Anthony J. Comerota, MD

Dr. Comerota discusses protocol for DVT and PE treatment, as well as opportunities for attendees of the first ISVS meeting this March.

How does understanding the natural history of deep vein thrombosis (DVT) contribute to effective treatment and improved patient outcomes?

Natural history studies have been performed that look at the deep venous system in patients who were treated with anticoagulation alone and have either clot resolution or no clot resolution. These NIH-sponsored studies showed that patients who have spontaneous clot resolution over time (within 60 days) are likely to retain their valve function and have significantly fewer episodes of recurrent thrombosis. This should translate into less postthrombotic morbidity.

Unfortunately, we cannot predict which patients will spontaneously lyse their clot on anticoagulation alone. What is clear is, if the clot disappears within 1 to 2 months of initiating treatment, vein patency will be restored with a high likelihood of preserving valve function.

Patients with iliofemoral venous thrombus have obliterated their single venous outflow channel from their lower extremity and have exorbitant postthrombotic morbidity. Akesson and his colleagues[1] and Delis and his colleagues[2] have reported that 95% of these patients end up with chronic venous insufficiency. Approximately 40% to 50% will have venous claudication—pain with walking—because of their venous hypertension and resultant venous congestion in their legs at 5 years, and 15% will already have developed a venous ulcer. We know that leaving the clot in patients with extensive DVT leads to profound morbidity. We also know that if we eliminate the clot, we are likely to preserve valve function. If we are successful in eliminating the clot, patency will be preserved. Therefore, restoring patency and preserving valve function returns the venous system to its normal functional state. This translates into lower postthrombotic morbidity, and new observations indicate that it results in a lower risk of recurrence.

Which factors dictate the duration of anticoagulation for acute DVT?

There is increasing evidence that we can adjust treatment for individual patients in terms of the duration of anticoagulation. Generally, we know that if patients have idiopathic DVT, they should be on longer courses of anticoagulation and may be considered for indefinite anticoagulation. However, we also know that after a full course of anticoagulation (a minimum of 3 months or more), a venous duplex ultrasound that shows persistent luminal obstruction (at least 40%) is associated with a significantly higher risk of recurrence compared to those with a normal ultrasound, ie, no evidence of luminal obstruction. Generally, a normal ultrasound at treatment end is associated with a low risk of recurrence.

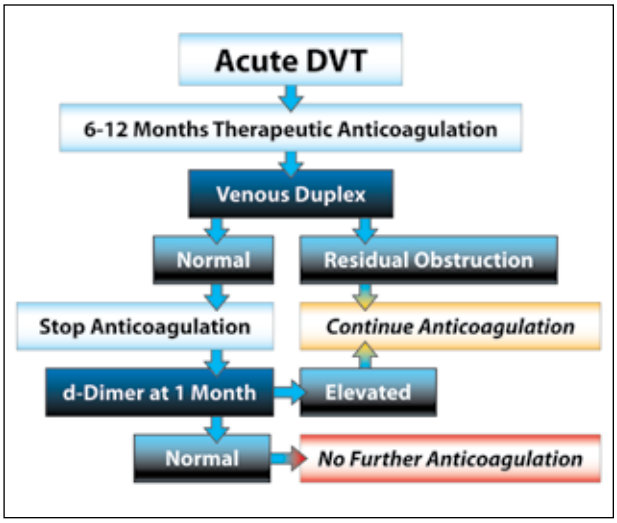

Figure 1. Algorithm for anticoagulation management.

I perform a venous duplex examination following the patient's full course of anticoagulation. If the ultrasound is negative, I stop anticoagulation. After 4 weeks, I will obtain a D-dimer blood test. The D-dimer is a measure of thrombus activity. If the D-dimer is elevated, studies have shown that these patients are at high risk for recurrence. In patients with an elevated D-dimer, I will restart their oral anticoagulation, assuming they are not at high risk for bleeding. My algorithm for managing the duration of anticoagulation is illustrated in Figure 1.

In which patients is aggressive pulmonary embolism (PE) treatment necessary?

It's my opinion that patients with massive and submassive PE should be treated in some way to remove the embolus obliterating the pulmonary arteries. If the PE does not adversely affect right ventricular function (mean-

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ing that the heart function is normal on echocardiography) and biomarkers for myocardial damage (troponins) and excessive myocardial stretch (BNP) are normal, the patient will generally do well with anticoagulation.

Patients who have an abnormal cardiac echo, a dilated right ventricle, high pulmonary artery pressures, septal deviation, and/or tricuspid insufficiency, which are objective parameters of right ventricle strain, are known to have higher associated morbidity and mortality. An RV/LV ratio of ≥ 1 are known on CT scan as another indicator of severe right ventricular strain. Therefore, the right heart is beating against an elevated pressure, which will take its toll over time. If there are elevated troponins and BNPs, we know that those patients have worse outcomes over time than patients with normal biomarker levels. Those are the patients who I believe should be treated with a strategy of thrombus removal.

Patients with massive PE who are hemodynamically unstable with low blood pressure and poor oxygenation should all be evaluated for a treatment designed to reduce or eliminate their PE burden. Although the medical community is divided regarding opinions about treatment of submassive PE, I believe the current evidence shows short and long-term benefit for these patients. My approach to the management of patients with PE is summarized by the algorithm illustrated in Figure 2.

