A Treatment Algorithm for DVT

Determining therapeutic protocol for acute and chronic DVT.

BY MARK J. GARCIA, MD, MS, FSIR

Venous thromboembolism (VTE) affects approximately 950,000 patients per year,[1] with up to 60% developing some form of the most common complication of deep vein thrombosis (DVT), postthrombotic syndrome (PTS).[2] There are ongoing clinical trials evaluating the effect of early intervention for acute DVT on the development of PTS, such as the NIH/NHLBI-sponsored ATTRACT trial[3] and the recently enrolling ACCESS PTS trial (Ekos Corporation, a BTG International Group),[4] which looks at endovascular intervention for patients with documented PTS and the ability to recanalize diseased venous segments as well as reduce the sequelae of PTS. To effectively achieve the desired outcomes when treating patients with DVT, whether acute or chronic, there are many factors to consider when contemplating intervention. This article attempts to describe the basic algorithm for determining which type of DVT treatment a patient may receive and why. These are not hard and fast rules but rather a general framework for determining which technique will give the safest and most effective result.

INITIAL THROMBUS ASSESSMENT

Age of Thrombus

The first important consideration is to categorize whether the patient has acute/subacute DVT (< 4 weeks) or chronic DVT (> 4 weeks). The age of the thrombus will help differentiate whether I will consider AngioJet (Bayer) "rapid lysis" pharmacomechanical thrombectomy (PMT) for acute/subacute thrombus or Ekos's ACCESS PTS thrombolysis protocol for chronic DVT as my first line of therapy. I consider standard catheter infusion of a thrombolytic agent after PMT for residual, acute thrombus.

Extent of Thrombus

The importance of determining the age of the thrombus is married to determining the extent of the clot. If the initial physical exam, evaluation, and imaging suggest unilateral infrainguinal disease, then ultrasound imaging alone is sufficient. If, however, there is bilateral leg involvement, pelvic vein involvement, or signs to suggest inferior vena cava (IVC) thrombosis (eg, history of IVC filter with bilateral leg swelling or DVT), I will obtain a magnetic resonance venogram or computed tomography venogram to evaluate the central venous system and use this to help determine my game plan for treatment.

Comorbidities

Once the clot age has been determined, any underlying patient comorbidities that may alter the initial approach must be considered, including renal insufficiency or patients at high risk for bleeding, such as those with recent trauma, surgery, stroke, or malignant

