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Case Report

Uncomplicated percutaneous IVC filter removal following implantation time of 6033 days ☆,☆☆

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ABSTRACT

Pulmonary embolism (PE) is a major cause of morbidity and mortality in the United States and usually occurs secondary to venous thromboembolism. Inferior vena cava (IVC) filters are minimally invasive intravascular devices placed in patients who are at increased risk for venous thromboembolism leading to PE, however, has a contraindication to medical anticoagulation therapy. The longest reported case of a retrievable IVC filter has remained in place and successfully removed in a living patient has been 4753 days (13 years). We present a case of an uneventful, successful IVC removal with a dwell time of 6033 days (16 years).

Introduction

Pulmonary embolism (PE) is a major cause of morbidity and mortality in the United States and usually occur secondary to venous thromboembolism (VTE) [1]. The current standard of treatment for VTE leading to PE is medical anticoagulation therapy [2]. However, certain patients at risk for ultimately developing PE either do not respond to anticoagulation therapy, or, have contraindications to anticoagulation (eg, recent hemorrhage, recent surgery). Inferior vena cava (IVC) filters are minimally invasive intravascular devices placed in patients who are at increased risk for VTE leading to PE, however, have a contraindication to medical anticoagulation therapy [3]. Because IVC filters have the potential to remain within the body over extended periods of time, complications can occur, such as caval wall perforation, migration, filter fracture, and IVC stenosis [4]. These complications have stressed recent emphasis of IVC filter removal, especially when the filter is no longer indicated [5]. However, the very complications associated with longer filter dwell times give many providers pause as it relates to removal, despite several advanced techniques for filter removal published in the literature [6-8].

To the knowledge of these authors, the longest retrievable IVC filter has remained in place in a living patient has been 4753 days (13 years) [9]. We present a case of an uneventful, successful IVC removal with a dwell time of 6033 days (16 years).

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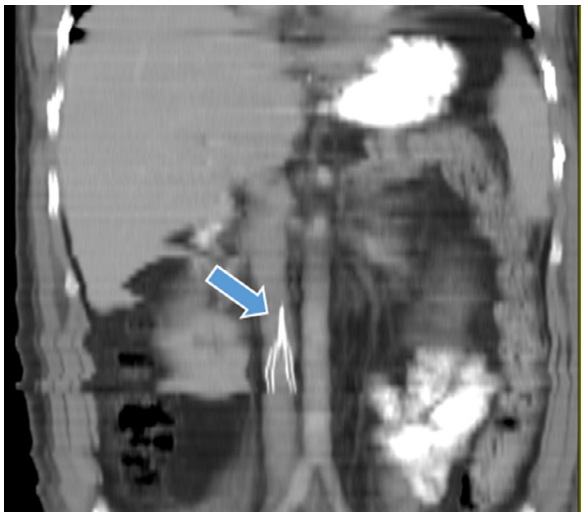

Fig. 1 – Reformatted average-intensity-projection contrast-enhanced CT image of the abdomen in the coronal plane demonstrating successful placement of a Gunther-Tulip IVC filter in the infrarenal vena cava in 2003.

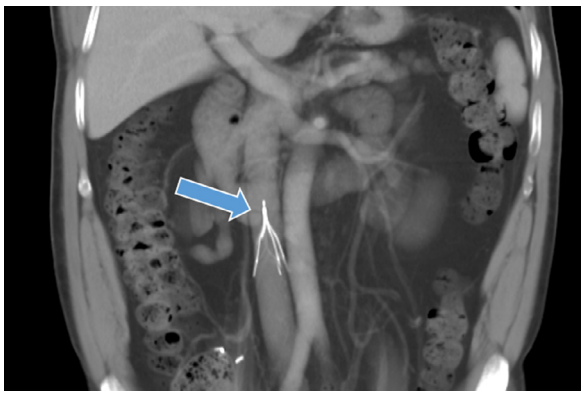

Fig. 2A – Reformatted average-intensity-projection contrast-enhanced CT image of the abdomen in the coronal plane from 2018 demonstrating the grossly stable positioning of the IVC filter with no evidence of filter thrombus.

