Complex venous reconstruction for chronic iliofemoral deep vein thrombosis: Pearls and Pitfalls

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INTRODUCTION

BACKGROUND:
Chronic lower extremity venous disease is a medical condition that affects 6-7 million patients in the United States. Patients with a history of deep venous thrombosis (DVT) can develop post-thrombotic syndrome (PTS) which can result in debilitating lower extremity symptoms ranging from severe pain and swelling to skin ulcers. It is theorized that PTS is caused by venous hypertension, which can develop because of chronic venous occlusion. There are several scoring systems available to grade the severity of PTS symptoms, such as the Venous Clinical Severity Score (VCSS), the Villalta score, and the CEAP classification system. Patients with severe PTS symptoms can benefit from stent assisted recanalization of the occluded vein(s) and an optimal anticoagulation regimen. Appropriate stent sizing and placement technique are crucial to maintain long-term stent patency and therefore symptom relief.

PURPOSE:
Review a series of cases that demonstrate recanalization techniques in patients with chronic post-thrombotic iliofemoral venous occlusions and provide an overview of factors that can lead to stent occlusion or stenosis.

METHODS AND CASE DISCUSSION

Five patients with a history of DVT and moderate to severe PTS, with or without history of prior stenting, were selected:

1. Patient with a history of chronic left iliac vein occlusion which was treated with recanalization and stenting using intravascular ultrasound and fluoroscopic guidance. The cranial end of the stent was deployed at the iliac vein confluence and the caudal end was deployed in a region of good inflow **(stenting from "healthy vein to healthy vein")**. This is an example of optimal iliac vein stenting.

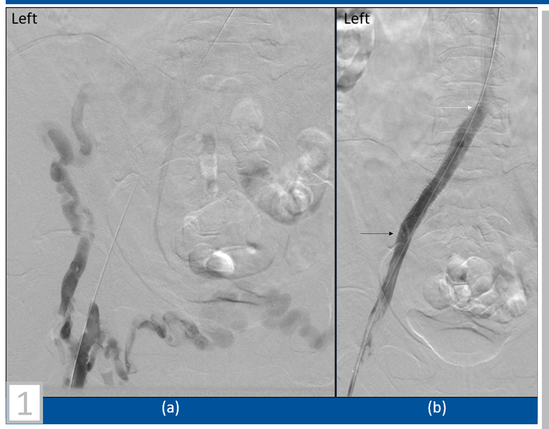
2. Patient with an occluded left iliac vein stent, likely **due to poor inflow into the stent** after deployment. The clot in the stent was treated with thrombolysis. The old stent was relined, and the caudal end of a new stent was extended into the common femoral vein – to ensure good inflow.

3. Patient with an occluded left iliac stent, likely **due to poor outflow into the inferior vena cava (IVC)** because of its position (an error that likely occurred because the patient's spinal hardware could make it difficult to accurately identify the iliac vein confluence). This was treated by relining the old stent and deploying the cranial end of the new stent at the iliac vein confluence (which was accurately identified using intravascular ultrasound and fluoroscopy).

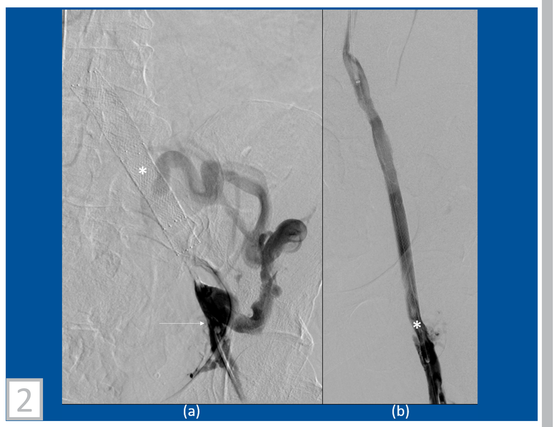
4. Patient with occlusion of the right iliac vein due to an **incorrectly deployed stent** in the left common iliac vein. The cranial end of the **left iliac vein stent extended too far across the right iliac vein outflow resulting in occlusion of the vein**. This was treated with recanalization and stenting of the right iliac vein.

5. Patient with infra-renal IVC and bilateral iliac vein occlusion due to an IVC filter. This was treated with complex, forceps-assisted filter removal and stent assisted iliocaval recanalization. Optimal stent placement in this scenario includes a **buttressing IVC stent and double-barrel/kissing iliac vein stents (only double-barrel iliac vein stents extending into the IVC, without an IVC stent, is also an acceptable technique)**.

