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Internal jugular and common femoral venous access for the removal of a long-term embedded vena cava filter

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ABSTRACT

We describe an inferior vena cava filter retrieval technique requiring triple venous access performed in a 35-year-old male who was referred for filter removal 16 months after its insertion. The filter showed a right-sided tilt with endothelialization of the distal filter struts into the caval wall. Access was required via both internal jugular veins to straighten the filter using a snared-loop technique. Further 18 F right common femoral vein access was required to snare and remove the filter, which could not be completely collapsed distally due to endothelialized tissue, precluding normal removal via the jugular venous route.

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Inferior vena cava (IVC) filters are often placed for the prevention of venous thromboembolism in high-risk patients as well as those who have contraindications to or have failed anticoagulation in the setting of existing venous thromboembolism. In these situations, there is proven efficacy in the short-term setting without similar results in the longer term (1, 2). Optional retrievable IVC filters are now increasingly being used in multiple trauma patients with a high risk of pulmonary embolism (3). In these patients, filters are usually placed with the intent of removal when the patients' clinical condition permits and where possible within the manufacturer's recommended temporal guidelines. At our institution, a tertiary trauma referral center, IVC filters are often prescribed in this setting, with patients often requiring multiple surgeries and a protracted recovery period. We describe a difficult case of filter retrieval performed 16 months after initial placement due to loss at the clinical follow-up. This case required triple venous access, via both internal jugular veins (IJVs) and right common femoral vein (CFV), employing both previously described techniques: the wire loop-and-snare and cone-over-guidewire techniques (4).

Technique

A 35-year-old male patient had an optional retrievable IVC filter (Günther-Tulip, William Cook Europe, Bjaeverskov, Denmark) inserted preoperatively following extensive traumatic pelvic fractures. The patient had a protracted period of treatment and rehabilitation, and was lost to the initial clinical follow-up. He presented for filter retrieval 16 months after its initial placement. Although this condition was outside of the manufacturer's normal temporal guidelines of 20 days, the procedure was attempted considering the patient's age and desire for retrieval.

After securing access into the right IJV using an aseptic technique and under ultrasonography guidance, a 5 F multiendhole catheter (Omniflush, AngioDynamics, Hampshire, United Kingdom) was manipulated in the IVC caudal to the filter over a 0.035-inch J guidewire. Inferior vena cavography confirmed the intravascular location of the filter with the filter apex tilted to the right and the absence of significant thrombus (Fig. 1). Using a Günther Tulip vena cava filter retrieval set (William Cook, Europe) via the right IJV access, unsuccessful attempts were made to snare the filter because it was tilted and likely endothelialized with the IVC vessel wall. Therefore, attempts were made to displace the tilted filter apex from the IVC wall using a 5 F Rösch interior mesenteric (RIM) catheter (AngioDynamics) and 0.035-inch hydrophilic guidewire (Terumo UK, Surrey, United Kingdom) in combination with the retrieval snare from the Günther Tulip vena cava filter retrieval set using a wire

