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Invited Review

Long term follow-up in PeVD with compression syndromes

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Abstract

Long-term follow-up is crucial for patients with Pelvic venous disease (PeVD) and compression syndromes, regardless of the chosen treatment. The specific condition of the patient and the performed treatments will determine the frequency of follow-up appointments. The frequency of follow-up appointments can vary based on the severity of the condition, the type of treatments performed, and individual patient factors. Some patients may require more frequent check-ups initially, with the possibility of spacing them out as their condition stabilizes. Long-term follow-up is a crucial component of the comprehensive care of patients with PeVD and compression syndromes. It enables healthcare providers to monitor the patient's progress, address any emerging issues, and optimize treatment strategies for better long-term outcomes.

Keywords: May-Turner, Nutcracker, PeVD, venous compression syndromes, long-term follow-up

INTRODUCTION

Compression syndromes can contribute to the development of Pelvic venous disease (PeVD) by impeding normal venous blood flow and causing venous hypertension in the pelvic region. Furthermore, the use of technical terms should be consistent, and technical terms should be explained when first introduced to maintain comprehensibility. As a result, patients may experience different symptoms, such as chronic pelvic pain, lower back pain, leg pain, and varicose veins. The precise cause and mechanism of PeVD can differ among individuals, and potential treatment options include conservative management like lifestyle changes and compression stockings, or more invasive procedures such as venous stenting, to alleviate venous compression and enhance blood flow [1].

Economic Footprint

The global venous stent market size was valued at US 1.08 billion in 2022 and is projected to reach US 2.44 billion by 2032. Some of the leading companies in the Venous Stents market are Boston Scientific Corp, CR Bard Inc, Cook Medical Inc, Medtronic Plc, OptiMed Medizinische Instrumente GmbH, and Plus Medica GmbH. Medtronic Plc dominated the market in 2022 (Figure 1).

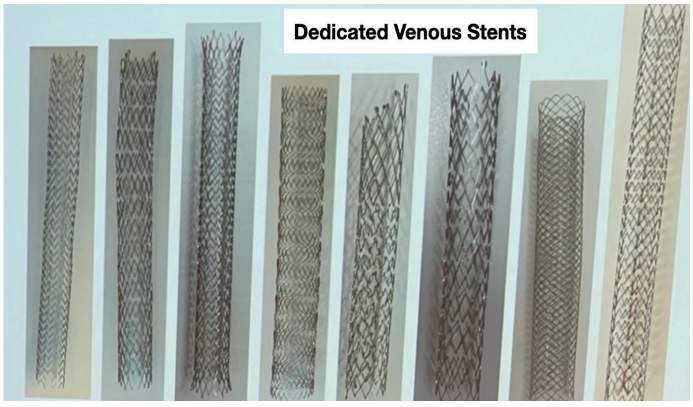

Figure 1. Dedicated venous from different manufacturers

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Patient Selection

Selecting the appropriate patients based on their clinical presentation and anatomic findings is crucial to achieving successful treatment outcomes for symptomatic venous outflow obstruction. Whenever the use of a venous stent is under consideration, it is of primary importance to consider the impact of the patients' symptoms on their quality of life. Venous stents are long-lasting implants, therefore careful evaluation is necessary to determine if the patient's symptoms have a substantial effect on their quality of life to justify stent placement. Experts in venous care generally advise against placing stents for minor symptoms like mild ankle swelling.

May-Thurner

Endovascular intervention on the left common iliac vein (CIV) is indicated based on the severity of its stenosis. According to Carr et al., narrowing of the left CIV to 4 mm increases the risk of deep vein thrombosis (DVT), necessitating CIV stenting. Ahmed and colleagues [2] shared similar views on stenting for MTS. Meanwhile, Daugherty and Gillespie identified a specific criterion for stenting: a decrease in the CIV lumen diameter to 2-6 mm and a stenosis area of 65-99% confirmed by intravascular ultrasonography (IVUS). In our clinics, we consider stenting to be an absolute indication for patients with May-Thurner Syndrome (MTS) and PeVD when compression stenosis of the left CIV exceeds 50%, as determined by pre-operative workup, at least two modalities' DUS and MRV or CTV and during the procedure IVUS [3].

Endovascular treatment of May-Thurner Syndrome can achieve long-lasting primary patency [2]. Self-expanding stents are the preferred option since they provide strength, flexibility, and high radial force. Nevertheless, precise placement can be challenging, and there is a risk of foreshortening. Nitinol stents, on the other hand, can be delivered more accurately due to the absence of foreshortening during deployment.

