Three Tips to Ensure Your Deep Venous Intervention Isn't Doomed From the Start

Practical tips to minimize postinterventional thrombotic complications.

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Lower extremity deep venous interventions can range from stenting a nonthrombotic iliac vein lesion (NIVL) to a significantly more complex intervention, such as an inferior vena cava (IVC) recanalization requiring thrombectomy and multiple overlapping stents. Several factors must be considered to provide optimal care for these patients and minimize failures and reocclusions. Most important is understanding if the incident thrombotic event is provoked or unprovoked, the patient's age and overall clinical status, bleeding risk, potential drug-drug interactions, concomitant conditions that affect drug absorption (bariatric surgery) and elimination (hepatic and renal impairment), patient preference, medication adherence, and finally, the associated costs of the drug to the patient. Intraprocedural complexities encountered by the intervening team also play a vital role in the immediate postprocedural anticoagulant choice.

Patient enrollment in clinical trials is challenging. To overcome this challenge, all venous interventional trials are designed to be pragmatic. In this effort, no clinical trial—investigational device exemption (IDE)[1-4] or randomized controlled trial[5-7]—has been prescriptive in instituting a specific anticoagulation regimen. As a result, no level 1 data exist to support one type of anticoagulant or regimen over another. Some single-center studies have reported the success of various combinations of anticoagulant and antiplatelet regimens.[8-11] In a simplistic sense, these reports recommend using multiple, more aggressive antithrombotic regimens for hypercoagulable states or complex interventions and simpler, single antiplatelet regimens for nonthrombotic interventions. Data on antiplatelet therapy are even more heterogeneous than anticoagulant therapy. Most practices use single antiplatelet therapy for at least a few weeks after the intervention, with some studies showing improved patency.[12] However, some report no difference in patency rates with or without the use of antiplatelet therapies in addition to anticoagulation.[11]

A recent expert panel narrative review provided detailed recommendations for antithrombotic therapy after several venous interventions.[13] Based on the available evidence, this article focuses on practical tips to minimize postinterventional thrombotic complications, particularly in high-risk patients.

TIP 1: HYPERCOAGULABLE STATES AND A TEAM APPROACH

Two single centers have reported a hypercoagulable state frequency of 25.5% and 47% in patients undergoing deep venous interventions.[8,11] For optimal outcomes, eliciting a good personal and family history of venous thromboembolism (VTE) is the first step in diagnosing an inheritable hypercoagulable disorder. Similarly, understanding the patient's risk of antiphospholipid antibody syndrome (APS) (an acquired hypercoagulable state) is equally essential. Associated conditions such as malignancy, rheumatologic disorders, and history of miscarriages as well as elevated baseline prothrombin time/activated partial thromboplastin time (PT/aPTT) at admission must raise the suspicion of APS. In such a scenario, standard aPTT-based unfractionated heparin (UFH) nomograms may be inadequate to maintain therapeutic anticoagulation. Instead, anti-Xa levels

may be used to titrate the UFH drip. Otherwise, weight-based, twice-daily, subcutaneous, low-molecular-weight heparin (LMWH) must be considered.

In a cohort of 81 patients with unprovoked deep vein thrombosis (DVT) undergoing interventional therapies, Gwozdz et al reported that 47% had either inherited or acquired thrombophilia.[8] Outcomes were similar between the group with hypercoagulable states as compared to the group without. During the immediate postoperative phase, all patients received a 2-week course of therapeutic twice-daily LMWH. Furthermore, patients with antithrombin deficiency were carefully treated with UFH, with dose adjustment based on anti-Xa levels. At the time of the intervention, 50 U/kg of antithrombin replacement was administered. For patients weighing > 100 kg, anti-Xa levels were measured after the third LMWH dose. Subsequently, a transition was made to warfarin for a duration of 6 months, with a target international normalized ratio (INR) range of 2 to 3, unless a higher range was required due to previous arterial events or recurrent VTE with an earlier target INR range of 2 to 3. Patients with APS continued to receive long-term vitamin K antagonist therapy beyond the 6-month period. At the 6-month mark after the intervention, patients without APS were considered for a switch to direct oral anticoagulants (DOACs). Antiplatelet therapy was not administered alongside DOAC therapy.

