

CASE REPORT

Endovascular management of symptomatic deep vein thrombosis with combined approach

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Abstract

The combined use of thrombectomy with direct intravenous thrombolytic infusion provided effective treatment of DVT and uncovered an underlying left common iliac vein stenosis, which was successfully managed by angioplasty and stenting.

KEYWORDS

Boston Vici Venous Stent System, deep vein thrombosis, endovascular combined approach, Sentry Bioconvertible (IVC) filter

1 | INTRODUCTION

The endovascular treatment of the symptomatic deep vein thrombosis (DVT) is a valid alternative procedure in selected patients. Endovascular combined approaches such as venoplasty, venous stenting, thrombectomy, and intravenous thrombolysis are becoming the treatment of choice to achieve venous outflow in DVT. The primary goal of this treatment is the restoration of venous outflow and can be achieved by combined endovascular techniques. We report a case of 38-year-old woman, with leg pain and edema, skin changes, venous claudication, and dyspnea for pulmonary embolism. The patient was treated by four steps procedures: positioning of Sentry bioconvertible in vena cava inferior (IVC) filter, Angiojet intravenous thrombolysis, Angiojet intravenous thrombectomy,

and self-expanding nitinol stenting (*Boston Vici Venous Stent System*). During the scheduled follow-ups at 1, 2 and 6 months, there were no filter tilting, migration, perforation, embolization, fracture, or filter-related death. The stent was patent and was phasic with the acts of the breath. The patient reported a significant reduction of edema and complete resolutions of the clinical symptoms without reocclusion signs. In our case, the combined use of surgical thrombectomy with direct intravenous thrombolytic infusion provided effective treatment of DVT and uncovered an underlying left common iliac vein stenosis, which was successfully managed by angioplasty and stenting.

Chronic venous insufficiency (CVI) is a pathological condition characterized by inadequate venous return from the lower extremities, resulting in venous hypertension.^{1,2}

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Patient with significant lower extremity symptoms have pain, dermal irritation, swelling, and skin changes and are at risk of developing debilitating venous ulceration.

The pathophysiology of CVI is complex and often is associated with valve insufficiency, venous reflux, deep vein thrombosis (DVT), or extrinsic venous compression.³

Patients with symptomatic DVT, refractory to medical therapy, may benefit from endovascular recanalization and the placement of venous stents, which allow for venous decompression,⁴ with a high 5-year patency rate.⁵

These endovascular procedures are aggravated by the risk of distal embolization and, in particular, of pulmonary embolism (PE).⁶

According to the US Food and Drug Administration (FDA),⁷ the use of inferior vena cava (IVC) filters is indicated in the case of⁸:

1. Pulmonary embolism (PE) with contraindication of anticoagulation therapy;
2. Failure of anticoagulant therapy;
3. Urgent treatment in case of massive pulmonary embolism (PE);
4. Chronic recurrent pulmonary embolism (PE).

Other endovascular methods used are thrombolysis and thrombectomy of the thrombosed venous axis.

2 | CASE REPORT

P.D., a 38-year-old woman with a history of IVC CEAP₂ (Clinical manifestations, Etiology, Anatomic distribution, Pathophysiology) came to our observation reporting painful symptoms affecting the left lower limb associated with edema, skin dyschromia, and dyspnea. CT venography, performed in an emergency regime, revealed the presence of thrombosis of the left iliac-femoral venous axis associated with pulmonary thromboembolism.

The manuscript does not involve human or animal subjects or patients and therefore approval from the institutional review board (IRB) is not required.

The procedure was performed in the operating room or angiography suite with the patient under local anesthesia and intravenous sedation.

In the first instance, a bioconvertible vascular filter (Boston Sentry) was placed through the right femoral access (Figure 1).

The second therapeutic step involved an ultrasound-guided antegrade puncture of the left popliteal vein. From the left popliteal access, on a standard 0.035" hydrophilic guide, the iliac-femoral venous axis was recanalized and the patient underwent thrombolysis therapy with



FIGURE 1 Bioconvertible vascular filter (Boston Sentry) was placed through the right femoral access

urokinase 100,000 U and thrombectomy with the Angiojet system.

Phlebography revealed the persistence of thrombotic material at the level of the iliac vein, the site of probable ab extrinsic compression (Figure 2A). The procedure was then completed with the placement and delivery of the venous stent (VICI) at the iliac-femoral level (Figure 2B,C).

