IVUS-Guided VCF Placement

An alternative approach to an increasingly popular vena cava filter placement technique.

BY JOHN H. MATSUURA, MD

The number of articles reporting the safety and clinical usefulness of bedside placement of vena cava filters continues to grow.[1-6] Critically ill patients with injuries that increase the risk of deep venous thrombosis and pulmonary embolism are the main indication for this procedure. The concept of bedside placement of vena cava filters brings the filter to the patient, and reduces the risks and inconvenience associated with the transportation of the patient to the operating room or radiology suite. I would like to share our approach and discuss alternative techniques to visualization of the vena cava using standard fluoroscopy.

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TECHNIQUE

Our early experimental animal research revealed two important concerns:[7] (1) Due to the lack of spatial orientation and difficulty entering the inferior vena cava without fluoroscopy, the jugular approach should be avoided

Figure 1. Measurement of vena cava diameter using intravascular ultrasound (IVUS) just below the renal veins.

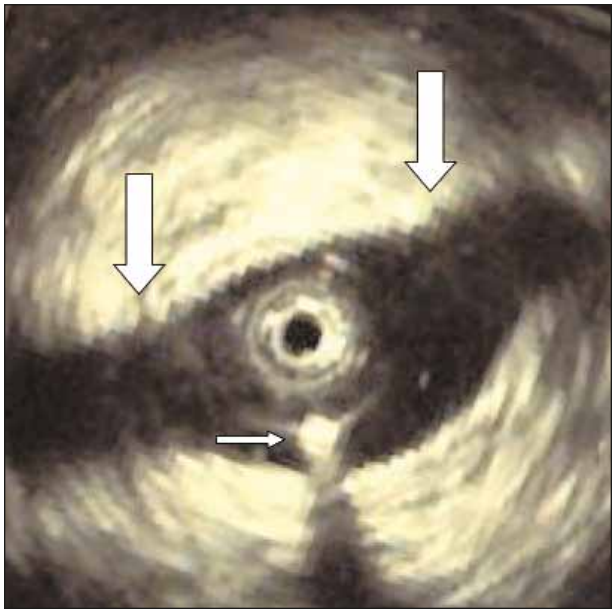

Figure 2. IVUS catheter image showing the tip of the vena cava filter (small arrow) and the renal veins (large arrows).

Figure 3. Deployment of the vena cava filter under IVUS imaging.

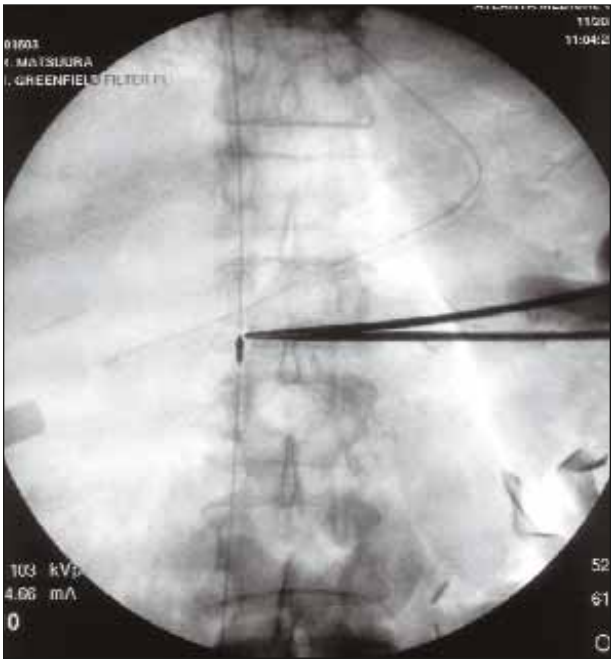

Figure 4. The IVUS catheter tip is located at the level of the renal veins (L-1, L-2) and a hemostat is used to mark their location. Locking the C-arm unit maintains an accurate positioning of the renal veins.

with this technique. (2) Even with proper technique, movement occurred during vena cava filter placement, and therefore "real time" imaging was important in accurate deployment of the device. Consequently, we adopted a technique accessing the ipsilateral femoral vein twice, passing two guidewires into the vena cava.

