Vena Cava Filters

Procedural recommendations for IVC filter placement.

BY DAVID TROST, MD

ACCESS SITES

Placement
- Right internal jugular vein: 99% of the time
- Left internal jugular vein: .5% of the time
- Femoral veins: .5% of the time

Retrieval
- Right internal jugular vein
  - Günther Tulip (Cook Medical, Bloomington, IN)
  - Recovery (Bard Peripheral Vascular, Murray Hill, NJ)
- Right or left common femoral vein
  - OptEase (Cordis Corporation, Warren, NJ)
(For a complete listing of all available IVC filters, please see page 128.)

FILTER PLACEMENT EQUIPMENT

Vein Access
- Micropuncture kit
- Ultrasound guidance

Guidewires
- Initial access
  - .035-inch Bentson (Cook Medical)
- Delivery sheath access
  - .035-inch Amplatz Super Stiff (Boston Scientific Corporation, Natick, MA)

Flush Diagnostic Catheters
- 5-F Omni Flush (AngioDynamics, Inc., Queensbury, NY)
- 5-F Marker Omni Flush (AngioDynamics, Inc.)
- 5-F pigtail

Selective Catheters
- 5-F Cobra
- 5-F Bernstein

CONTRAST AGENTS
- Nonionic iodine-based
- Renal failure patients
  - Visipaque (GE Healthcare, Waukesha, WI)
  - Gadolinium-based
  - CO₂

DIAGNOSTIC NOTES

The flush inferior venacavography should be performed from the left common iliac vein if possible to allow the identification of most caval anomalies. Selective renal venography should be performed if the anatomy is not clear from the flush cavogram.

Many patients receiving inferior vena cava (IVC) filters have had an abdominal/pelvic CT or MRI scan. Reviewing the imaging before the filter placement procedure will delineate the caval and renal vein anatomy so that there are no surprises during the filter placement.

IVC FILTER RETRIEVAL

Access Site Per Filter Requirements
- Jugular vein for Recovery and Günther Tulip
- Femoral for OptEase
- Vein Access
  - Micropuncture kit
  - Ultrasound guidance

Guidewires
- Initial access
  - .035-inch Bentson (various vendors)
- Removal sheath access
  - .035-inch Amplatz Super Stiff

Flush Diagnostic Catheters
- 5-F straight flush (various vendors)

Selective Catheters
- 5-F multipurpose
- 5-F Bernstein

Removal Systems
- Günther Tulip, OptEase: stiff teflon 8-F to 11-F sheath with coaxial snare (Cook Medical); other systems can be constructed from components from various vendors.
- Recovery: Recovery cone removal set (Bard), 260-cm stiff .035-inch guidewire for exchange.

NOTES
If a filter is difficult to remove due to angulation, a tip-deflecting wire can be used to carefully pull it back in line with the retrieval cone (Bard) or within reach of a snare (Günther Tulip or OptEase).
Planning for a successful retrieval begins at initial placement. Try to keep the filter centered in the cava. Orient the hook (if so equipped) so that it is easy to see in the anteroposterior or a shallow oblique view. Place the top of the filter approximately 1 cm inferior to the renal veins. Be certain that the access needed for retrieval exists.

**REMOVAL TECHNIQUE**

Use the access route appropriate for the filter being retrieved. Perform a cavography with a straight flush catheter so that it cannot get tangled in the filter. If there is more than a small amount of thrombus on the filter, it should be left in place, and the patient should be anticoagulated, if possible. If the thrombus is small, filter removal is still possible. The thrombus is usually well adhered to the filter and will come out with the device.

Engage the hook on the OptEase and Günther Tulip filters with the snare. Advance the sheath over the filter to remove. The Recovery filter is removed with a special cone instead of a snare. The cone engages the apex of the filter. The filter is removed by fixing the sheath and pulling the filter, which is different from the OptEase or the Günther Tulip devices. A final cavogram is performed to make sure the cava has not been damaged and that there is no stenosis or thrombus present. The straightforward removal is a quick and easy procedure. A difficult removal can be long and arduous.

**THE DIFFICULT REMOVAL**

Removals can become difficult at two points during the procedure: engaging the retrieval mechanism and removing the embedded components of the filter. This article deals with the first step in this process, engaging the retrieval mechanism. Difficulty engaging the retrieval mechanism can be simply due to angulation of the filter, but it can also be due to embedding of the retrieval end of the filter into the wall of the cava. First, try to look at the filter in several oblique angles. Sometimes, the filter looks centered on the anteroposterior view, but it is
severely angulated on the lateral view. This information can sometimes guide the retrieval, allowing for success with standard techniques. If this fails, other methods can be explored. These second-line methods differ depending on the filter being removed. The techniques will be described separately below.

**GÜNTHER TULIP AND OPTEASE FILTERS**

Using a 6-F or 7-F angled catheter to guide the snare can frequently solve difficulty engaging the retrieval hook. If this does not succeed, a tip-deflecting wire can be placed through the removal sheath next to the snare and used to grasp the filter just beyond the hook element and pull the filter straighter, allowing the snare to grasp the retrieval hook. Sometimes, the snare can be used to grab the end of the tip-deflecting wire to create a loop snare. This snare can be slid up onto the retrieval hook and pulled up into the sheath (Figure 1).

**RECOVERY FILTER**

The filter can occasionally be straightened enough to allow the cone to engage the top of the filter by using a stiff guidewire that goes through the cone, past the filter, and down into the iliac veins. The wire should be negotiated past the filter on side nearest to the caval wall to pull the filter and the cone in line with each other. Placing the wire can be tedious and require several tries.

This frequently requires multiple exchanges of the cone and an angled catheter. A useful trick is to place an acute bend on the wire about 5 cm back from the tip before it is placed down the flush or selective catheter. Once the cone is placed, the whole system—wire and catheter—can be rotated to move the cone within the cava, which can help to achieve the necessary alignment to engage the filter. To achieve the best alignment, the system can also be withdrawn above the filter and used to move the guidewire around the filter without a selective catheter to facilitate placement of the guidewire along the optimal side of the filter (Figure 2).

An alternate method is to use a tip-deflecting wire, which can be placed through the Recovery retrieval cone and used to pull the filter apex up into the cone. When engaging a Recovery filter with the tip-deflecting wire, it is important that the filter elements are bisected. If only one or two arms are engaged, the filter may become distorted if traction is placed on the tip-deflecting wire. When the cone engages the filter, the tip-deflecting wire must be relaxed to allow the cone to close properly.

If multiple unsuccessful attempts are made, the retrieval cone should be periodically removed, and the integrity of the cone should be checked. If the membrane has detached from the metal fingers or the fingers are bent, the cone should be replaced.

Other techniques for achieving alignment of the retrieval system and the filter have been used, such as moving the filter with an angioplasty balloon or using pulmonary biopsy forceps to grasp the top of the filter.

**CONCLUSION**

These tips can be very useful at increasing the successful retrieval rate of optional vena cava filters. They work well for the nonembedded or the minimally embedded filter. Techniques for the assessment and removal of deeply embedded filters are beyond the scope of this article.

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