The final phlebography revealed the patency of the left iliac-femoral venous axis with resolution of the extrinsic ab compression (Figure 2D).

The patient was discharged on the second postoperative day. Doppler soon control, performed at discharge, revealed patency of the treated vessels and a clear reduction in edema with almost complete resolution of the pain and dyspnoic symptoms.

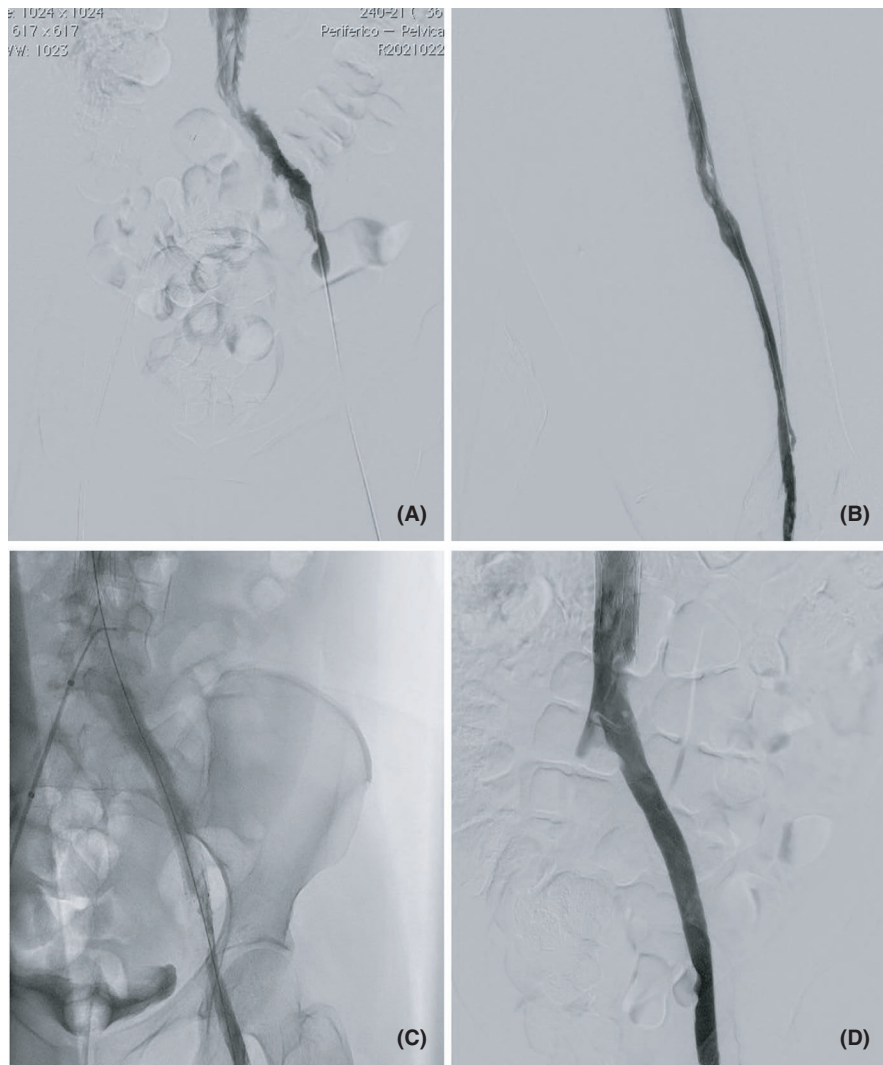
After 6 months, the CT venography of the abdomen and lower limbs of the patient revealed the patency of the iliac-femoral deep venous axis, of the implanted stents, in the absence of signs of recoil.

3 | DISCUSSION

While DVT treatment options have evolved, clinical evidence guiding advanced therapy use remains inconsistent.⁹ In patients refractory to anticoagulant therapy, or if this is ineffective, endovascular procedures can be used. An emerging technique in recent years is represented by the placement of stents at the level of the deep venous system.¹⁰

There is considerable variability among studies on the safety and effectiveness of venous stent placement that

FIGURE 2 Phlebography revealed (A) the persistence of thrombotic material at the level of the iliac vein, the site of probable ab extrinsic compression, (B, C), the placement and delivery of the venous stent (VICI) at the iliac-femoral level, and (D) the patency of the left iliac-femoral venous axis with resolution of the extrinsic ab compression



complicates accurate assessment of these outcomes across different disease pathogenesis.