Case report

A 38-year-old man with a past medical history a hypothyroidism presented from an outside hospital in 2003 as a red trauma following a snowmobile accident. The patient was helmeted when he collided head-on with another snowmobile. The patient suffered subdural and epidural hematomas, a cardiac contusion with magnetic resonance imaging evidence of tear and tamponade, lung contusions, a grade IV splenic laceration, bilateral grade II renal lacerations, and multiple comminuted fractures to his left scapula, left wrist, and multiple ribs. Neurosurgery recommended conservative management with close clinical follow-up given the size and location of the hematomas. The patient was taken to interventional

Fig. 2B – Single-slice axial contrast-enhanced CT image of the abdomen at the level of the inferior mesenteric artery origin demonstrating perforation of the 4 inferior tynes through the caval wall. No involvement of the vital adjacent structures by the tynes is seen.

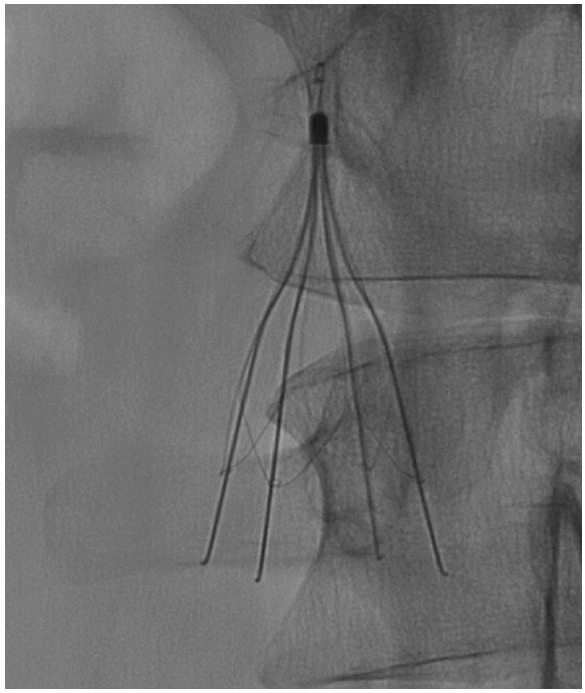

Fig. 3 – Initial fluoroscopic scout imagaing during filter retrieval demonstrating an intact filter.

radiology (IR) where he underwent successful splenic artery embolization. Given the setting of trauma with an expected protraction of his nonmobile state, a Gunther-Tulip Vena Cava Filter (Cook Medical Corporation—Bloomington, IN) was also placed for PE prophylaxis (Fig. 1).

The patient ultimately made a full recovery and experienced no interval major medical misadventures. Unfortunately, the patient was lost to follow-up—he temporarily moved to another state—and his IVC filter was not removed following recovery from initial injuries.

Fig. 4 – Initial fluoroscopic cavogram demonstrating no evidence of filter thrombus. Note the aforementioned perforation by the inferior tynes.

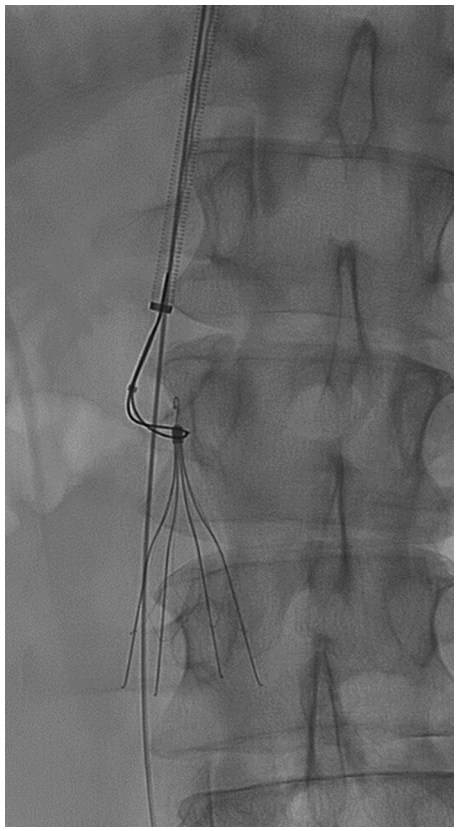

Fig. 5 – Fluoroscopic imaging demonstrating the snare device engaging the IVC filter by its retrievable hook.

Sixteen years later, now age 55, the patient returned to our IR clinic expressing the desire to have the filter removed. He explained that after hearing several radio and television advertisements about the risks of IVC filters, he no longer wished to have one in place. The patient was counseled regarding the risk of removal of IVC filters with long dwell times, as mentioned in the introduction. The interventional radiologist ultimately made the decision to remove the IVC filter.

