Journal of
Vascular Surgery
Venous and Lymphatic Disorders™

## VENOUS AND ENDOVENOUS TECHNIQUES

**From the Southern Association for Vascular Surgery**

# A novel technique to remove inferior vena cava filters using a homemade snare device

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**The need to retrieve inferior vena cava filters is quite evident due to the long-term complications. We present a novel technique to remove inferior vena cava filters using a homemade snare created using a looped a 0.014-inch semistiff wire. Employing this technique, 18 consecutive retrievable filters were removed. All filters were easily snared on the very first attempt, and no complications occurred. Our novel technique to retrieve filters is efficient, safe, and cost-effective. (J Vasc Surg: Venous and Lym Dis 2014;2:94-7.)**

Inferior vena cava (IVC) filters are widely used to prevent pulmonary embolism in patients with deep vein thrombosis (DVT) when anticoagulation is contraindicated or ineffective. However, once the indication is over, they should be removed to prevent significant complications like increased incidence of recurrent DVT, IVC thrombosis, migration, fracture, distal embolism, IVC perforation and erosion into surrounding organs.[1-3]

The standard retrieval technique, using several commercially available devices including snare and cone, has a varying degree of success in different hands. The factors related to the technical failure to retrieve filters include longer dwell time, filter tilt, and tissue overgrowth at the contact site with the IVC wall requiring secondary techniques.[4] Our objective is to describe a novel technique to remove IVC filters using a simple, safe, and cost-effective homemade snare.

## METHODS

We performed a retrospective review of all the patients undergoing IVC filter removal using our snare device fashioned on the back table from October 2011 to November 2012. Patient demographics, indication for filter placement, dwell time, operative details, and imaging studies were reviewed. All cases were performed by a single vascular surgeon (K.S.) at one institution. Preoperative bilateral lower extremity venous duplex scan was performed in all patients to evaluate for the presence of DVT. No preoperative abdominal imaging was performed. Pre- and postretrieval cavagram was performed in all cases.

**Technique.** Ultrasound-guided access is obtained through the right internal jugular vein. Using a standard Seldinger technique over a Bentson (Cook Medical, Bloomington, Ind) wire, an 8F Terumo destination sheath (Terumo Medical Corp, Somerset, NJ) is placed in the IVC landing approximately 3 cm above the filter. An 8F sheath was used in all cases except for one patient with a Gunther Tulip filter (Cook Medical), where a 9F cook sheath was used. A Miracle Bros 0.014-inch semistiff wire (Abbott, Santa Clara, Calif) is doubled up forming a loop. One end of the wire is kept longer than the other for orientation purposes. The shorter end of the wire is bent at approximately 2 cm proximal (away) to the loop, forming a gentle angle. The loop is advanced through the sheath into the IVC under fluoroscopic guidance. The Bentson wire is typically also left in the sheath to prevent the orifice of the sheath pointing toward the IVC wall, preventing the risk of perforation during advancement of the snare (Fig 1). The longer end of the wire is pulled while the shorter end of the wire is advanced, creating a right-angle semistiff loop. While keeping tension on the longer end of the wire, the shorter end can be advanced or pulled to change the size of the loop. The steps are illustrated in a schematic illustration (Fig 2). With the right-angle loop formed and protruding out of the sheath, both are advanced over the filter. Because of the stiffness of the wire, the right angle remains in place as the snare is pushed down along the IVC. The loop is manipulated to a desired size to encompass the entire lumen of the IVC, making the capture of the filter hook effortless as long as the head of

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Author conflict of interest: none.
Presented at the Thirty-seventh Annual Meeting of the Southern Association for Vascular Surgery, Paradise Island, Bahamas, January 23-26, 2013.
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The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.
2213-333X/$36.00

http://dx.doi.org/10.1016/j.jvsv.2013.06.007

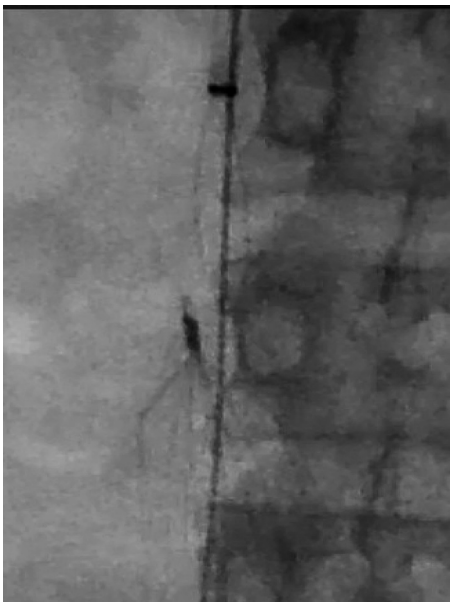

**Fig 1.** The sheath sits 3 cm proximal to the filter head. The Bentson wire is left in place, and the snare is advanced. This method keeps the sheath pointing in a caudal direction, preventing the snare from injuring the caval wall as it exits the sheath.