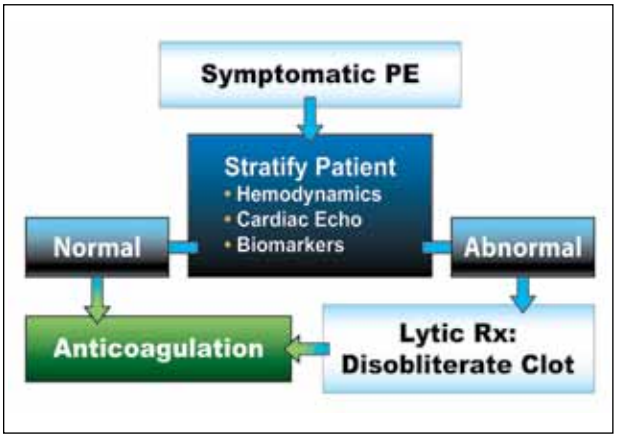

Figure 2. Algorithm for managing patients with PE.

Which patients are at the greatest risk for postthrombotic syndrome (PTS)? How should care be tailored to prevent this?

First of all, PTS can be prevented by eliminating the clot early in patient care. Patients at greatest risk of PTS are those with iliofemoral venous thrombosis because they have obliterated their single venous outflow conduit from their leg. If iliofemoral DVT patients are treated with anticoagulation alone, the thrombus will eventually evolve to collagen tissue within the vein, which persists as chronic venous obstruction. That obstruction results in severe venous hypertension (ambulatory venous hypertension), which is the underlying pathophysiology of PTS.

If this develops and if imaging studies show that the patient has occlusion or substantial obstruction of the common femoral and iliac veins associated with severe PTS, we will recommend a hybrid operative and endovascular procedure, which includes an operation to open up the common femoral vein—called a common femoral endovenectomy. Then, we will perform a patch venoplasty, and on the operating room table, we will recanalize the obliterated iliac venous system and vena cava if it also is occluded. Iliocaval recanalization includes balloon dilation and stenting with the goal of restoring unobstructed venous drainage from the profunda femoris veins to the vena cava. This has shown enormous benefit in patients with extensive postthrombotic iliofemoral occlusion.

The best approach for patients with iliofemoral DVT is to threat them initially with pharmacomechanical thrombolytic techniques to eliminate their acute clot and correct any underlying venous lesions which might exist. This approach has been shown in large patient series and randomized trials to significantly reduce postthrombotic morbidity.

At what point can you determine that percutaneous techniques are not enough and that endovenectomy is the next step?

In patients with chronic PTS, we look at the common femoral vein to determine whether the patient can be treated by percutaneous techniques alone. If the common femoral vein is open and the occlusion is limited to the iliac veins, we can perform a percutaneous-only procedure. If the common femoral vein is obliterated, percutaneous techniques won't be enough since the common venous outflow channel from the leg remains obstructed. Persistent common femoral vein obstruction puts the iliac intervention at risk of rethrombosis. Stenting across the orifice of the profunda is not a good option as it leads to profunda occlusion in some with significant worsening of their postthrombotic morbidity.

What can be done to ensure that emergency department patients with symptoms of DVT and PE are getting the referrals and subsequent interventions when needed?

An effective approach is to meet with the emergency department physicians. It is true that the majority of patients with venous thrombosis can be treated on an

outpatient basis. However, we have established a protocol that when a venous ultrasound shows occlusion of the common femoral vein (indicating this patient will not do well with anticoagulation alone), a consultation is requested to evaluate the patient for an initial strategy of thrombus removal.

In what ways can endovascular practices contribute to DVT Awareness Month?

There is an increasing body of evidence that shows that (1) endovascular techniques can be highly successful in removing clot; (2) if clot is removed, postthrombotic morbidity is reduced; (3) if clot is removed, we also know that recurrent DVT is reduced; and (4) if you reduce recurrence, you substantially reduce postthrombotic morbidity. Therefore, when patients present with DVT, physicians need to at least be aware that techniques are available to eliminate the clot and they should evaluate whether the patient would be an appropriate candidate for a strategy of thrombus removal.

What can ISVS attendees anticipate this March?

We are looking forward to an exciting inaugural meeting of the ISVS (International Society of Vascular Surgery) in Miami, March 9–11. The meeting is going to be an excellent educational opportunity for those who attend. We have the world's experts who will be presenting their data on aneurysmal disease, arterial occlusive disease, carotid disease, venous disease, and dialysis access. The entire spectrum of vascular disease is being covered. We have a robust scientific program and poster presentation program. We also have a residents and fellows paper competition. Unique to this program is a Technology Showcase in which industry has an opportunity to address the physician attendees regarding their new technology or what is new and different about their current products. Overall, I believe it is going to be a great meeting for everyone. ■

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1. Akesson H, Brudin L, Dahlstrom JA, et al. Venous function assessed during a 5 year period after acute iliofemoral venous thrombosis treated with anticoagulation. Eur J Vasc Surg. 1990;4:43-48.
2. Delis KT, Bountouroglou D, Mansfield AO. Venous claudication in iliofemoral thrombosis: long-term effects on venous hemodynamics, clinical status, and quality of life. Ann Surg. 2004;239:118-26.