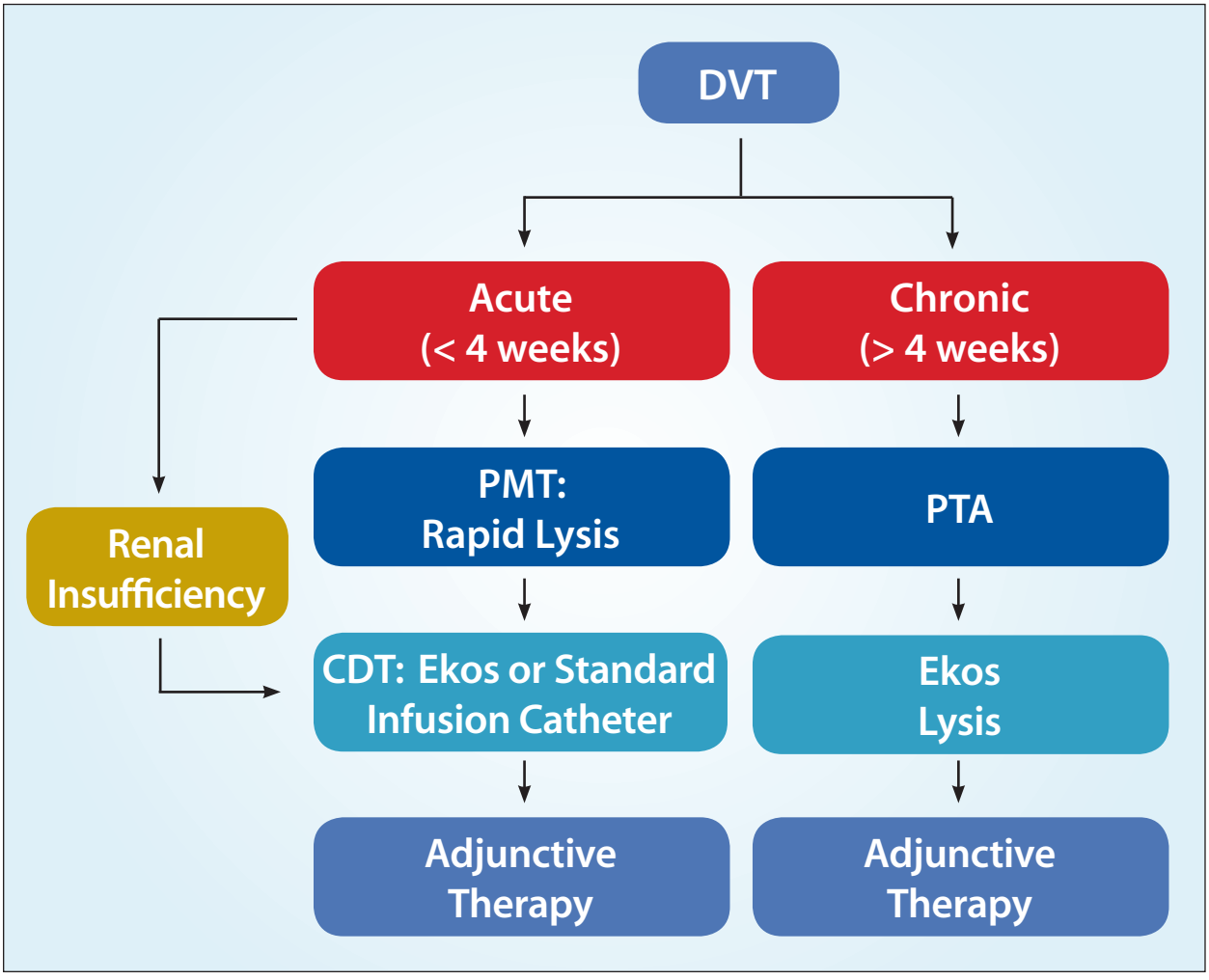

Figure 1. The overall treatment algorithm used for patients presenting with DVT. CDT, catheter-directed thrombolysis; DVT, deep vein thrombosis; PMT, pharmacomechanical thrombectomy; PTA, percutaneous transluminal angioplasty.

disease, among the standard contraindications for thrombolytic therapy. Additional considerations include blood dyscrasias, thrombocytopenia, coagulopathies, or hepatic dysfunction, as well as serious allergies to medications that cannot be pretreated with a standard steroid prep. Abnormalities should be addressed and corrected, if possible, before undertaking any further risk and placing the patient at potential harm.

TREATMENT TECHNIQUES

Once the pretreatment evaluation has been completed, the details of the actual treatment technique can be decided (Figure 1).

Rapid Lysis

If there are no confounding factors, my standard approach to tackling acute and subacute DVT is to perform the rapid lysis technique, which we developed in 1997. This pharmacomechanical technique combines r-tPA with the AngioJet system, which is delivered through an 8-F hockey stick guide catheter coaxially placed through an 8-F sheath. Depending on the volume of thrombus to be treated, I will place 10 mg of alteplase in 500 mL of saline or 25 mg in 1,000 mL of saline.

The combination of the guide catheter and AngioJet is passed to the central-most portion of the clot, and once activated, they are slowly retracted together through the clot. As the system is being retracted, the guiding catheter is rotated in a spiraling fashion from the central to peripheral extent of the thrombus. This spiraling technique allows for wall-to-wall circumferential apposition and, in our experience, greater thrombus removal.