the filter is not embedded in the IVC wall. Once the loop sits on the filter head, the loop is tightened by pulling the short end, and the filter hook is snared (Fig 3). The sheath is then advanced over the filter until the filter is constrained (Fig 4). The filter is then pulled out through the sheath. The sheath is removed from the neck with the patient in Trendelenburg position, and digital pressure is used to ensure hemostasis.

## RESULTS

Over a 13-month period, 18 consecutive patients had filter retrieval using the method described. The average age of the patients at the time of retrieval was 50 ± 15 years, and 83% were male. Contraindication to anticoagulation was the primary indication for IVC filter placement in 44%

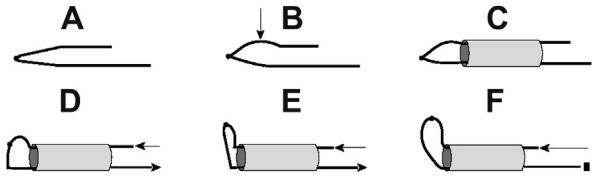


**Fig 2.** Schematic illustration of steps to form the homemade snare. **A,** The 0.014-inch wire is looped leaving a short and a long end for orientation. **B,** A soft bend (*arrow*) is made on the short end side of the wire approximately 2 cm proximal to the tip of the loop. **C,** The loop is inserted into the sheath. **D,** The long end of the wire is pulled while the short end is pushed in, and the right angle snare begins to form. **E,** Once the tip of the snare fully abuts the sheath, the snare automatically forms a right angle. **F,** The size of the snare can be manipulated by either advancing or pulling on the short wire end and holding the long end in position.

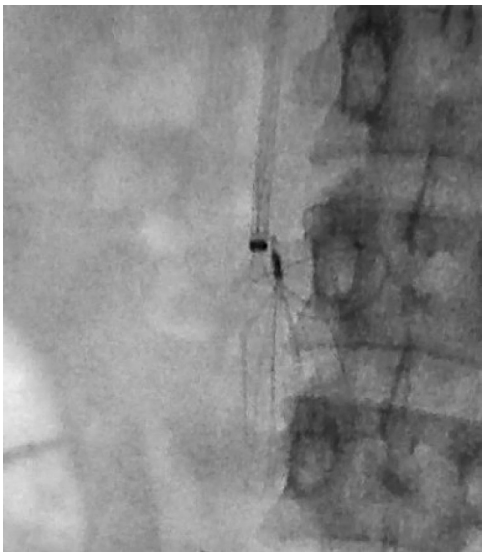

**Fig 3.** The sheath and the loop are advanced together until the loop sits on top of the filter. The wire ends are then manipulated to tighten the loop and to snare the hook of the filter.

(8/18) of cases. Prophylactic filters were placed in five patients, and the remaining five patients had a filter placed prior to percutaneous mechanical thrombectomy for extensive lower extremity DVT. The average dwell time for filters was 8.8 weeks (range, 5-52 weeks). All cases were performed as outpatient and were discharged without complications.

The overall success rate for retrieval in our series was 100% (18/18). All filters were the retrievable type containing a hook at the head. Preretrieval cavagram ruled out IVC or filter thrombosis and evaluated the position of the filter, degree of the tilt, and penetration of the filter

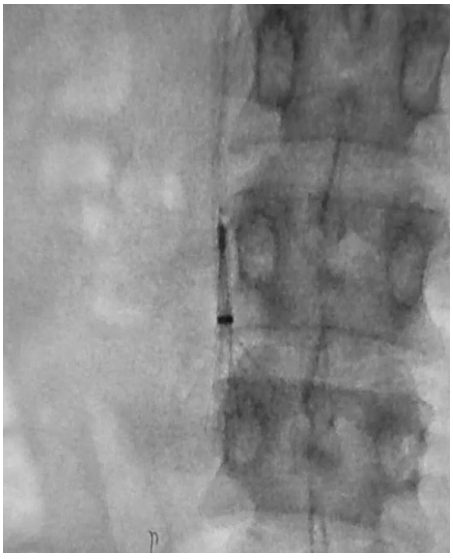

**Fig 4.** The wire ends are pulled while the sheath is advanced to constrain the snared filter.