Revascularization of inferior vena cava due to thrombosis after filter implant

Recanalización de vena cava inferior por trombosis luego de implante de filtro

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ABSTRACT

Objectives. Report a case of revascularization of inferior vena cava due to thrombosis following the use of a filter and investigate the number of cases available in the medical literature and compare diagnosis and treatments.
Results. Medical literaturedescribes the implantation of a single stent covering the filter and kissing stents with good patency rateswith the use of isolated anticoagulation, which is safe and effective at the mid-term follow-up with minimal morbidity and low reintervention rates, but with few cases per study.
Conclusion. The recanalization of the inferior vena cava due to filter thrombosis can be performed by implanting kissing stents even with patients with thrombophilia with good patency rates in the mid-term.

Keywords: *inferior vein cava filter, thrombosis, inferior vein cava.*

RESUMEN

Objetivos. Relatar un caso de revascularización de vena cava inferior debido a una trombosis como consecuencia del uso de filtro, investigar en la literatura el número de casos y comparar el diagnóstico y los tratamientos.
Resultados. Los trabajos de la literatura describen la colocación de un único stent cubriendo el filtro y kissing stents, con buenas tasas de permeabilidad con el uso de anticoagulación aislada, siendo seguros y eficaces en el seguimiento a mediano plazo, con una mínima morbilidad y tasas de reintervenciones bajas, pero con pocos casos en cada estudio.
Conclusión. La recanalización de la vena cava inferior debido a la trombosis de filtro se puede realizar con la colocación de kissing stents, incluso con pacientes trombofílicos, con buena tasa de permeabilidad a mediano plazo.

Palabras clave: *filtro de vena cava, trombosis, vena cava inferior.*

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INTRODUCTION

The occlusion of the inferior vena cava (IVC) or iliac veins due to thrombosis or non-thrombotic conditions is an important cause for venous flow reduction. This can lead to serious health problems like post-thrombotic syndrome (PTS) with ulcerated lesions in lower extremities (LE) that affect the patients' quality of life.[1] Diagnosis requires high clinical suspicion and, currently, treatment is endovascular.
The vena cava filter can contribute to the occlusion of the IVC. However, its revascularization has not been contraindicated.[2] We hereby present the case of a patient referred from another unit with an implant below the filter and an IVC occlusion associated with Behçet's syndrome (BS) and PTS with CEAP-C6 in the patient's right lower extremity (RLE).
Behçet's syndrome is a multisystem vasculitis of unknown etiology. Vascular compromise has been reported in 40% of the cases. It is the only vasculitis capable of damaging vessels of all types and sizes.[3] Lower extremity (LE) deep venous thrombosis (DVT) is the most common of all followed by thrombosis of the vena cava.

CASE STUDY DESCRIPTION

Back in 2002, this 48-year-old male patient experienced pain in his RLE associated with edema. After performing a Doppler echocardiography of his LE in a different unit, he was diagnosed with DVT in RLE and common femoral, superficial, and popliteal veins. At that time the patient also showed oral and genital ulcers. After being examined, he was diagnosed with BS, his thrombosis was treated with marevan, and his BS with azathioprine, meticorten, and colchicine. The patient's comorbidities were left brain hemorrhagic stroke and smoking. Over the next few years he experienced periods of relapse and remission of his BS and 3 more episodes of DVT in his LE until 2006 when a non-retrievable inferior vena cava filter was indicated due to repeated episodes of DVT despite the use of marevan with an international normalized ratio (INR) of 2-3. He also had relapsing ulcers in his LE. From 2006 through 2018 when he came to our office, his PTS was being treated with marevan, elastic compression stockings, and topical dersani.
We suspected a more proximal occlusion because the patient showed bilateral clinical signs, presence of vasculitis and the IVC filter. The coronary computed tomography angiography (CCTA) of the patient's abdomen and pelvis (**Figure 1**) confirmed the presence of an almost total thrombosis of the infrarenal IVC and the implant below the filter whose distal portion was located almost at the confluence of the common iliac veins and several tributaries of the azygos and hemiazygos veins with drainage sites.
After performing endovascular surgery under general anesthesia, the 2 femoral veins were punctured using Doppler echocardiography guidance. The phlebography performed (**Figure 1**) confirmed an occlusion of IVC very close to the renal veins until the lower part of the filter. After passing 0.035 in x 260 bilateral guidewires up to the superior vena cava, an intravascular ultrasound (IVUS) was used to see the veins (**Figure 3**) and later confirm the presence of iliac artery trabeculae.

