

A Complex Case of IVC Filter Removal

A case of a patient with a permanent filter removed using percutaneous interventional techniques.

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It is estimated that pulmonary embolism is the third leading cause of death in the United States, accounting for more than 50,000 to 100,000 deaths per year.^{1,2} In patients who cannot receive anticoagulation, the use of vena cava filters is one of several treatment options available to patients. Before 2003, vena cava filters available in the United States were permanent implants.³ Removable vena cava filters for temporary protection from pulmonary embolism was first proposed in 1967.⁴ Currently available vena cava filters in the United States include devices intended as permanent implants^{1,2} and devices with an option of removal at a later date. In the latter case, such devices have approval as permanent implants, with the option for removal at some point in the future care of the patient.

The classic example of the clinical use of an optional filter is that of a young trauma patient with multiple injuries, including long-bone fractures and head trauma, who could not receive anticoagulation and would be at significant risk for potential life-threatening venous thromboembolic events. The use of an optional vena cava filter in this setting would be a reasonable choice.

Rarely, vena cava filters that are permanent must be removed. An example would be a filter in a precarious position (eg, a filter that has migrated or was deployed incorrectly and is located partially in the right atrium of the heart). Although controversial, one might consider filter removal in a young patient with a hypercoagulable condition. We describe a complex case of permanent vena cava filter removal in a young male patient. Standard interventional techniques were used to retrieve the device.

Figure 1. Digital spot film documenting the use of in situ snare technique. The image reveals the hook-shaped catheter advanced through a 16-F jugular sheath. A floppy-tipped, exchanged-length guidewire has been advanced through the catheter. The distal wire tip was snared using a coaxially directed loop snare (not shown).



CASE DESCRIPTION

A 43-year-old man involved in a motor vehicle accident received a permanent vena cava filter at an outside institution. At 1 year after filter implantation, the patient was seen at our institution for evaluation of filter removal. The patient was unaware of the type of filter placed, and a plain film revealed that a permanent TrapEase filter (Cordis Corporation, Bridgewater, NJ) had been placed. The patient was told by his hematologist that the filter should be removed because he was now ambulatory and no longer at risk for venous thromboembolic events.

After a consultation with the patient's referring physicians, it was decided that an attempt would be made to

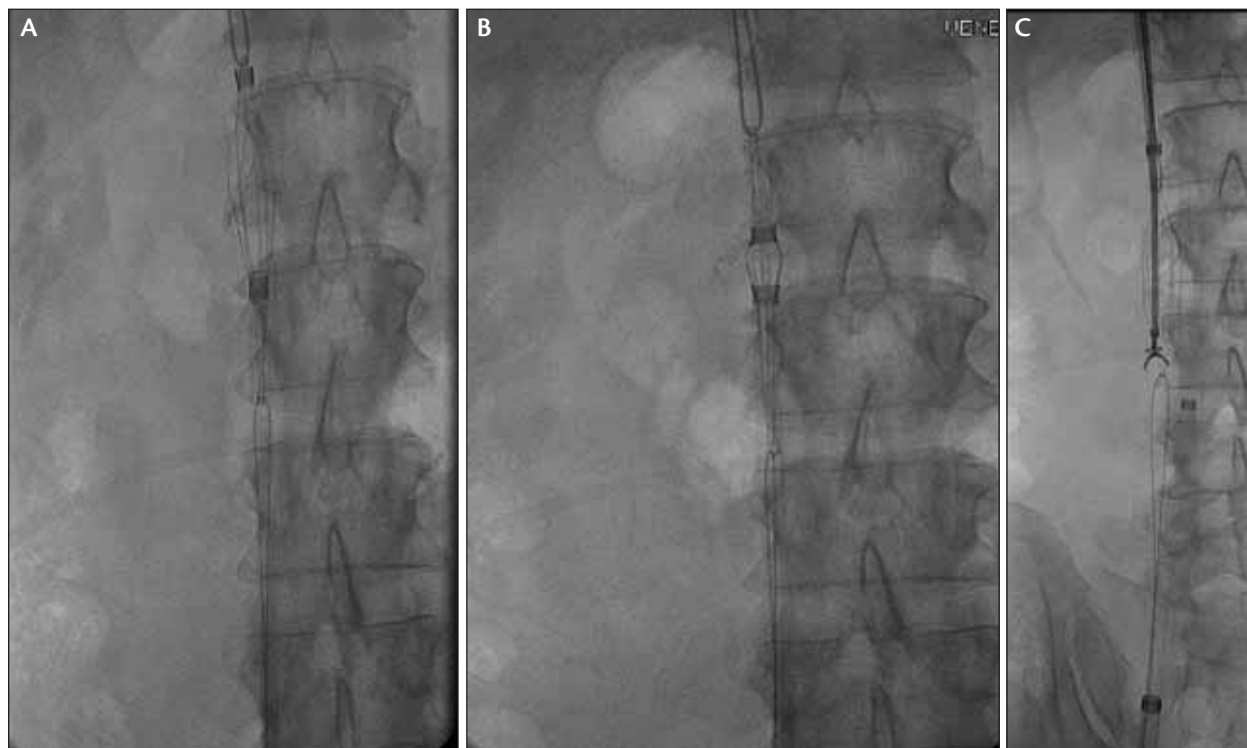


Figure 2. An in situ snare has been created by grasping the distal end of the floppy-tipped wire and achieving “through-and-through” jugular access. The Sos Omni catheter (AngioDynamics, Queensbury, NY) was then removed, leaving the wire in place. A femoral sheath was also placed, and the same technique was used to engage the caudal apex of the filter. Simultaneous tension on the jugular and femoral looped wires, with simultaneous advancement of the 16-F sheaths, was then performed (A). Attempts at full-filter collapse (closure) reveals endothelial bridging in the mid portion of the filter (between the two dark bands). The collapsed filter would not enter either the jugular or the femoral sheaths (B). Clamshell biopsy forceps (Cook Medical, Bloomington, IN) were placed through the jugular sheath and used to break endothelial bridges from the vertical struts and free the filter. In this image, a second femoral sheath was placed for potential advancement of a large angioplasty balloon, which would have been inflated to break endothelial bridges had the clamshell biopsy forceps not worked. The use of the balloon was not required (C).

remove this device given the consensus that it was no longer needed and was a potential source for future inferior vena cava (IVC) thrombosis.