Hager et al. [4] conducted a study to assess the mid- and long-term patency rates of endovascular stents implanted in patients with symptomatic and non-thrombotic May-Thurner Syndrome. Their findings were consistent with previous research, demonstrating favorable patency rates of 91% at 36 months for patients with long-standing pain and swelling but no deep vein thrombosis, as well as those in a post-thrombotic state. Stenting was found to be an effective treatment option for both groups [4,5]. These results indicate that the ongoing extrinsic compression does not affect stent patency. However, hypercoagulability plays a significant role in maintaining patency.

Nutcracker

Left renal vein (LRV) compression, also known as the Nutcracker phenomenon, can result in hematuria, flank pain, Pelvic Venous Disease, and varicosities. Compression of LRV and/or reflux in left gonadal vein (LGV) has previously been reported to cause venous insufficiency in the pelvic region and lower extremities [6,7]. Therefore, identifying venous abnormalities in individuals presenting with these symptoms may be crucial for appropriate diagnosis and treatment. Compression of LRV and/or reflux in LGV has previously been reported to cause venous insufficiency in the pelvic region and lower extremities [6,7].

Mandatory for stenting the LRV is the development of secondary gonadal vein reflux due to compression, leading to the decision to perform LRV stenting rather than gonadal vein embolization. However, due to the serious complication of stent migration that has been previously reported, [8] cautious interventional techniques, the use of large-diameter stents, and frequent follow-up with duplex ultrasound (DUS) are necessary. Additionally, patient selection should be limited to severe cases.

May–Thurner and Nutcracker

Patients with compression in both regions in our clinics we choose empirically to treat the May-Thurner point first and then wait and see how much of the complaints subsides.

Choice of Stent

Of significant importance is the selection of an appropriate stent.

Stent Selection

The stenting procedure is well-documented and established in the literature [9-11]. According to Raju et al., stents with a diameter of 16-18 mm are recommended for restoring the normal lumen of the CIV [10]. Additionally, these authors suggest the installation of stents with a diameter 2 mm larger than the recommended size. It is possible to perform aggressive post-dilation to eliminate any residual stenosis and achieve better fixation of the stent in the vein lumen.

Another aspect to consider when selecting an optimal stent is braiding and length. A variety of venous stents with different flexibility, strength, and radial resistance force, and various braiding have been developed to date [10]. The authors recommend using Z-stents, with a length of at least 90 mm for iliac vein stents. It's important to note that there have been no reports of breakage, migration, or thrombosis associated with these stents.

Furthermore, placement of the stent within the CIV lumen is crucial and ideally should be positioned within the iliac veins' immediate area of confluence. However, achieving this in practice is almost impossible due to the risk of proximal residual stenosis after stenting when the stent is placed within the same plane as the CIV. Therefore, it is generally recommended by authors to place a stent in a vein so that it extends 0.5-1 cm into the inferior vena cava lumen [10]. According to other authors, even a 2-cm displacement of the stent within the inferior vena cava should not be considered a major flaw in stenting technique [10]. The "jailing" effect leads to thrombosis of the contralateral OPV in no more than 1% of cases.

Stents are oversized by 10% to 20% based on diameter measurements from IVUS.

This is demonstrated through tomography images of a patient

with May-Thurner syndrome (MTS) and PeVD who received CIV stenting (Figures 2 and 3). PeVD symptoms were wholly eradicated and remain absent to this day; the stents remain completely patent, and there have been no instances of thrombosis in the iliocaval segment.

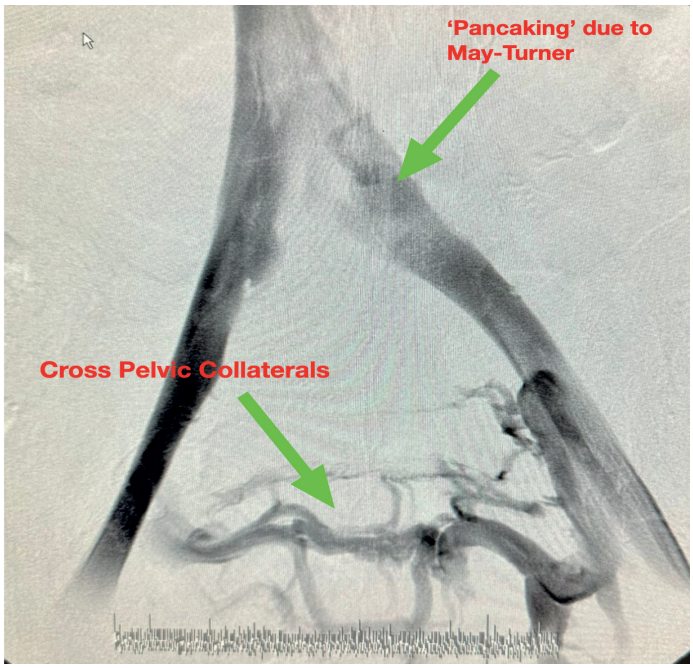

Figure 2. Secondary Pelvic Venous disease. Narrowing at the may-Turner point ('Pancaking') causes cross Pelvic Collaterals