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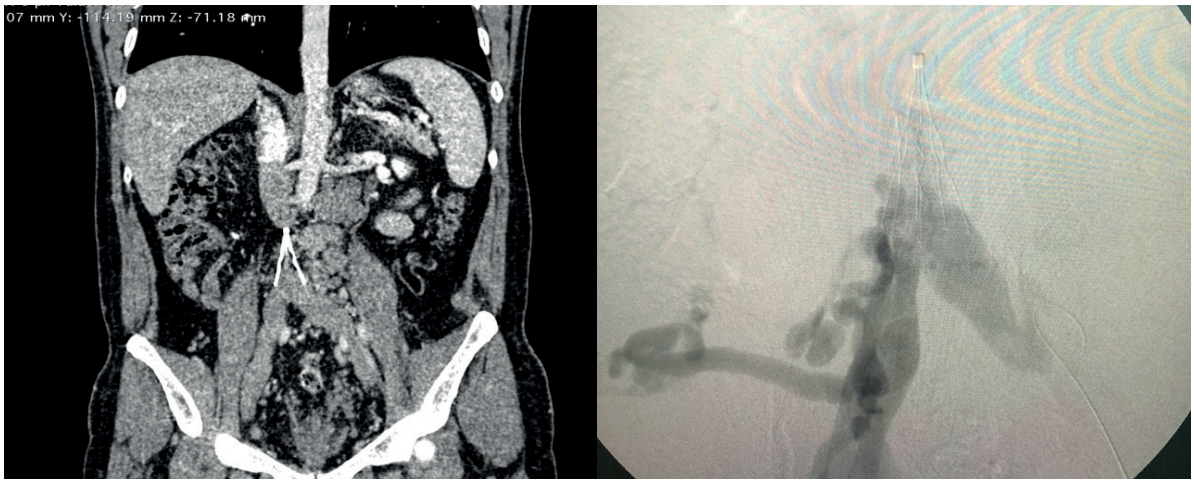

Figure 1. *Preoperative CCTA (left) showing an IVC filter thrombosis with IVC occlusion and renal vein refill. The CCTA was used for surgical planning purposes; early phlebography (right) confirming the IVC filter thrombosis associated with the large number of tributary veins.*

