

IN THE OFFICE-BASED LAB

Five Essential Components to Deep Venous Care

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As the popularity of performing procedures in the office-based lab (OBL) continues to rise, there is a continued push to expand the capabilities of these labs. Many labs have gone through some growing pains to reach the level of expertise and comfort that they have today. The lab that I developed and currently work in is no different. We started with dialysis interventions and arterial interventions and then expanded into deep venous interventions. With this expansion, we required different elements to be acquired or developed in order to be safe and successful. Although there are numerous devices, medications, personnel, and protocols that could be included, these are the five most essential.

1. PHYSICIAN EDUCATION AND TESTING AND SCREENING PROTOCOLS

First and foremost, referring physician education and vascular lab testing and screening protocols are of utmost importance. Referring physician education is crucial because, depending on your situation, you may be challenging the treatment paradigm of anticoagulation alone by offering procedural therapy to extract an iliofemoral deep vein thrombosis (DVT). If the referring physicians are unaware of the new treatment modalities for iliofemoral DVT, it may be difficult to access and treat this underserved population of patients. Also, the treatment of chronic obstructive deep venous disease in patients with postthrombotic syndrome may also be novel in your area. It will require a significant amount of physician interaction and education to promote these types of treatment in the community.

Once treatment is accepted within the physician community and patients are referred for deep venous intervention, the facility must be prepared to appropriately evaluate and treat these patients. This starts with

the appropriate testing protocols within the vascular lab. Venous duplex protocols to evaluate for DVT must include evaluation of the iliac veins. In many labs, the protocols stop at the common femoral vein. The protocols should also include evaluation and commentary on the distal extent of the venous thrombosis, including the tibial veins. This change in protocol will allow you to appropriately evaluate a patient who has an iliofemoral DVT. Furthermore, evaluation of the extent of the DVT to the tibial veins will help determine the distal access site during potential intervention.

The protocols for venous insufficiency testing should include a thorough evaluation of both the superficial venous system and the deep venous system that is inclusive of the iliac veins. Although many venous insufficiency testing protocols include evaluation for DVT, additional attention must be paid to the status of the vein walls, webs or synechiae within the lumen, and presence/absence of phasic flow through the deep veins. The expansion of the ultrasound testing protocols is required to appropriately evaluate a patient for deep venous disease, especially if one is considering intervention.

2. PATIENT EDUCATION AND PERI- AND POSTPROCEDURAL PROTOCOLS

Patient education and peri- and postprocedure protocols are essential to the success and safety of treating patients with deep venous disease. Unlike in the hospital setting, treating a patient in an office-based angiosuite requires successful treatment and discharge within an 8- to 12-hour time frame, depending on the hours of operation of the lab. This, in turn, requires development of specific protocols for each type of deep venous intervention that will enable successful treatment within the time allotted. For chronic venous disease, this should not be difficult to achieve. Treatment of venous stenosis

inclusive of webs and synechiae or compression syndromes such as May-Thurner syndrome should not be overly time-consuming. Cases involving chronic venous occlusion may take a significant amount of time to cross and treat, and therefore, additional time should be scheduled. Acute iliofemoral DVT treatment in the office-based angiosuite may also require additional time and resources.

When treating an acute iliofemoral DVT in the OBL, having the appropriate treatment protocol in place is of utmost importance to ensure the safety of the patient, the success of the procedure, and the timely completion of the patient's care from check-in to discharge. The treatment protocol that we use in our OBL is the ambulatory venous thrombectomy protocol. First, the patient is brought into the lab, and venous access is achieved, typically in the popliteal vein. We then deliver 10 mg of tissue plasminogen activator (tPA) under high pressure for a unilateral iliofemoral DVT. Once the bolus of tPA has been delivered, a lytic therapy catheter is placed through the thrombus, and patients are taken out to the holding area for a lytic infusion, with a plan to take them back for a second session later in the day. The tPA should be allowed to work for a minimum of 1.5 hours; however, the dwell time may be longer, and the amount of time is usually defined by the length of time it takes to perform a few cases in between the two procedures. The patient is then taken back into the angiosuite for venous thrombectomy, and secondary intervention, such as ballooning and stenting, is performed.

This protocol allows for the safe and effective treatment of the patient's iliofemoral DVT within 6 hours, which is well within the hours of operation of our angiosuite.