Sequential segments of approximately 10 to 15 cm are treated, followed by venography within each segment via the sideport of the AngioJet catheter to evaluate the effectiveness of the thrombus removal before moving on to the next, more peripheral segment. This technique has allowed for a one-and-done treatment session in half of our patients without the need for catheter-directed thrombolysis (CDT). If there is a significant residual clot burden, or if flow has not been reestablished, then CDT may be initiated if patient circumstances allow.

Catheter-Directed Thrombolysis

Because of the debulking nature of the rapid lysis PMT technique, CDT time is often shortened significantly. In patients with relative or even absolute contraindications to CDT, I will not withhold alteplase from the solution despite these bleeding risks, as it appears the majority of the thrombolytic agent is removed together with the thrombus and, theoretically, very little escapes into the systemic circulation. To date, this technique has been successfully used at our institution without any bleeding complications in patients who would normally have been considered absolute contraindications for thrombolytic therapy, including those who are post-recent trauma, surgery, or have primary or metastatic brain disease. If there is any hesitation from the patient, family, or medical team on giving the r-tPA, then the procedure will proceed with the standard heparinized saline solution (5,000 U/1,000 mL). However, this has rarely been the case.

If there are any other medical concerns, aside from bleeding, contraindicating the use of the AngioJet system (eg, hemolytic anemia, acute renal failure), then I typically use a CDT technique (EkoSonic or standard infusion catheter) in an effort to prevent hemolysis and hemoglobinuria, which can further adversely affect renal function. Additional thrombectomy devices have also been successfully utilized, including the Trellis (Covidien) and Arrow-Trerotola (Arrow International, a division of Teleflex) devices; other devices not yet used in our institution include the Cleaner (Argon Medical Devices, Inc., designed by Rex Medical), Indigo system (Penumbra), and AngioVac (AngioDynamics).

ACCESS

In considering the access site for DVT treatment, my intent is to utilize an access that will allow for the entire, affected deep venous system to be treated. For example, if the ipsilateral popliteal vein is patent, then the popliteal will be accessed. If the popliteal segment is involved, then I usually gain access from the ipsilateral posterior tibial vein, with additional options being the contralateral femoral or right internal jugular vein. If the involved segments are solely pelvis and central and the common femoral vein (CFV) is patent, then the CFV is used.

ACUTE VERSUS CHRONIC TREATMENT PROTOCOLS

Once the diseased venous segments are crossed, I then perform rapid-lysis PMT for acute DVT. If the DVT is chronic, I first perform serial venoplasty of each involved segment up to the expected size of the corresponding normal patent vein. This initial dilatation is dependent on the access site and size of my sheath. Once the venoplasty is completed, I prefer to stent any chronic central occlusion to the level of the inguinal ligament and reevaluate for flow and residual thrombus. After balloon dilatation with or without stenting, I subsequently place the Ekos thrombolytic system for overnight infusion, typically at 0.5 mg/h with pneumatic compression boots placed immediately. After overnight Ekos thrombolysis, venography and further intervention with additional venoplasty and possibly stenting if needed is performed the next day. The goal is to create inline flow from the calf to the thigh and the thigh into the pelvis and IVC. If, after all attempts at gaining flow from the femoral vein into CFV and iliac veins are unsuccessful, then I will stent across the inguinal ligament only to the level of the lesser trochanter—but again, only if needed.

CONCLUSION

Whether a patient suffers from acute or chronic DVT, by developing a treatment algorithm and fully evaluating the patient's circumstances before endovascular intervention, one can safely and effectively treat DVT and obtain excellent outcomes. ■

Mark J. Garcia, MD, MS, FSIR, is Medical Director, Center for Comprehensive Venous Health for Christiana Care Health Services in Newark, Delaware. He has disclosed that he is a member of the IAC Vein Accreditation Board and receives relevant research support and speaker honoraria from Bayer/Medrad, BTG/Ekos, and Cook Medical. Dr. Garcia may be reached at magarcia@christianacare.org.

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