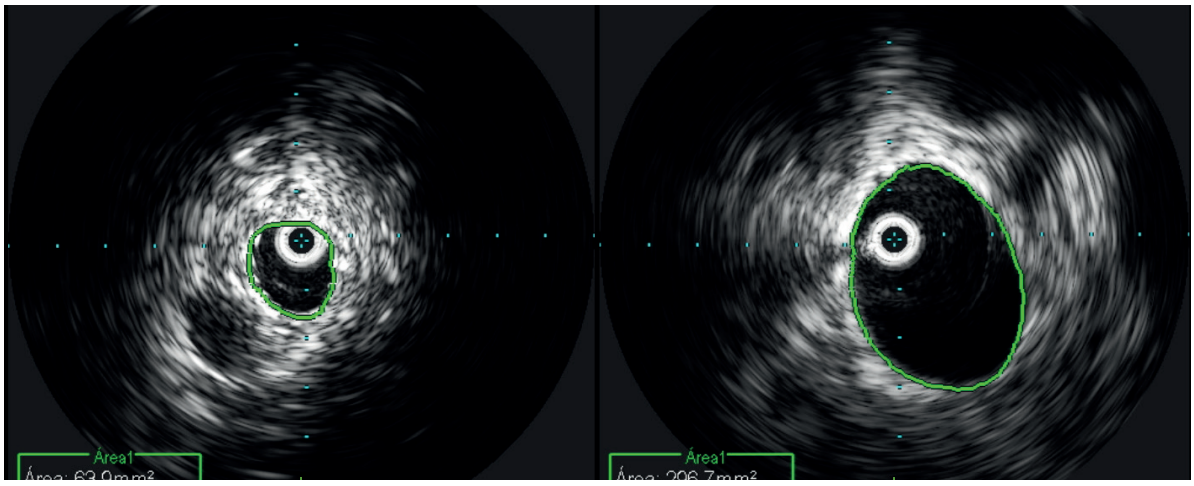

Figure 2. *On the right the IVUS shows the patent common iliac vein and on the left the inferior vena cava distal portion with a significant reduction of its area and fibrosis.*

Guidewires were changed for the Lunderquist guidewire followed by ballooning with 2 Mustang 12 x 80 and 12 x 60 balloons using the kissing technique and implantation of 2 16 x 90 and 12 x 60 and 12 x 80 Wallstent endoprostheses, again using the kissing technique, in the inferior vena cava towards the common iliac veins with previous phlebographic control (**Figure 3**) and significant reduction of tributary veins as seen on the IVUS. Trabecular areas were covered with stents and maintenance therapy with mareavan was used the next day with clopidogrel 300 mg at 75 mg/day.

The control Doppler echocardiography of the cavo-ilio-femoral segment conducted at the 1-week and 3-month follow-up and the CCTA conducted at the 1-month follow-up (**Figure 4**) confirmed the patency of the stents. The patient's anticoagulation was treated with mareavan and clopidogrel over the course of 3 months. The patient's venous claudication and swelling had improved significantly. His legs did not feel tired anymore and he had no pain. In any case, the elastic compression stockings were not removed.

REFERENCE REVIEW

The studies reviewed analyzed a total of 809 patients with critical occlusions or stenosis of the cavo-ilio-femoral segment. The main etiology of 98 of these 809 patients was thrombosis of the IVC filter implant (different types were used: Trapease, Optease, Gunt-Tulip, Celect, Denali) and the second most common etiology was neoplasm related acquired thrombophilia.

Inclusion criteria

- Cavo-ilio-femoral segment stenosis or occlusions.
- Hereditary or acquired thrombophilia.
- Patients with failed clinical treatment.
- Stratification of CVD on the CEAP clinical classification (class C) prior to surgery (≤ 30 days).

Exclusion criteria

- No filter thrombosis.
- < 18 years old.
- Acute or chronic thrombosis of lower extremities requiring thrombolysis prior to stenting.
- Peripheral artery disease with clinical signs of weak or absent peripheral pulses.

Back in 2007, Neglén P et al.[4] studied a total of 708 patients. Fifty-three of them had an occluded IVC filter. The filter was removed laterally or remodeled and an IVC stent was implanted. Twelve per cent of the patients from this group suffered postoperative stent thrombo-