Preprocedure computed tomography imaging demonstrated perforation of the 4 inferior tynes through the IVC wall by a maximum of 1.1 cm. There was no additional involvement of the perforated tynes with any adjacent structure, nor was there evidence of filter thrombus, tilt, migration, or fracture (Figs. 2A and 2B).

Informed consent was obtained following the explanation of the risks and benefits of the procedure and of conscious sedation. The patient was taken to the IR suite and placed in the supine position. Conscious sedation was achieved with a total of 150 mcg of intravenous fentanyl and 3.5 mg of intravenous midazolam. Local anesthesia was achieved with 1% buffered lidocaine. Initial scout images of the IVC filter demonstrated an intact filter (Fig. 3). Via a right jugular vein approach, the IVC was accessed and a flush catheter was advanced down into the IVC. An initial cavogram demonstrated no evidence of IVC thrombus (Fig. 4). Through a 10-French sheath, a snaring device was used to engage the hook of the IVC filter (Fig. 5). The sheath was easily advanced over the IVC filter, collapsing it (Fig. 6). The filter was pulled completely into the sheath and all devices and equipment were removed from the patient. A final cavogram demonstrated and intact IVC with no evidence of contrast extravasation (Fig. 7). The patient tolerated the procedure well and without procedure-related complication. At 7-month follow-up, the patient continued to endorse no ill effects from the procedure and remained in his usual state of health.

Discussion

This case demonstrates the prospect of uneventful IVC filter removal for filters that have been in place for an extended period of time. A more challenging retrieval was anticipated due to suspected ingrowth of the IVC filter into the IVC wall secondary to endothelialization from a long dwell time, however, the IVC filter was removed effortlessly. This is not to say endothelialization did not occur, but that rather, if it did, it did not present an issue with this retrieval. This case also demonstrates that long dwell times do not automatically forestall the ability for simple and safe removal.

At this time and with the limitations of a single case report, we cannot fully identify and assess factors that allowed for an easy retrieval. However, it is important to note the filter

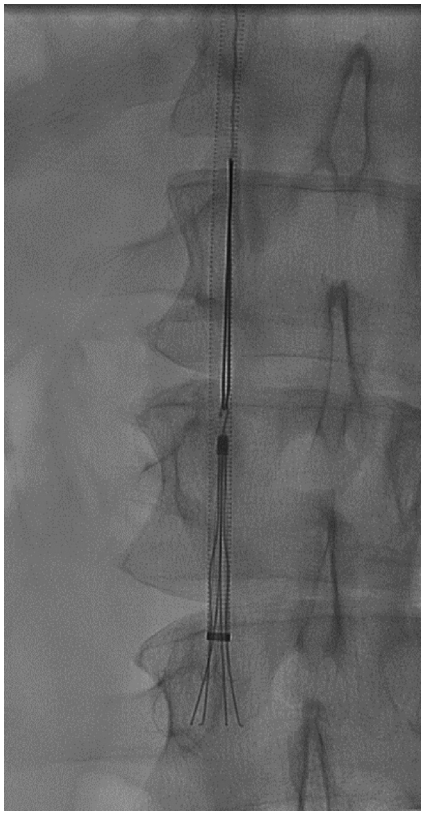

Fig. 6 – Successful advancement of the 10-French sheath over the IVC filter, collapsing it into the sheath.

Fig. 7 – Final fluoroscopic cavogram demonstrating and intact IVC with no evidence of contrast extravasation.

type in this case—a Gunther-Tulip—does play a pivotal role in retrieval, and of the popular filters in use at the author's institution, the Gunther-Tulip tends to be one of the easier ones to remove. On the other hand, other IVC filters can prove to be much more challenging to safely remove if left in place for similar periods of time based on many factors, including their design. Another important factor aiding to assess ease or possibility of retrieval was proper evaluation of the IVC filter and patient's anatomy with preprocedure imaging. Though this cannot demonstrate caval wall in-growth, it can provide other vital information, such as filter rotation or perforation of adjacent vital structures (eg, the aorta).

This is only a single case study and clearly cannot be assumed to represent the majority of cases with IVC filter in place for a long time. However, combining that easy retrieval in this case and the many advanced techniques for removal in the literature establishes the possibility for expeditious and uneventful retrieval. These encouraging findings point to the need of more studies regarding removal of longstanding IVC filters in an effort to continue improving on long-term management of these devices.

Ethical Approval

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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