

## Inferior Vena Cava Filter Removal – Hope for the Best and Prepare for the Worst: An Anesthesiology Perspective

### Abstract

A patient presented to our institution for an elective removal of an inferior vena cava (IVC) filter under local anesthesia. Once removed, it was noticed that the filter had a missing secondary leg. The patient had a chest CT done which showed a hyper-attenuating structure in the region of the tricuspid valve highly suspicious for the fractured strut of the filter. Upon these findings, the patient was taken once again to the surgical suite for an endovascular retrieval of the strut. For fear of a possible cardiac injury and a potential need for a sternotomy, the patient received general anesthesia and was placed with appropriate IV access and full cardiac monitors. The strut was removed successfully without any complications. Despite the relative benign nature of this endovascular procedure, one should always be prepared for an appropriate resuscitation in case of an occurrence of a surgical complication.

**Keywords:** Endovascular retrieval, inferior vena cava filter, strut

### Introduction

Inferior vena cava (IVC) filters are commonly used in patients who suffer from recurrent venous thromboembolism and who also have contraindications to anticoagulation. IVC filters are not free of side effects and can present with possible complications, such as thrombus formation, infection, fracture, and migration. We present a case of a fractured IVC filter strut that was embolized to the tricuspid valve and the subsequent management of this complication.

### Case Report

This case is about a 65-year-old female patient who developed bilateral lower extremity deep venous thrombosis (DVT). She had a medical history of right intradural internal carotid artery (ICA) aneurysm, status poststent-assisted flow diversion, and coil embolization. Anticoagulation was contraindicated due to recent coil embolization of the right ICA. An IVC filter was placed to protect the patient from pulmonary embolism. Ten months after the IVC filter placement, the patient had a complete resolution of lower extremity DVT, confirmed by ultrasound. She presented to our institution for elective

removal of the IVC filter. The procedure was performed in the angiography suite under local anesthesia. Under fluoroscopic guidance, the IVC filter cap was dissected from the IVC wall, grasped, and then removed through a sheath. A cavagram was performed, and no complications were noted, showing patency of iliac veins and the IVC. However, on examining the filter, one of the secondary legs was missing, likely representing a fracture. The patient was evaluated at multiple sites with fluoroscopy to look for the retained foreign object. The procedural field was also inspected exhaustively. However, the missing piece was nowhere to be found. The patient remained hemodynamically stable through the entire case. At this point, the procedure was concluded, and the patient was sent to obtain computed tomography (CT) scan of the chest, abdomen, and pelvis to look for the retained IVC filter leg.

The imaging of the CT abdomen and pelvis was unremarkable. Chest CT scan revealed an ill-defined hyper-attenuating structure in the region of the tricuspid valve [Figure 1]. This was highly suspicious for the fractured strut of the IVC filter. Two-dimensional transthoracic echocardiography was obtained, which showed no changes compared to prior studies in the past.

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**How to cite this article:** Poliwoda S, Suthar R, Suraci N, Garcia P, Behrens V, Goldman H. Inferior vena cava filter removal – hope for the best and prepare for the worst: An anesthesiology perspective. *Ann Card Anaesth* 2019;22:337-9.

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### Access this article online

**Website:** www.annals.in

**DOI:** 10.4103/aca.ACA\_159\_18

### Quick Response Code:



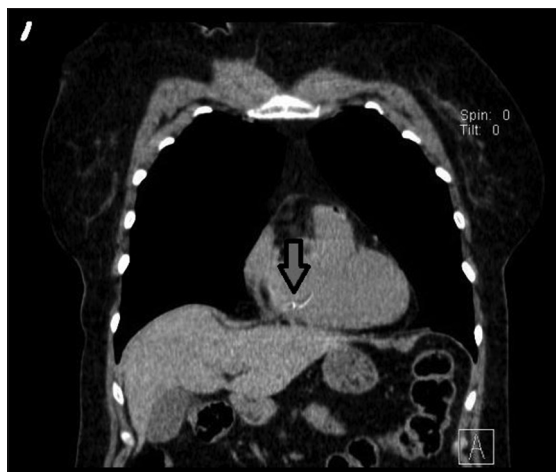


Figure 1: Chest CT showing IVC filter strut on tricuspid valve (red arrow)