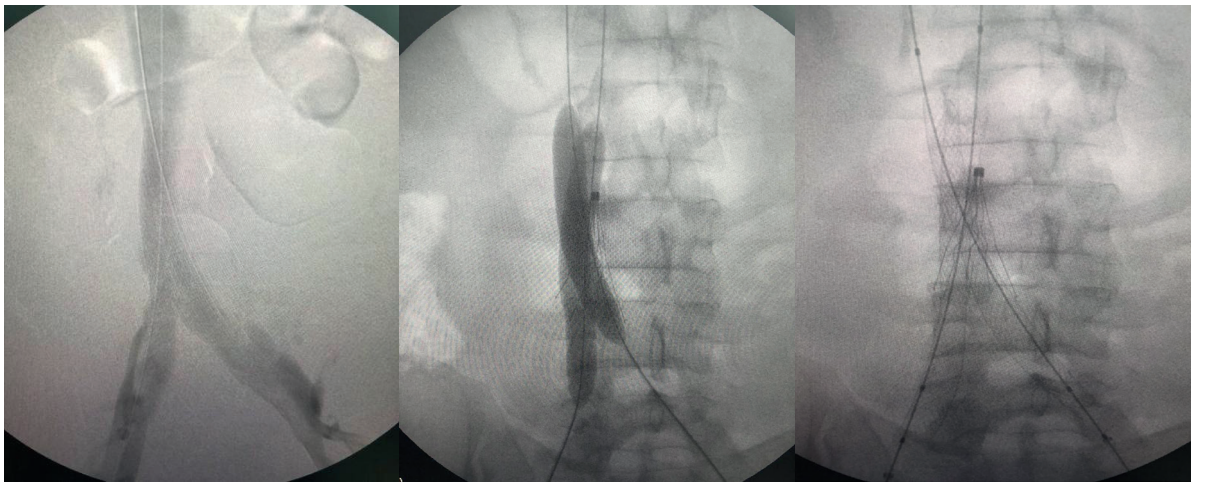

Figure 3. *Kissing balloon and stent of the inferior vena cava towards the common iliac veins with phlebographic control.*

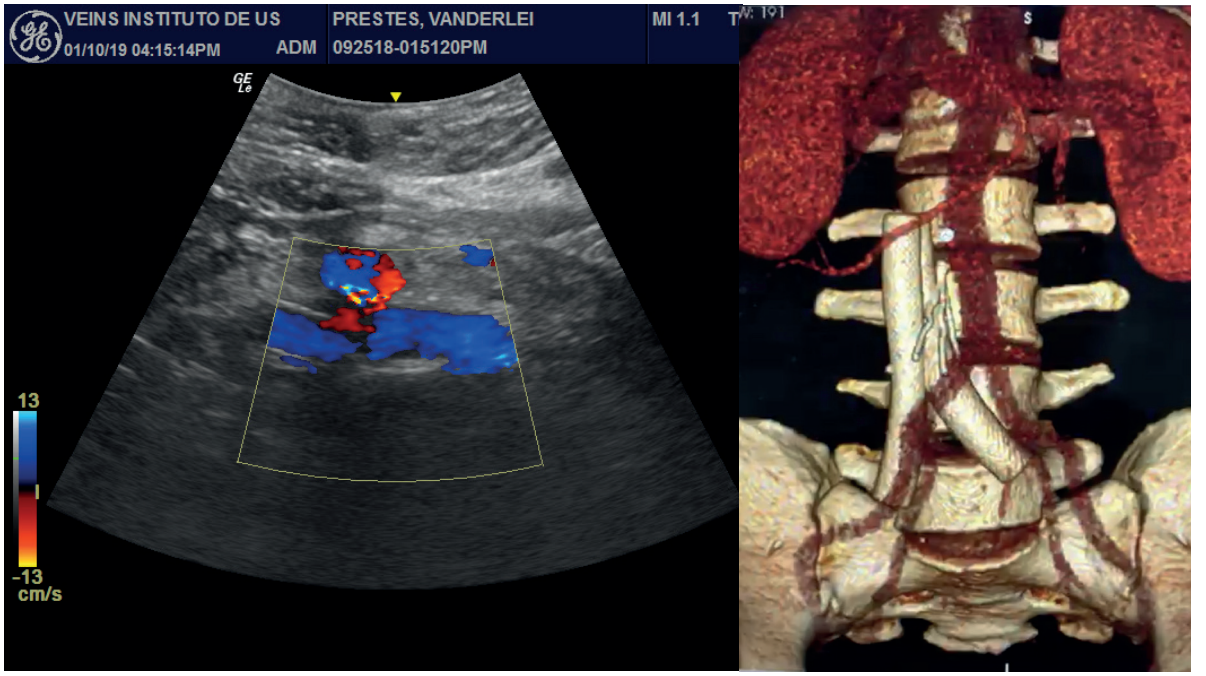

Figure 4. *Control CCTA at the 1-month follow-up. Right: reconstruction showing the crushing of the IVC filter. Left: patency as seen on the Doppler echocardiography performed at the heart center.*

sis. At the 54-month follow-up, the rates of primary and secondary patency of this group were 32% and 42%, respectively.

