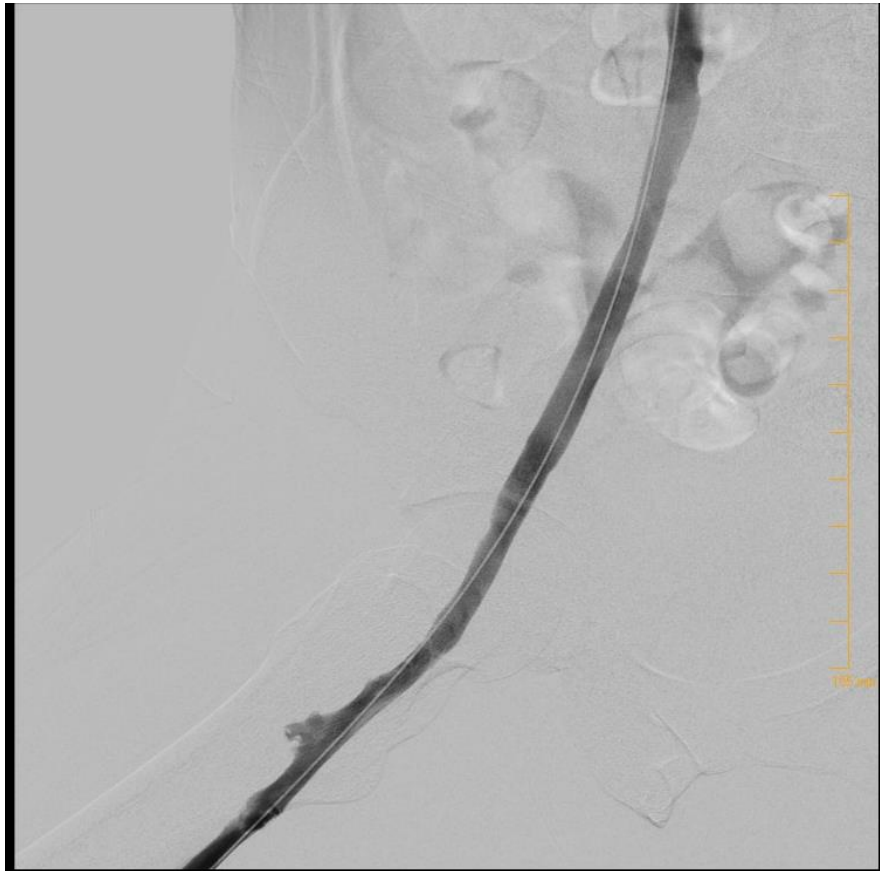
Heparin therapy was started initially and an IVC filter was placed. On hospital day three a percutaneous manual thrombectomy was performed using the Inari ClotTrievers. Venous access through the right popliteal vein was achieved using ultrasound. The ClotTrievers catheter was advanced into the distal femoral vein under fluoroscopic guidance. To prevent shearing of the collection bag, a sheath was inserted from the right internal jugular vein just past the IVC filter. Venography showed extensive thrombosis from the IVC to the distal femoral vein (Image 3). The Inari ClotTrievers was advanced from the distal femoral vein into the IVC. The collection bag was then deployed. Mechanical thrombectomy was performed from the IVC through the femoral vein yielding a significant thrombus (Image 4). Four total passes were performed and completion venography illustrated resolution of the clot (Image 5). The patient reported mild soreness and swelling immediately after the procedure. No complications occurred from the procedure during the hospital stay. She was discharged on the second postoperative day with apixaban.



**Image 3.** Venography from the IVC through the distal superficial femoral vein using a pull back technique. Extensive deep vein thrombosis is visualized with guide wire in place.



**Image 4.** Specimens removed from patient using percutaneous mechanical thrombectomy. 60cc syringe and ruler included for reference.



**Image 5.** Venography following completion of percutaneous mechanical thrombectomy. In-line flow is visualized from distal superficial femoral vein through the IVC.

## DISCUSSION

Early treatment of deep vein thrombosis helps prevent complications including limb ischemia and pulmonary embolism. Popular techniques include catheter directed thrombolysis (CDT) and pharmacomechanical thrombolysis. These procedures use localized thrombolytics to dissolve clots. However, thrombolytics have serious adverse effects including an increased risk for bleeding.<sup>5, 6, 7</sup> The ATTRACT trial concluded that compared to anticoagulation alone, pharmacomechanical thrombolysis carries an increased risk for bleeding without a difference in quality of life.<sup>5</sup> In addition, patients receiving thrombolytics have longer hospital stays.<sup>7</sup> One possible explanation is procedure time. CDT often requires multiple treatment sessions and infusion times up to 72 hours.<sup>2</sup> An alternative explanation is the need to monitor for possible bleeding. The Society of Interventional Radiology recommends that patient's hematocrit, platelet count, and PTT be checked every twelve hours.<sup>8</sup> They also encourage frequent examinations for impending signs of bleeds, including pericatheter oozing and epistaxis.

Predictably, thrombolytic use has many contraindications.<sup>8</sup> These criteria limit treatment options for many patients. A review of vascular referrals at one tertiary center found that only 37% of patients diagnosed with acute DVT had no absolute contraindications for CDT.<sup>9</sup> Percutaneous mechanical thrombectomy provides an option for patients who do not qualify for thrombolytic therapy. It is a relatively new approach to clot removal without thrombolytics. In our case, the Inari ClotTrievers successfully restored in line flow through the iliofemoral veins.

Large randomized controlled trials are required to contrast percutaneous mechanical thrombectomy against thrombolytic treatments. Early research

shows that compared to CDT, percutaneous mechanical thrombectomy has decreased ICU stays, bleeding complications, and total hospital costs.<sup>10</sup> Additionally, limited data exists documenting adverse effects and long-term outcomes of ClotTrievers therapy. The CLOUT registry is an ongoing prospective cohort study that will demonstrate all-cause mortality, major bleeding, and treatment success.

### Notes

**Potential conflicts of interest:** Authors declare no conflicts of interest.

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