The decision was made to retrieve the IVC filter strut under fluoroscopic guidance. Because of the possibility of tricuspid valve/heart injury and the need for sternotomy, general anesthesia was planned. Two large bore peripheral IVs (18G on each hand) were placed. Preinduction arterial line was placed in the left radial artery. The Standard American Society of Anesthesiologists monitors with five-lead electrocardiography were used throughout the procedure. After IV induction of anesthesia, the trachea was intubated with a 7.0 endotracheal tube, and a transesophageal echocardiograph (TEE) probe was inserted into the esophagus to assess cardiac integrity during the procedure. The interventional radiologist accessed the right common femoral vein and carefully advanced the guide catheter into the right atrium. After appropriate maneuvering, the filter fragment was snared and slowly pulled out of the heart. TEE study during and after procedure did not show any cardiac complications. It only revealed mild tricuspid regurgitation that was unchanged and already present from before as evidenced by prior echocardiographic studies. The fragment was secured and sent to pathology [Figure 2]. A completion cavagram was obtained. No complications were noted, the sheath was removed from the puncture site, and manual compression was held until hemostasis was achieved. The patient remained hemodynamically stable throughout the procedure. She was extubated successfully at the conclusion of the case and transferred to post anesthesia care unit where she remained. She was subsequently admitted to regular floor for overnight observation and was discharged home on the postoperative day 1 in stable condition.

## Discussion

Approximately 300,000 people suffer from pulmonary embolism each year in the United States.<sup>[1]</sup> Treatment and prophylaxis for this are usually managed with anticoagulation. However, in the presence of contraindications

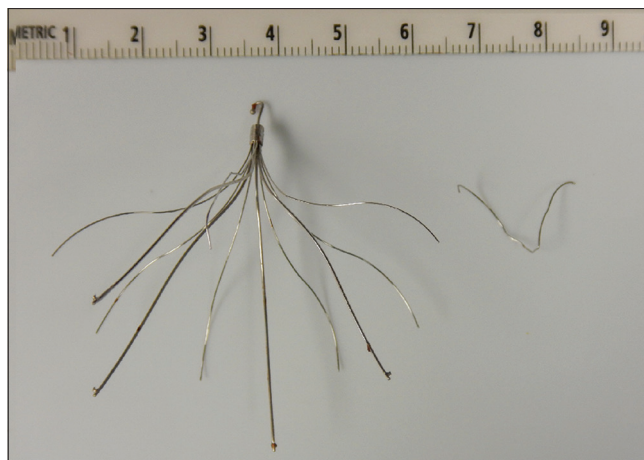


Figure 2: Extracted IVC filter and strut

to anticoagulation, an alternative is to use IVC filters. Although IVC filters are usually beneficial, they also present complications such as thrombosis (<10%), bleeding (15%), migration (1%), fracture (1%), and many others.<sup>[1]</sup>

Fractures are more commonly seen in the retrievable IVC filters as opposed to permanent filters, especially when the former ones are left for long periods of time.<sup>[1]</sup> When this occurs, there is the potential complication of embolization of the fractured fragment. There have been reports where these fractures were later found to the renal veins, heart, and pulmonary vasculature.<sup>[2-4]</sup> Patients with these complications can be asymptomatic or present with a variety of symptoms. In a case report by Shennib *et al.*, a 23-year-old patient with a history of IVC filter presented with chest pain and tachycardia. The patient was found to have a fractured IVC strut which migrated to the right ventricle and caused a pericardial effusion.<sup>[5]</sup>

Careful inspection of the IVC filter after retrieval was the key to the diagnosis of the embolized strut. It is of prime importance that when a retrieved IVC filter is not complete, a thorough inspection of the surgical field as well as the vascular system through imaging should be performed to find the missing piece. CT scans appear to be the most suitable modality to visualize these fragments within the chest.<sup>[5]</sup> Fortunately, our patient was asymptomatic and hemodynamically stable.

There are not many studies addressing a standard approach for this type of complication. Some cases describe open surgical extraction.<sup>[5]</sup> Other cases were seen where the decision was to leave the fragment where it was found, especially if the patient was asymptomatic. Another treatment approach is the endovascular extraction which was used in the present case. One study showed successful endovascular retrieval in 19 of 24 patients, leaving the rest to open extraction and conservative management.<sup>[6]</sup>

## Conclusion

From an anesthesiology standpoint, it is very important to be prepared for the possible complications of endovascular retrieval. In our case, the patient underwent general anesthesia with appropriate venous access and monitoring to facilitate appropriate resuscitation in case of a surgical complication.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Acknowledgements

We would like to thank Dr. Howard Wittels, our program chief, and Dr. Gerald Rosen, our program director, for their constant support. We would also like to thank from our pathology department, Dr. Robert Poppiti and Dr. Pukhraz Basra for the images of the IVC filter and strut.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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