It is important to note that this group involved hematologists in the patient's VTE care pathway. Anticoagulation was tailored to each patient, which is the likely reason for these successful outcomes. It is unclear whether all patients need to be on warfarin instead of DOAC, but they achieved good results with their regimen. Hence, consider involving hematology or vascular medicine colleagues in tailoring anticoagulation for patients with hypercoagulable states.

TIP 2: ADHERENCE TO BEST PRACTICE INTERVENTIONAL TECHNIQUES AND CONSIDERATION OF LMWH FOR COMPLEX LESIONS

The triad of NIVL, acute DVT, and postthrombotic syndrome (PTS) venous lesions represent a broad spectrum of disease pathology and likely indirectly reflects varying degrees of intrinsic hypercoagulability and risk. Clinical trials have consistently demonstrated that the primary patency of PTS lesions is worse than NIVL or even acute DVT lesions.[3,14] PTS patients typically require longer stented segments and routinely involve stenting across the inguinal ligament to achieve flow continuity. Failure to adequately assess venous inflow or stent in a manner that optimizes maximal continuity and flow is a major factor for early stent failure. Technically, this often requires stenting down to (but not across) the profunda and femoral vein confluence.[15] Rarely, even stenting into the axialized profunda femoral vein is required.[16]

Appropriate lesion assessment using intravascular ultrasound (IVUS) allows for real-time, high-quality imaging of venous pathology and has emerged as the gold standard imaging modality in this field. Its use has been shown to minimize the undertreatment of disease compared to multiplanar venography, allow for more appropriate stent sizing, and promote optimal lesion coverage.[17] Undersizing of stents can introduce iatrogenic stenosis and continued symptoms, whereas oversizing often leads to unnecessary pain. Achieving appropriate stent overlap, especially in areas of flexion, can prevent stent separation, which is a common cause of failure. Finally, choosing modern venous stents designed specifically to address the complexities, size requirements, and forces of the venous system offers notable advantages compared to stents designed for arterial use.

Marston et al studied 106 patients undergoing deep vein interventions and stenting for chronic obstruction of the common femoral vein, iliac veins, and/or IVC. Early reocclusions were noted in 25.1% of the procedures. They noted that patients who needed recanalization of a fully thrombosed venous outflow tract before the placement of a stent, patients with extensive venous occlusions, and those with a known hypercoagulable condition were at higher risk for reocclusions. This group also recommends using LMWH for > 10 days (typically 2-4 weeks) before transitioning to oral anticoagulation to decrease the chances of early stent reocclusion.[11]

TIP 3: GOOD SURVEILLANCE PROGRAM

In a systematic review of standard stents, the median primary patency rates were reported at 71% with a median follow-up of 23.5 months.[18] IDE studies reported 12-month primary patency rates ranging from 84% to 89.9%.[1-4] These rates ranged from 71.9% to 81.3% in the PTS groups.[1,3,4]

An institutional, team-based surveillance program is necessary to improve the primary assisted patency rates. Although there are no specific guidelines, the usual standard of care for follow-up visits is 4 to 6 weeks, 6 months, and 1 year, along with duplex ultrasound at each visit. Some may need longer-term, yearly follow-ups.

These visits must be used to manage the patient's overall clinical status and confirm the cessation of

antiplatelet therapy if not needed. In patients receiving longer-term LMWH, the first peak anti-Xa levels must be measured to ensure therapeutic range. In a prospective, double-blinded study, a first-peak anti-Xa level > 0.8 U/mL was associated with significantly higher bleeding rates with both UFH and LMWH.[19] It is also important to remember that LMWH can result in heparin-induced thrombocytopenia, although at a substantially lower frequency than UFH. This risk varies depending on the patient population. One study in patients undergoing cardiac surgery reported a frequency of 0.4%.[20] A baseline platelet count must be obtained when initiating LMWH and at the 4- to 6-week follow-up. These visits should also be an opportunity to assess the patient's tolerance to the anticoagulants and the bleeding risks.

SUMMARY

Venous stenting is on the rise to treat DVT and venous outflow obstructions. Close adherence to best practice interventional techniques, lesion assessment with IVUS, and modern venous stent platforms are critical. Nevertheless, there is insufficient evidence on effectively managing antithrombotic medications postprocedurally. Only clinical trials explicitly addressing these issues, conducted in a standardized manner, can make reliable, evidence-based recommendations. Until such time, we hope that this article provides some guidance to minimize failures and complications of treatment. ■

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