The major difference between performing a procedure to remove an acute iliofemoral DVT in the OBL and the acute care hospital is that the patient will go home at the end of a procedure, whereas after care is performed by the nursing staff in the hospital. Postprocedure protocols for patient education and follow-up should be in place for those treated in the OBL. The education protocols need to encompass the potential complications that the patient may encounter after the procedure, which could be as benign as encouraging hydration in the case of hemoglobinuria or as serious as going to the emergency department in the case of bleeding. The education protocols also need to include the anticoagulation regimen after the procedure, as the patient will be responsible for administering their own anticoagulation. The follow-up protocols for the facility should also include a postoperative phone call on days 1 and 2 to encourage adherence to the anticoagulation regimen, as well as a general assessment of the patient's condition. Additional calls and/or office visits may be required to ensure patient safety and successful treatment of the patient's condition.

3. LARGER BALLOONS AND STENTS

The next component required to treat venous disease in the OBL is having larger balloons and stents that are

the appropriate size for treating the deep venous system. Many OBLs are set up to treat arterial disease of the upper and lower extremities, in which the arteries will be anywhere from 2 to 10 mm, which necessitates balloons and stents of the appropriate size. In the deep venous system, the majority of interventions will be performed in the inferior vena cava (IVC), common iliac veins, and external iliac veins. The common femoral, superficial femoral, and popliteal veins may also need to be treated as well. These vessels typically range between 8 and 18 mm for the popliteal vein to the common iliac vein, and treatment of these larger-caliber veins will therefore require larger balloons. The IVC is usually even larger, thus requiring even larger balloons; however, the IVC typically can be successfully treated using smaller balloons in parallel. The larger-caliber veins will also require larger-diameter stents.

With stenting, the majority of devices will be placed in the IVC, common iliac veins, and external iliac veins. Stenting of the common femoral vein, superficial femoral vein, and popliteal vein should be done in an extremely judicious fashion. Given the fact that the majority will be placed in the IVC down to external iliac veins, larger-caliber stents (12–20 mm) will allow for treatment of most situations. When starting deep venous intervention in the OBL, it is important to check that the appropriate inventory is available prior to starting any intervention.

4. THROMBECTOMY DEVICE

Another essential component to the success of an OBL deep venous program is using a thrombectomy device to treat acute iliofemoral DVT. Unlike treating the patient in a hospital, venous lysis alone is not an option in the OBL. Due to the time constraints of an 8- to 12-hour day, a thrombectomy device will be necessary in most cases to complete therapy within that time frame. The procedure protocol for DVT treatment in an OBL must be successful in the vast majority of patients, as there are extremely limited options to continue treatment overnight with a lytic infusion. There are a variety of thrombectomy devices that can be utilized in this situation, including devices that utilize aspiration alone, mechanical thrombectomy, aspiration with mechanical assistance, or rheolytic mechanical thrombectomy. Any of these devices can be used; however, I have had the greatest success using rheolytic pharmacomechanical thrombectomy. Almost all venous thrombectomy cases will be more successful when a combination of lytic therapy and use of a thrombectomy are employed.

5. LYTIC AGENTS, INFUSION CATHETER, AND INFUSION PUMP

The last components required to treat DVT in the OBL are those that are most familiar to interventionists. These

include the requirement for a lytic drug (eg, tPA), a catheter to deliver the drug, and an infusion pump to accurately administer the appropriate dose. In terms of the lytic agent, any of the multiple agents, including tPA, recombinant tPA, and tenecteplase, among others, can be utilized. The lab must identify a reliable source of the lytic agent and understand how to store the medication, as some will have special storage requirements such as refrigeration. Additional education for the staff may be required on how to appropriately reconstitute the drug and administer it.

In terms of infusion catheters, at least one catheter will be required to deliver the lytic agent. There are many to choose from, and all of them can be effective, so the choice should be based on operator experience. Infusion pumps are necessary if the patient is going to be placed on a lytic infusion. This is of the utmost importance to ensure that the patient gets an appropriate dose. Many drugs that are used in the outpatient lab are given as a one-time dose or a recurring bolus at a specific time interval. Lytic infusions are performed on a continuous basis and can cause severe complications if given in inappropriate amounts. Infusion pumps will allow for the appropriate dose to be delivered through the lytic catheter and to the patient. They will also allow for the appropriate amount of heparin to be given as well. Delivering these medications in combination and in the appropriate amounts is extremely important for the safety of the patient and the success of the procedure.

CONCLUSION

Although there are many components required to safely and effectively treat deep venous disease in the OBL, I have highlighted the five that are viewed as essential to ensuring the safety and success of these procedures. Hopefully, the overall message conveyed is that the treatment of deep venous disease is more than just the technical interventional components. Successful treatment of these disease processes in the outpatient setting requires an understanding of the natural history of the disease, current treatment modalities and recommendations for treatment, appropriate equipment, technical expertise, ability to deliver an appropriate anticoagulation regimen, and a robust ability to follow-up on the patient's status postprocedure. ■

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Disclosures: None.