

Complex Hybrid Suprarenal Inferior Vena Cava Filter Retrieval

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The exponential rise in inferior vena cava (IVC) filter placement is associated with increased complications both during implantation and retrieval. In this report, a 64-year-old man was transferred from an outside hospital with cardiac tamponade secondary to a snare eroding into the right atrium. This complication occurred after attempted suprarenal IVC filter removal. The filter, entangled with the snare, was retrieved by a hybrid technique of mobilizing the liver to expose the suprarenal IVC, followed by using a snare and sheath to compress and extrude the filter. This is the first reported hybrid retrieval of a suprarenal IVC filter.

The implantation of inferior vena cava (IVC) filters for venous thromboembolism protection in patients with contraindications to anticoagulation has continued to rise, particularly with the development of retrievable filters. Approximately 260,000 IVC filters are placed annually; however, the retrieval rate is only 34% because of poor strategies for follow-up and lack of patient communication.¹ Improper filter deployment and implantation increases incidence of filter tilt, penetration into the IVC wall, and large thrombus burden, which further increases the overall retrieval failure rate.¹ Filters are currently approved for infrarenal placement with few indications for the suprarenal positioning. Indications include anatomic variations that prevent infrarenal placement, IVC compression, pregnancy, duplicated IVC, or thrombus in the IVC gonadal or renal veins.^{2–5} We report the first hybrid retrieval of a

suprarenal IVC filter in a patient with cardiac tamponade secondary to a retained snare and filter eroding into the right atrium.

CASE REPORT

A 64-year-old man was transferred from an outside hospital secondary to a foreign body eroding into the right atrium. Before his arrival, he had a history of 2 pulmonary embolisms (PEs). The first was followed by 8 months of anticoagulation therapy. Shortly after completion of therapy, he experienced another PE and was found to have protein C and S deficiency. It was decided at this time to place an IVC filter. His first IVC filter failed to deploy appropriately; thus, a second filter was placed in the suprarenal position. The suprarenal filter also failed to deploy properly. Percutaneous retrieval was attempted but unsuccessful, with a part of the retrieval device becoming entangled within the suprarenal filter. Both filters and part of the retrieval snare remained in the patient at discharge, and he was sent home on therapeutic anticoagulation. One year later, the patient started experiencing increased fatigue. Radiographic evaluation demonstrated a pericardial effusion and a suprarenal IVC strut with the retrieval device penetrating through the IVC into the right atrium (Fig. 1). The patient was transferred to our institution for extraction and possible surgical repair.

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Fig. 1. Axial image showing proximal IVC filter penetrating the right atrium and pericardial effusion.

In the operating room, a percutaneous attempt from the right internal jugular vein successfully retrieved the infrarenal IVC filter; however, the suprarenal filter remained within the IVC because of the excessive tilt (Fig. 2). The tip of the filter was through the wall of the IVC and could not be manipulated to a position parallel within the IVC. After multiple maneuvers and instrumentation to straighten the filter, which included snare retrieval, cone retrieval, endobronchial forceps, and balloon angioplasty to deflect the filter off the wall, it was determined that the filter could not be removed percutaneously.

An exploratory laparotomy was performed for open transcaval removal of the suprarenal IVC filter. A Kocher maneuver, followed by mobilization of the right hepatic lobe, was completed to isolate both the infrarenal and suprarenal IVC (Fig. 3). In addition, all branches, including the hepatic veins, the renal veins, and porta hepatis, were identified and isolated to occlude blood flow. A cavotomy with open retrieval was attempted but unsuccessful due to extensive bleeding despite having proximal and distal vascular control. After extensive dissection of the cava, the hook of the filter was identified outside of the IVC. It was then determined that a hybrid approach could be performed. First, all the filter legs that were penetrating through the IVC were cut off. Next, a snare wire was attached to the visualized hook and tightened. A 14-French sheath was then placed over the snare and the filter. As the snare wire was pulled, this allowed the filter to enter the sheath and collapse until it was completely extracted from the cava. Little manipulation or force was necessary to collapse and withdraw the filter. Once the filter was removed, the IVC was repaired with 5-0 pledgeted prolene suture in an interrupted

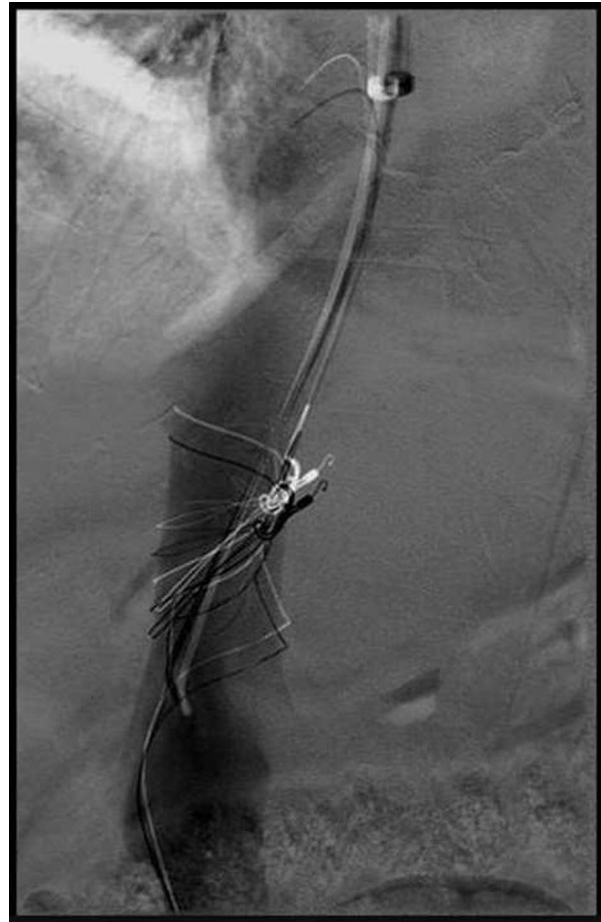


Fig. 2. Venography showing both filters and the retrieval wire and the extent of filter tilt.

fashion. Cardiothoracic surgery was consulted intraoperatively to evaluate the cardiac tamponade. After removal of the foreign body from the pericardium and suction of the free fluid, there did not appear to be any damage to the heart or reaccumulation of the fluid. Therefore, the pericardium was primarily repaired and no further intervention was necessary. The patient tolerated with the procedure well and did not experience any postoperative complications and no evidence of IVC thrombosis or deep venous thrombosis on ultrasound.

DISCUSSION

We report the management of a 64-year-old man who experienced complications secondary to suprarenal IVC placement and failed percutaneous retrieval and who required a novel hybrid approach for filter removal. Although studies evaluating suprarenal filters have largely supported their safety and efficacy, the complications of migration remain a concern.⁶⁻⁸ Proximity to cardiac pulsations and

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