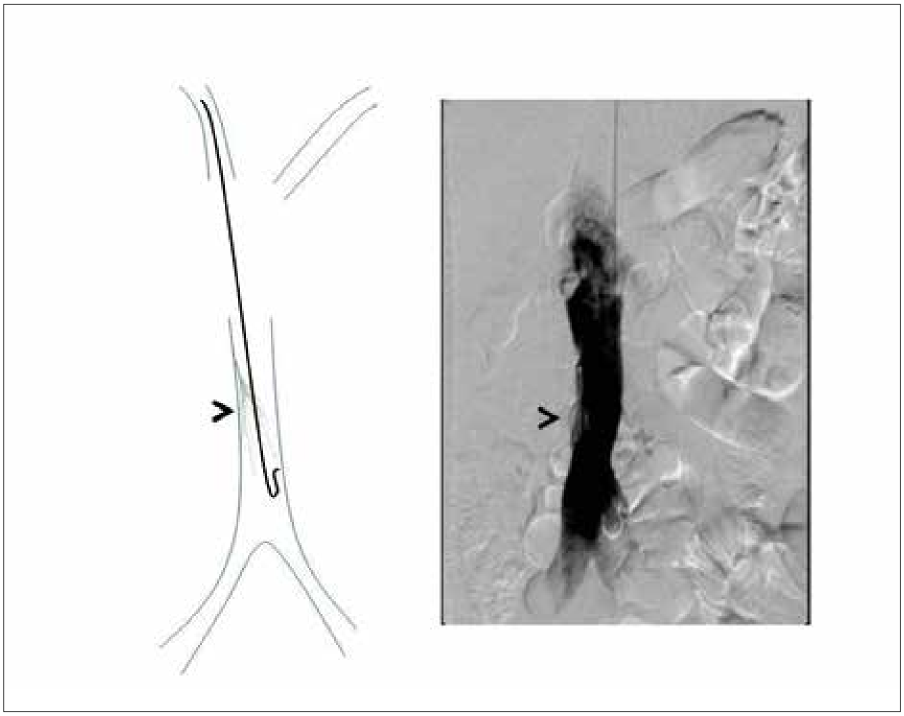

Figure 1. Anteroposterior fluoroscopic image with corresponding schematic diagram showing an inferior vena cava filter with a right-sided tilt *(arrowheads)* and contrast injection, confirming an intravascular position.

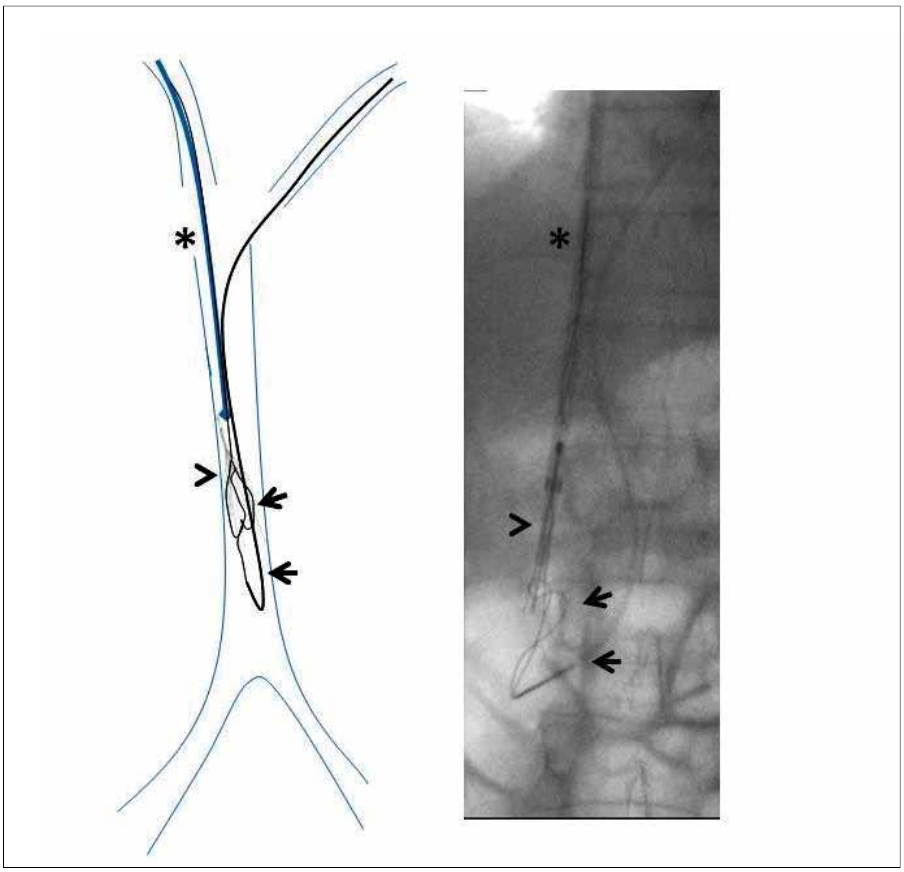

Figure 2. Fluoroscopic image with corresponding schematic diagram showing a partially collapsed and sheathed filter *(arrowheads)* with distal struts exposed. Note the vascular sheath in the right internal jugular vein *(asterisks)*, 5 F Rösch interior mesenteric catheter, and Amplatz gooseneck snare placed via the left internal jugular vein *(arrows)*.