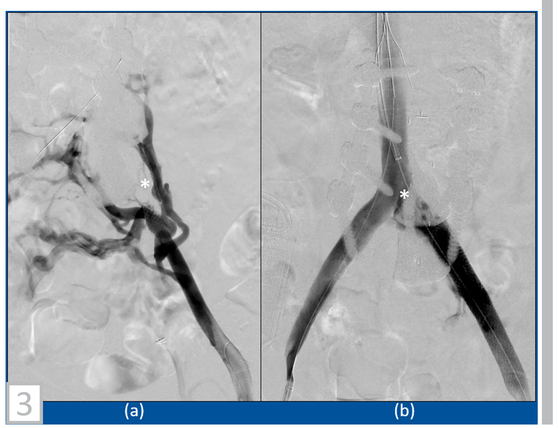
CASES



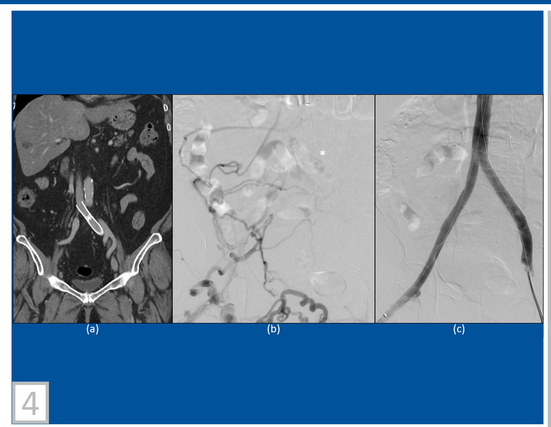
Case 1: (a) Chronic left iliac vein occlusion (patient in prone position); (b) successful iliac vein stenting, with cranial end of stent (white arrow) at the iliac confluence, and caudal end (black arrow) at a site of good inflow



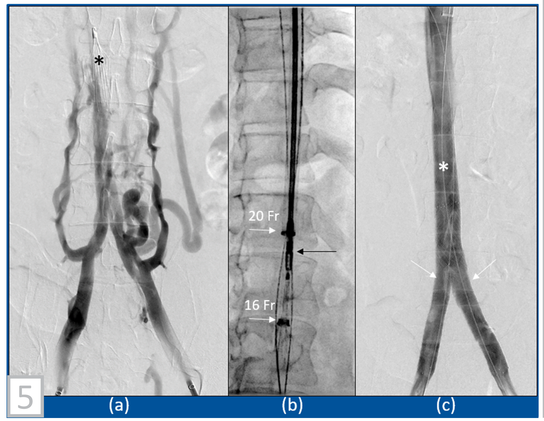
Case 2: (a) Occluded left iliac stent (*) due to sub-optimal inflow (white arrow); (b) successful recanalization after relining the old stent and extending the caudal end of the new stent (*) below the inguinal ligament, to ensure optimal inflow



Case 3: (a) Occluded left iliac stent (*) due to sub-optimal outflow; (b) successful recanalization after relining the stent and extending the cranial end of the new stent to the iliac vein confluence (*), to a site of optimal outflow



Case 4: (a) and (b) Occluded right iliac vein due to incorrectly deployed left iliac vein stent (*) – cranial end of the stent was positioned too far into the IVC resulting in occlusion of the right iliac vein outflow; (c) successful stent assisted right iliac vein recanalization and stenting



Case 5: (a) IVC filter (*) related iliocaval occlusion; (b) IVC filter removal using telescoping 20 Fr and 16 Fr sheaths (white arrows), and endobronchial forceps (black arrow); (c) successful stent assisted iliocaval recanalization using a buttressing IVC stent (*) and kissing iliac stents (arrows)

CONCLUSIONS

- Venous recanalization and stenting can significantly improve PTS related symptoms in patients. **Appropriate stent placement is crucial in achieving long term stent patency and symptom relief.**
- Use of intravascular ultrasound (in addition to fluoroscopy) helps in more accurate estimation of vein diameter and identification of important anatomic landmarks – factors that could help in adequate **stent sizing and deployment**.
- Stenting from **"healthy vein to healthy vein"** is critical in preventing stent occlusion and maintaining long-term patency.

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