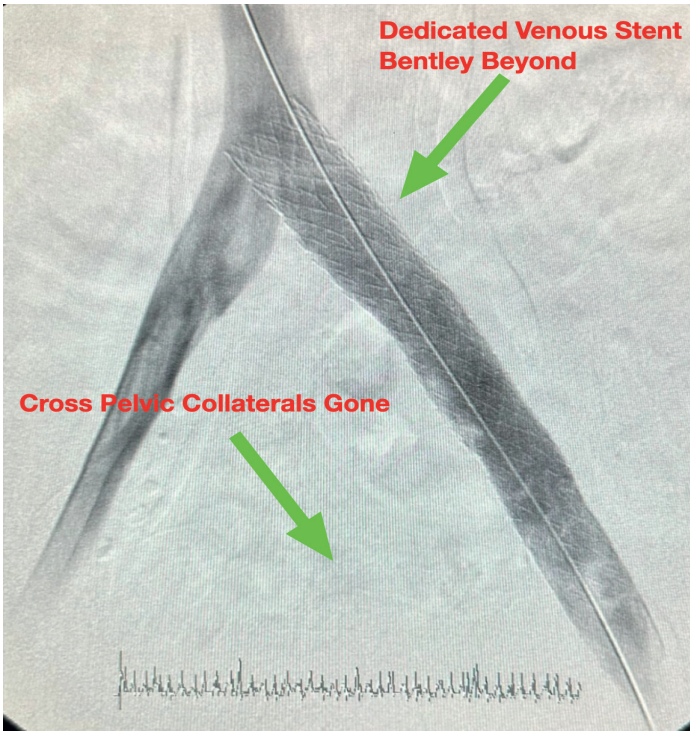

Figure 3. Narrowing at the may-Turner point has been treated by using dedicated venous stent causes cross Pelvic Collaterals to disappear

Post-Procedure Follow-up

Patency was evaluated using Doppler ultrasound (DUS) within 24 hours of stenting and subsequently during outpatient visits at 2, 6, and 12 weeks, 6 months, and annually thereafter. The same follow-up protocol was applied after re-intervention. In instances where patency was uncertain on DUS, additional MRV imaging was performed, as described in this article [12]. The duration and dosage of anticoagulation were determined by consultation with a hematologist and continued for at least 12 months with the option to extend duration based on individual patient needs. Patients who experienced unprovoked DVT, persistent risk factors for DVT, and/or recurrent DVT were deemed eligible for indefinite anticoagulant therapy. Anticoagulant cessation after twelve months was considered for cases of distinct, transient DVT risk factors and patent stents.

Re-intervention

Reinterventions were carried out in cases of thrombosed stents or significant stenosis (over 50%) identified via DUS during routine follow-up or when patients reported complaints. Following confirmation via MRV imaging, phlebography, and/or IVUS, any missed inflow and outflow or stent fracture were addressed with a stent, where the most distal part of the stent was placed in the common femoral vein. Inflow from the femoral vein and deep femoral vein was visualized to ensure proper placement. Anticoagulation therapy was discussed with the hematologist. It is essential to carefully consider the potential risks and benefits of each procedure before selecting a course of action. The recommended re-intervention procedures were stent stenting, stent extension, percutaneous transluminal angioplasty, and thrombolysis [13,14].

Underlying causes for re-intervention can be classified as;

- Technical,

  - Compromised inflow due to inadequate stenting of existing venous lesions

  - Compromised outflow due to inadequate venous stenting proximally

  - Device failure (Stent fracture, compression, migration).

- Hematological: e.g., inadequate due to anticoagulant therapy or due to non-complainant patients or thrombosis despite anticoagulation

- Multifactorial a combination of two or more item's from above.

CONCLUSION

Venous stenting can improve the quality of life for numerous patients with venous outflow disease. However, proper patient selection and careful technique are essential to prevent poor

outcomes. While the introduction of dedicated venous stents is encouraging, recent stent withdrawals emphasize the importance of education and training in the safe placement of these stents.

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