loop-and-snare single access technique (Sling technique). Unfortunately, the filter apex could not be displaced.

The orientation of the tilted filter apex suggested greater advantage in displacing it using additional access via the left IJV. After securing access in the left IJV with a 6 F×5.5 cm introducer sheath (Avanti+Sheath Introducer, Cordis Europe, Waterloo, Belgium), a 5 F RIM catheter and 0.035-inch hydrophilic guidewire (Terumo UK) combination via the left IJV access and the Günther Tulip retrieval snare from the right IJV were successful in displacing the tilted filter apex from the IVC wall using a wire loop-and-snare technique (Sling technique) (Fig. 2). However, after snaring the filter apex, attempts to sheath the filter through the 11 F retrieval sheath failed due to the inability to collapse the distal filter struts completely. Repeat vena cavography revealed significant tenting of the caval walls suggesting endothelialization of the filter struts, which were successfully released with repeated intermittent caudal traction with the retrieval sheath. The filter, despite now lying freely within the caval lumen, remained incompletely collapsed and could not be sheathed. An attempt to remove the partially collapsed filter via the right IJV was not undertaken due to the potential for vascular trauma. An attempt to further collapse the filter struts using a 25 mm eV3 Amplatz GooseNeck snare (eV3 Europe, Paris, France) to assist in completely sheathing the filter was unsuccessful and, unfortunately, the snare became entangled on the struts.

Therefore, access into the right CFV was secured with an 18 F vascular sheath (William Cook Europe) to attempt retrieval of the filter and entangled snares via the CFV. Another 25 mm GooseNeck Snare was then used to snare the distal filter struts via this access and guide the filter into the 18 F sheath (Fig. 3). The IVC filter, including the entangled Günther Tulip retrieval snare in the filter apex and the Amplatz GooseNeck snare on the filter struts, were pulled into the 18 F sheath. The completely retrieved filter and entangled snares that were released from their respective IJV access were pulled in the 18 F sheath up to the right CFV, and the sheath containing the filter

