Migration and Other Venous Stenting Complications: How to Identify and Avoid Them

Understanding the mechanisms underlying stent migration, stent fractures, chronic back and pelvic pain, and restenosis or occlusion and reducing these complications with appropriate patient selection, procedural technique, and thorough postprocedural protocols.

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Deep venous disease with or without the development of postthrombotic syndrome can be a significant source of patient morbidity and leads to very poor quality of life in this generally younger population group. Judicious use of venous stenting in patients with symptomatic thrombotic and nonthrombotic pathology within the proximal lower limb deep veins is a well-recognized management modality with good long-term outcomes.[1,2] Nonetheless, as with all management strategies, there are associated pitfalls and complications. These complications may transform a quality-of-life procedure into a life-threatening situation. This article reviews some of the technical problems related to venous stenting and the techniques to potentially avoid them.

STENT MIGRATION

Since the recent spate of device recalls, stent migration has been at the top of the agenda. This complication has the potential for significant morbidity and, in the worst cases, mortality. In the best-case scenario, a stent that migrates from the common iliac vein could cage the inferior vena cava (IVC). However, in most cases, the stent only stops in the heart or lung. Depending on when and into which vessel the migration occurs, treatment options vary.

Stent migrations occur due to incorrect stent length and diameter selection. This was highlighted in a review by Sayed et al[3], and it is far more common when treating nonthrombotic iliac vein lesions with focal stents where the normal compliant vessel is not always enough to keep a stent in place.

The first decision to be made is whether the patient actually needs treatment. Ensuring that stents are only placed for appropriate indications and clear stenosis is essential. If a stent is not placed, it can't migrate! To this end, several strategies have been described to confirm that a lesion is in fact real. These strategies include the Valsalva maneuver with intravascular ultrasound (IVUS) at the vessel crossing, balloon pull back, multiplanar venography to demonstrate significant collaterals, and increasing the threshold of stenting to > 60% stenosis as per the VIDIO guidelines.[4]

IVUS is extremely useful for measuring the vein diameter and area of the target vessel to ensure that an appropriate stent is chosen. Regarding stent length, a longer stent that anchors in the mid portion of the external iliac vein is recommended over short spot stenting. This ensures the stent has come around the bend in the pelvis and is held by a long segment of vein. Although some may argue against this, the relative downsides of longer stents (ie, more metal, coverage of the internal iliac) are greatly offset by the significant decrease in migration potential, for which the risk is death.

STENT FRACTURES

Fractures tend to occur more commonly when stents need to be extended into the common femoral vein (CFV). Generally, stent fractures occur adjacent to the femoral head and approximately 1 cm below the ligament. They appear to be more common with closed-cell stent design/segments and significantly less common with open-cell or braided stents.[5]

Although not all stent fractures cause symptoms, it is still undesirable when they occur. The exact mechanism of stent fracture is not fully understood, but hypotheses suggest it may be related to crushing under the

ligament or, potentially, the pelvic rami caused by flexion/extension movement in the region.[6]

To reduce the chance of stent fracture, if stenting down to the profunda vein/femoral vein confluence, it is important to avoid any stent overlap at the ligament or adjacent to the femoral head. The areas of stent overlap convert a flexible open-cell stent into a more rigid closed-cell stent, which increases fracture risk. Furthermore, if overlap is on a bend, it can lead to the formation of in-stent stenosis.

CHRONIC BACK AND PELVIC PAIN

It is commonplace to have some degree of backache after iliac vein stent deployment. Symptoms are generally managed with simple analgesics, and in the vast majority of cases, they resolve within 2 to 3 weeks postprocedure and generally diminish rapidly within the first 24 hours. This complication has been poorly and inconsistently reported.

Stent oversizing has been identified as a potential risk factor that can lead to persistent backache. The mechanism is unclear, but it might be a compressive effect on nerves arising from the sacral plexus or due to nociceptor/proprioceptive pain signals from the overstretched vein. Therefore, ensuring that stents are not oversized and large stents are not placed are important components to minimize the chance of this complication.

RESTENOSIS OR STENT OCCLUSION

In-stent stenosis or occlusion is the most common problem related to venous stenting, particularly in patients treated for postthrombotic disease. The reasons are multifactorial[7]:

1. Failing to stent the entire diseased venous segments. IVUS is very helpful in identifying the disease segments, profunda vein origin (inflow), and iliac vein confluence (outflow). The inflow and outflow can also be identified using bony landmarks and/or venography, but this is not as accurate as IVUS.

2. Loss of stent patency caused by inadequate inflow. Significant disease within the femoral and profunda vein leads to poor inflow and often causes occlusion of the proximal venous stents. In these cases, various open (CFV endovenectomy and arteriovenous fistulas) or endovascular (femoral and profunda venoplasty) procedures can be attempted to remedy or improve the inflow into the stent. However, this must be a last resort because the morbidity associated with the procedure is arguably not offset by the sustained patency/symptom relief gained.

3. Poor compliance with postprocedure anticoagulation therapy. Venoplasty and stenting are associated with postprocedural inflammation, particularly when placed in a postthrombotic vein, where there is an increased tendency of exaggerated inflammation with scarring and thrombosis. Thus, postintervention anticoagulation is an essential step to maintain stent patency.

CONCLUSION

Deep venous stenting is an established and successful treatment for patients with severe and, in most cases, debilitating uncompensated venous hypertension symptoms caused by outflow pathology in the IVC and iliofemoral veins. The procedure is safe, and complications are uncommon. However, when complications do occur, they can be difficult to fix and cause significant morbidity and, potentially, mortality. Appropriate patient selection via thorough clinical and radiologic assessment, meticulous procedural technique, and good postprocedural protocols will further improve the chance of long-term stent patency and reduce complications. ■

1. Majeed GM, Lodhia K, Carter J, et al. A systematic review and meta-analysis of 12-month patency after intervention for iliofemoral obstruction using dedicated or non-dedicated venous stents. J Endovasc Ther. 2022;29:478-492. doi: 10.1177/15266028211057085
2. Badesha AS, Siddiqui MM, Bains BRS, et al. A systematic review on the incidence of stent migration in the treatment of acute and chronic iliofemoral disease using dedicated venous stents. Ann Vasc Surg. 2022;83:328-348. doi: 10.1016/j.avsg.2021.12.084
3. Sayed MH, Salem M, Desai KR, et al. A review of the incidence, outcome, and management of venous stent migration. J Vasc Surg Venous Lymphat Disord. 2022;10:482-490. doi: 10.1016/j.jvsv.2021.07.015
4. Gagne PJ, Gasparis A, Black S, et al. Analysis of threshold stenosis by multiplanar venogram and intravascular ultrasound examination for predicting improvement after iliofemoral vein stenting in the VIDIO trial. J Vasc Surg Venous Lymphat Disord. 2018;6:48-56e1. doi: 10.1016/j.jvsv.2017.07.009
5. Morris RI, Jackson N, Khan T, et al. Performance of open and closed cell laser cut nitinol stents for the treatment of chronic iliofemoral venous outflow obstruction in patients treated at a single centre. Eur J Vasc Endovasc Surg. 2022;63:613-621. doi: 10.1016/j.ejvs.2021.10.052
6. Cheng CP, Dua A, Suh GY, et al. The biomechanical impact of hip movement on iliofemoral venous anatomy and stenting for deep venous thrombosis. J Vasc Surg Venous Lymphat Disord. 2020;8:953-960. doi: 10.1016/j.jvsv.2020.01.022
7. Black SA, Morris R. The unknowns of venous stenting: why do good cases go bad? Endovasc Today. 2019;18:65-66, 68-69.

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