In 2015, Fatima J et al.[7] studied 28 patients. Sixteen showed ICV filter occlusions, 13 had passed the ICV filter, 14 had thrombophilia (half due to neoplasms). Self-expandable stents (Wallstent; Boston Scientific, Natick, Mass, United States) were the most commonly used ones on the IVC (n = 22) with or without secondary use of balloon expandable stents (Palmaz stent; Cordis, New Brunswick, NJ, United States). In this study, no reinterventions were reported in 84% of the patients over 2 years with patency and symptom-free survival rates of 90% and 80%, respectively at the 2-year follow-up.

Back in 2017, Sasan Partovi et al.[5] studied 7 patients (mean age 55 ± 16 years; all of them male patients). The indications for implanting the IVC filter were contraindications for anticoagulation (n = 3) and additional PE protection (n = 4). The patients received the following filters: TrapEase IVC filter (n = 3; Cordis, Warren, NJ, United States), OptEase IVC filter (n = 1; Cordis, Warren, NJ, United States), Gunther-Tulip IVC filter (n = 1; Cook Inc.; Bloomington, IN, United States), and the Celect IVC filter (n = 1; Cook Inc., Bloomington, IN, United States). Two IVC filters were implanted in 1 patient: one IVN Simon Nitinol inferior vena cava filter (Bard Peripheral Vascular, Tempe, AZ, United States) and one IVC Celect filter. At the follow-up, the stent primary patency rate was 85.7% (6 out of the 7 patients), while the secondary patency rate was 100% (7 out of the 7 patients) at the 51-month follow-up.

In 2018, Erben Y et al.[6] studied 66 patients with thrombosis of the vena cava. In 25 of these patients the inferior vena cava filter was the etiology confirmed. A single stent was deployed to cover the entire filter area. Follow-up was 42 ± 36 months. Four patients were lost to follow-up. Primary patency, primary assisted patency, and secondary patency at the 36-month follow-up were 78%, 87%, and 91%, respectively. Symptoms resolved in 83% of the patients.

DISCUSSION

Thrombosis of the vena cava is a known complication of ICV filters. A large number of patients had a 20% thrombosis rate in their ICV filters as confirmed by the follow-up CCTA. However, most of them were asymptomatic. In a different study that analyzed 121 patients after IVC filter permanent implantation, the ultrasound confirmed the presence of asymptomatic filter thrombosis in up to 6% of the patients.[5] The main reasons of filter thrombosis are associated with the capture of a large thrombus or even primary thrombosis of the filter.[9]

According to the series studied by Corriere et al.[10] thrombosis was more common in retrievable compared to permanent filters. Also, there was a greater incidence in bionic devices. According to this same author, the option of using retrievable filters is highly attractive; however, the risk of pulmonary embolism should always be taken into consideration and the device retrieved to avoid further complications. Data from the medical literature on endovascular recanalization therapy of the inferior vena and its patency rates are scarce, especially in patients with thrombophilia—in our case it was BS. The surgeries presented in the studies were the use of a single stent or the stent kissing technique to cover the vena cava filter. In certain situations where the filter was patent with mild cava vein occlusion blow the filter, the cephalic portion of the stent was positioned right underneath the filter. According to Neglén et al.[5] the patency of thrombotic occlusions of the vena cava with or without the presence of a filter did not change the patency of the stent after treatment at the 54-month follow-up. In our case, positioning was well-beneath the vena cava filter, which prevented the use of a single stent.

The treatment option of using the kissing technique in the iliac veins towards the inferior vena cava is a feasible alternative for the management of thrombosis in this segment as it has been reported by Sasan Partovi et al.[6] A kissing stent was used in all of them and in most it was associated with pharmaco-mechanical thrombosis with a good patency rate.

CONCLUSION

In patients with inferior vena cava occlusions or stenoses, the use of a non-retrievable filter, even with vasculitis, and the implantation of a single stent in the cava vein or a venous kissing stent from the iliac veins towards the inferior vena cava can be an alternative treatment. It is safe and effective in the mid-term follow-up with minimal morbidity and low reintervention rates according to the studies analyzed. It also improves the patients' quality of life.

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