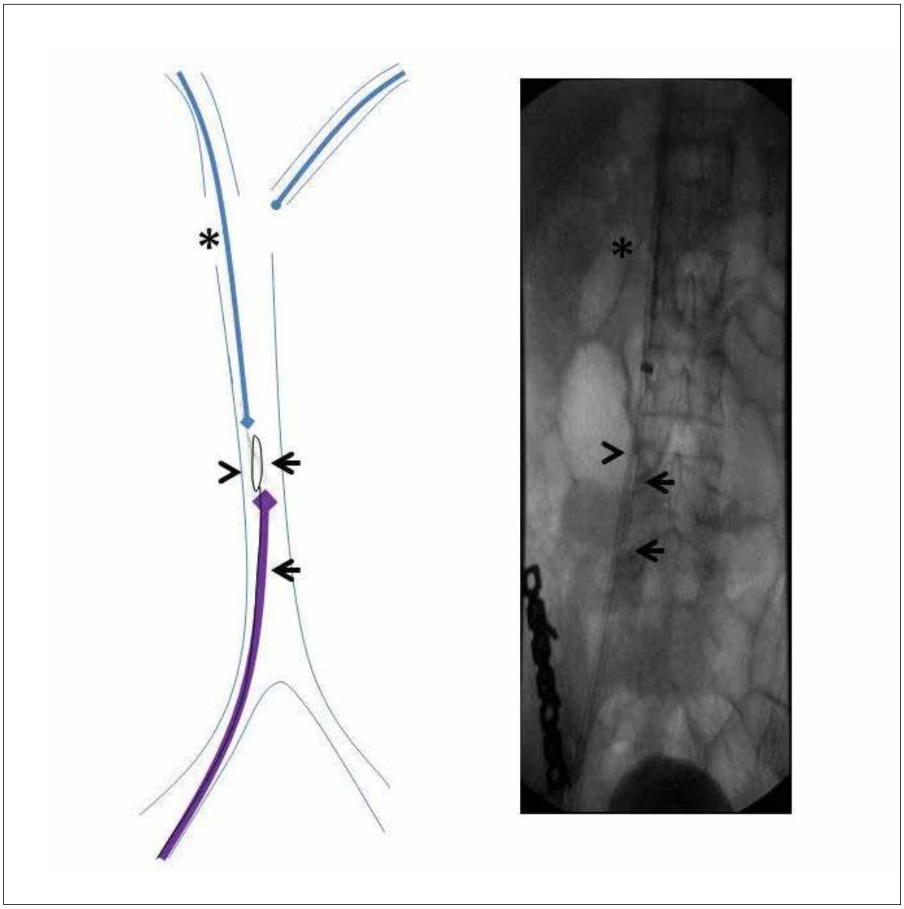

Figure 3. Fluoroscopic image with corresponding schematic diagram demonstrating an 18 F vascular sheath and gooseneck snare *(arrows)* via the right common femoral vein ensnaring the filter (*arrowheads*). The filter lies partially collapsed within the vascular sheath inserted via the right internal jugular vein *(asterisks)*.

Figure 4. The removed filter via the right common femoral vein shows significant endothelial tissue on the filter struts that prevented complete distal collapse and removal via the internal jugular veins.

was partially removed from the right CFV. The 18 F sheath was clamped at the right common femoral vein dermatotomy to ensure hemostasis, and the proximal end containing the filter was cut to reveal the partially collapsed filter and snare wires. The latter step was performed to allow direct visualization and ensure good control of the snares because they were removed with the 18 F sheath (Fig. 4). Further vena cavography revealed no evidence of caval injury. The patient displayed no immediate post procedure complications and had an uneventful recovery.

Discussion

Several publications have described nonstandard filter retrieval techniques, including the wire loop-and-snare and cone-over-guidewire techniques (4, 5). Modifications of both these techniques were employed in our case. The long period of the filter indwelling time (468 days) resulted in considerable endothelialization of both the filter apex and struts such that, after they were freed from the caval wall, they prevented complete distal filter collapse due to excessive endothelial tissue on the struts (Fig. 4), thereby precluding safe removal of the filter via the initial right IJV access. Additionally, caudal access was required via the right CFV, allowing the snaring of the partially collapsed filter struts and guidance into a large-caliber vascular sheath. The latter condition was particularly important because the Günther Tulip retrieval snare was entangled in the endothelial tissue in the filter apex via the right IJV access, and the Amplatz GooseNeck snare was entangled in the endothelial tissue in the filter struts via the left IJV access. Additional caudal venous access via the CFV should be considered whenever a freed but non-collapsible IVC filter needs to be removed. We acknowledge that single IJV access should be sufficient in most cases; however, the filter apex could not be displaced in our case but was successfully removed using dual IJV access given the orientation of the tilted filter apex.

In conclusion, we believe that our described approach may be beneficial for long indwelling filters where endothelialized tissue on the filter struts prevents complete distal filter collapse, precluding safe jugular removal. Many previous reports have demonstrated successful Günther Tulip filter retrieval outside the recommended temporal guidelines (6, 7), with one case of filter retrieval up to 3006 days postinsertion (8), although the rate of successful retrieval decreases with increased indwelling time (6), and nonstandard techniques may be required.

Conflict of interest disclosure

The authors declared no conflicts of interest.

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