A recent systematic review and meta-analysis was conducted to determine the safety and efficacy of venous stent placement in patients with iliofemoral venous outflow obstruction.¹¹ A total of 37 studies and 2860 patients were considered. The technical success was about 95%, with regard to complication rates between 0.3% and 1.1% for major bleeding, 0.2%–0.5% for pulmonary embolism, 0.1%–0.7% for periprocedural mortality, and 1%–6.8% early thrombosis. Primary patency at 1 year was 96% in non-thrombotic compressions, 87% in acute thrombosis, and 79% in chronic thrombosis.² Therefore, this study concluded that stent placement for iliofemoral venous outflow obstruction is a procedure with high technical success and acceptable complication rates regardless of the cause of the obstruction.

Another recent study⁵ reports the safety and effectiveness of a placement of a dedicated endovenous stent (Vici Venous Stent System, Veniti, Inc/Boston Scientific) in patients with symptomatic iliofemoral venous obstruction

(VIRTUS trial). In fact, 170 patients were enrolled, the freedom of major events at 30 days was 98.8%, the primary patency at 1 year of 84%. At 12 months, 64% of patients had a significant reduction in the Venous Clinical Severity Score. Therefore, the study demonstrated that the use of Vici Venous Stent System for the treatment of symptomatic iliofemoral venous obstructions induces the reduction of clinical symptoms and improvement of quality of life, through a follow-up of 1 year.

Besides, thrombectomy may be an alternative or supportive treatment in patients with recent onset of DVT. Razavi et al.¹² demonstrate the procedural outcomes of patients with endovascular treatment for deep vein thrombosis of the lower limbs (DVT) with rheolytic thrombectomy (RT). In the Peripheral Use of AngioJet Rheolytic Thrombectomy (PEARL) registry, 329 patients with DVT were enrolled, of whom 67% were treated within 14 days of onset of symptoms. Four treatment approaches using AngioJet thrombectomy were identified: Rheolytic thrombectomy (RT) without lytic agent, pharmacomechanical catheter-directed thrombolysis (PCDT),

and catheter-directed thrombolysis (CDT). The rate of freedom from rethrombosis was 98%, 87%, and 83% at 3, 6, and 12 months, respectively. Major bleeding events occurred in 12 patients (3.6%).

In patients with symptomatic DVT and indications for endovascular treatment, the use of a vascular filter may be useful, especially in the case of pulmonary embolism.⁹ For years, the use of removable caval filters has been the gold standard in these patients where the transient risk of PE has passed, suggesting that the benefit/risk profile begins to favor filter removal between 29 and 54 days after implantation.¹³ In recent times, interest has grown about bioconvertible filters such as the Boston Sentry.^{13,14}

In the first work,¹³ with a 1-year follow-up, 129 patients were enrolled, with a technical success of 97.4%. At 1 year, there were no cases of new symptomatic pulmonary embolisms, two patients presented symptomatic caval thrombosis in the first month. Filter tilting, migration, embolization, or related deaths in the first year were not appreciated. Bioconversion was obtained at 6 months in 95.7% of cases, in 96.4% at 1 year and 96.5% at 24 months by radiography, computed tomography (CT), and CT venography through 2 years.¹³ Through 24 months of follow-up, there was no evidence of late-stage IVC obstruction or thrombosis after filter bioconversion or of thrombogenicity associated with retracted filter arms.¹⁴

4 | CONCLUSIONS

Endovascular procedures of symptomatic DVT are a valid alternative especially in patients with extrinsic compression. There are several techniques available: thrombectomy/thrombolysis has proved effective especially in acute DVT; the use of venous stents is indicated in patients with extrinsic venous compression; in cases of DVT associated with pulmonary embolism with the indication of endovascular therapy, the use of bioconvertible caval filters has proved useful. The peculiarity of the proposed case lies in the need to combine all the techniques described in order to prevent new distal embolizations, recanalize the deep venous axis and keep it open over time.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTION

VG: Vascular surgeon who performed surgery. DB: Conceptualization and writing of the first draft. RS: Final approval of the manuscript submitted. LF: Supervision of the surgery.

ETHICAL APPROVAL

In our opinion, our manuscript would be suitable for the scope of clinical case reports as it deals with combined approach endovascular of symptomatic deep vein thrombosis (DVT) and it would provide new knowledge and originality in the field of vascular disease. This is an original manuscript that has not been submitted to another journal.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request. Research data are not shared.

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