An 8-F sheath is placed for insertion of the IVUS catheter and vein mapping from the right atrium of the heart to the iliac vein bifurcation. This not only verifies the location of the renal veins, but also aids in the identification of any potential anatomic variations. The IVUS catheter is then positioned at the level of the renal veins, and diameter measurement is obtained to ensure the vena cava diameter is acceptable (<28 mm) (Figure 1). The vena cava filter delivery system is then placed into the vena cava over the second wire and the filter is loaded into the tip of the delivery sheath. The delivery catheter is withdrawn until a strong acoustic shadow is seen, indicating the vena cava filter is passing the IVUS catheter inside the delivery sheath. When the acoustic shadow disappears and advancing the catheter slightly demonstrates reappearance of the acoustic shadow, the tip of the vena cava filter is level with the IVUS catheter tip and, therefore, located just below the level of the renal veins (Figure 2).

Keeping the IVUS catheter steady, the filter is slowly deployed, with constant visualization of the tip of the vena cava filter to ensure accurate deployment (Figure 3). My preference has been use of the OptEase vena cava filter (Cordis Endovascular, a Johnson & Johnson company, Miami, FL), but this technique can be used with other filter devices.

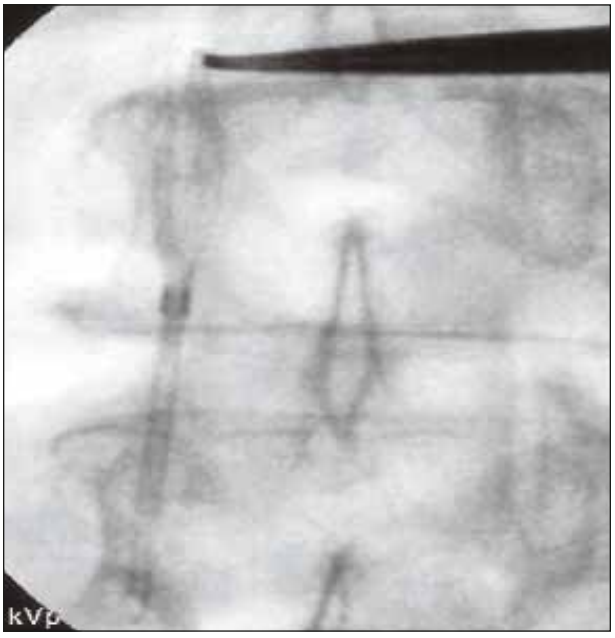

Figure 5. The filter is being deployed using the hemostat as a marker guide for the location of the renal veins.

ALTERNATIVES

It is also worth mentioning that both IVUS and carbon dioxide venography are alternative techniques for fluoroscopically assisted vena cava filter placement in patients with severe intravenous contrast allergy or renal insufficiency.[8] Visualization is very good with carbon dioxide and avoids the need to use contrast agents and prophylaxis with steroids and diphenhydramine in patients with contrast allergy. When using IVUS, I perform the same pullback mapping technique and, once the renal veins are located, I lock the C-arm fluoroscopy unit and mark the tip of the IVUS catheter with a hemostat (Figure 4) as the IVUS catheter is removed and replaced with the vena cava filter delivery catheter. The vena cava filter can then be deployed safely below the hemostat marker (Figure 5).

SUMMARY

In my opinion, IVUS is often underutilized in most endovascular practices. This application of IVUS has grown in popularity and offers a service to our critically ill patients. With experience, I believe this approach is more accurate than fluoroscopic placement. ■

John H. Matsuura, MD, is from The Vascular Disease Institute, Gainesville, Georgia. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Matsuura may be reached at (770) 534-0110; john_matsuura@hotmail.com.

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