TECHNIQUE

Under conscious sedation, percutaneous access was achieved from the right internal jugular and right common femoral veins. Long, 16-F venous sheaths were placed (Cook Medical). A 4-F Sos Omni catheter was advanced from the jugular and used to hook the apex of the TrapEase filter. An in situ snare technique was utilized. An Amplatz GooseNeck snare (ev3 Inc., Plymouth, MN) was advanced through the lumen of a 16-F Cook long jugular sheath. The snare loop was opened and used to grasp the tip of a guidewire advanced through the Sos Omni catheter. The large-caliber Cook sheath allowed placement of not only the 4-F Sos catheter with its guidewire but the GooseNeck snare as well (Figure 1).

After creating the in situ snare, the Sos Omni catheter was removed, leaving the wire looped through the filter apex and the two ends of the guidewire outside of the hemostatic valve of the jugular sheath. Using a similar technique from the femoral approach, the caudal apex of the TrapEase filter was likewise hooked, and the in situ snare technique was again used. With cranial and caudal tension on the wire ends, the two 16-F sheaths were then brought together under fluoroscopic guidance to collapse the filter (Figure 2A and B). Because of the endothelium of the filter struts, the collapse of the TrapEase filter was successful but the tissue would not allow removal from the caval wall. Therefore, from the jugular approach, clamshell biopsy forceps were advanced and used to remove and loosen the endothelial bridges on the vertical struts of the TrapEase filter (Figure 2C). Having successfully completed this, the two 16-F sheaths were brought together, and the filter was

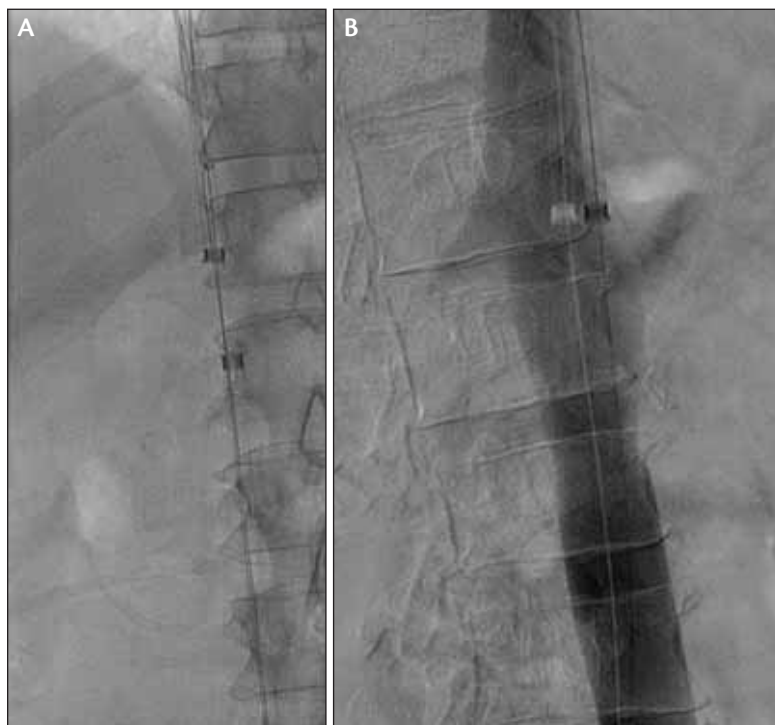


Figure 3. Digital spot film in the anteroposterior projection showing successful permanent filter retrieval from the jugular approach (A). An inferior vena cava-gram confirming patency of the IVC. There is no evidence of contrast extravasation. There is mild narrowing at the site of the previous filter, with mild caval wall irregularity. The patient was asymptomatic at 8-month follow-up (B).

successfully removed from the jugular sheath (Figure 3A). The completion cavagram (Figure 3B) documents successful removal with minimal irregularity of the caval wall and no contrast extravasation.

The patient tolerated the procedure well and is asymptomatic at 8-month follow-up. Of note, upon filter removal there was considerable endothelium attached to the struts of the filter. The filter was removed intact.

Based on recommendations published in the literature on the use of IVC filters, patients with venous thromboembolic disease “should continue to receive primary therapy for the full duration suggested in practice guidelines or according to the local standard of care.”^{5,6}

CONCLUSION

This case illustrates the use of endovascular techniques for removal of a device that would be labeled as a permanent implant. Removal of this permanent device is not recommended in the Instructions for Use.

What has been learned is the increasing awareness of the healing/remodeling of the IVC. Decousus et al⁷

found a significant benefit of IVC filters in the first 12 days after implantation (ie, a reduction in venous thromboembolic events). However, in patients who had IVC filters at 2 years, there was an increased incidence of venous thromboembolic events. Thus, data exist, although limited, to suggest that once a filter is no longer needed clinically, consideration should be given to device removal. The authors recognize that in this case, the removal of the permanent filter at 1 year is controversial. This case illustrates the feasibility of percutaneous removal in a young trauma patient in whom a permanent IVC filter was placed and in whom the use of an optional filter would have been a better initial treatment option. ■

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