

Heart block and cardiac embolization of fractured inferior vena cava filter

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Abstract

Objective: A 66-year-old man underwent a placement of an inferior vena cava filter before a gastric surgery 9 years prior, presented to the emergency room with a complete atrioventricular block. Chest x-ray and transthoracic echocardiogram showed struts migrating to right ventricle with tricuspid regurgitation. Cardiothoracic surgery was consulted and declined an open surgical intervention due to the location of the embolized fragments and the patient's overall condition. It was also felt that the fragments had migrated chronically and were adhered to the cardiac structures.

Methods: The patient underwent a dual-chamber permanent pacemaker implantation. Post-implant fluoroscopy showed no displacement of the inferior vena cava filter struts due to the pacemaker leads indicating that the filter fracture had likely been a chronic process.

Results: This case highlights a rare combination of complications related to inferior vena cava filter fractures and the importance of assessing for such fractures in chronic placements. Inferior vena cava filter placement for a duration greater than 1 month can be associated with filter fractures and strut migration which may lead to, although rare, serious or fatal complications such as complete atrioventricular conduction system disruption and valvular damage including significant tricuspid regurgitation.

Conclusions: Assessing for inferior vena cava filter fractures in chronic filter placement is important to avoid such complications. When possible, retrieval of the filter should be considered in all patients outside the acute setting in order to avoid filter-related complications. Filter retrieval rates remain low even when a retrievable filter is in place and the patient no longer has a contraindication to anticoagulation.

Keywords

Inferior vena cava filters, inferior vena cava filter complications, inferior vena cava filter fracture, heart block

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Introduction

Inferior vena cava (IVC) filters have been widely used to prevent pulmonary emboli in patients with venous thromboembolism but who have a contraindication to anticoagulation. Complications associated with IVC filter placement include erosion of the IVC, filter migration, and symptomatic IVC obstruction. Migration to the right side of the heart and beyond has been reported at varying times after implant.^{1,2} Complete heart block due to filter struts migration to the right side of the heart, however, has not been reported. We report the first case of complete heart block with tricuspid regurgitation due to fracture and embolization of an IVC filter.

Case

A frail 66-year-old morbidly obese man presented to the emergency room with acute onset dyspnea. He was found to be in complete atrioventricular block and a wide complex

escape rhythm. The patient had hypertension, type 2 diabetes, stage 3 chronic kidney failure, and chronic edema. He also had an IVC filter placed prior to gastric surgery in 2001 due to a pulmonary embolus. Cardiac enzymes were found to be normal as were basic labs except for chronic mild anemia and elevated creatinin kinase.

Chest x-ray revealed an atypical pattern of linear densities extending from the spine to the left chest (Figure 1).

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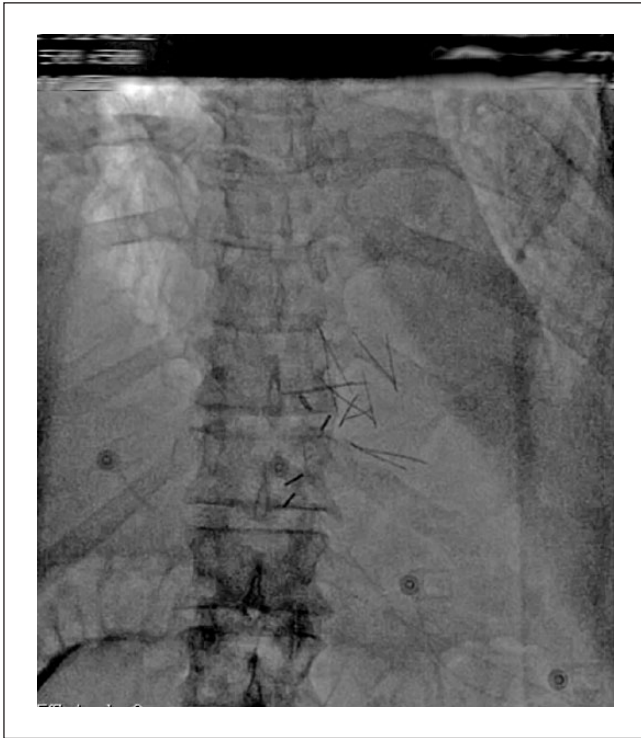


Figure 1. Initial chest x-ray image of the chest.

A transthoracic echocardiogram demonstrated echodense material present in the right ventricle (RV) and tricuspid regurgitation (Figure 2). Cardiothoracic surgery was consulted, and after reviewing the findings and discussions with the patient, it was felt that the patient's frail condition, the chronicity of the embolized struts, and their location within the heart represented an elevated risk for open surgical extraction. The decision was made to implant a dual-chamber permanent pacemaker to address the complete heart block. At the time of the pacemaker implant, the filter fragments were noted, some moving with the cardiac silhouette. The RV lead was advanced with difficulty due to significant tricuspid valve regurgitation. The atrial lead was placed without issue.

Discussion and conclusion

The initial x-ray fluoroscopy and transthoracic echocardiogram are shown in Figures 1 and 2. Prior to pacemaker implantation, a cine image of the filter revealed IVC filter fracture with embolization of all struts to the heart (Figure 3(a)). We believe that the embolized filter fragments had migrated chronically into the tricuspid valve and the right atrium. A multidisciplinary discussion with the patient reached the consensus that an open extraction of the fragments represented too high a risk and the patient elected for the pacemaker implant only. Unfortunately, there is no way of knowing that the fragments will not migrate further and

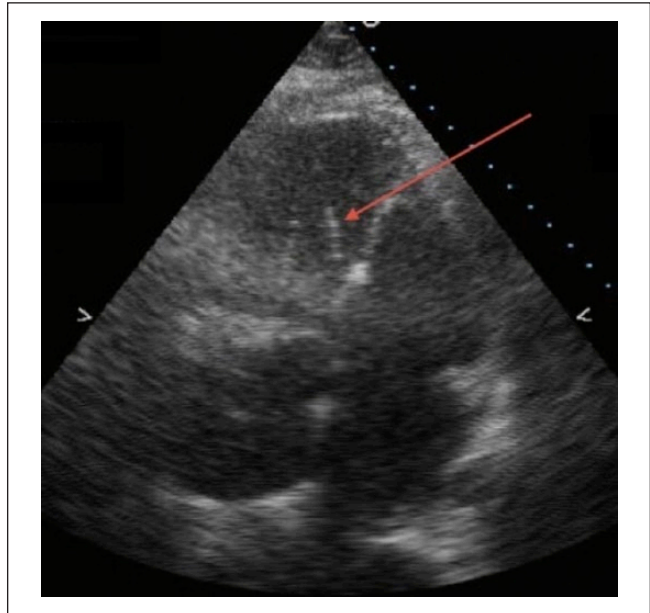


Figure 2. Echocardiogram image showing dense material at the tricuspid valve leaflets (red arrow).

cause further injury. There was clear impingement of the struts on the anterior and posterior aspects of the tricuspid valve extending into the RV. The IVC filter struts did not move during or after the device lead implants as observed on fluoroscopy (Figure 3(b)).

The embolized struts damaged this patient's tricuspid valve and his conduction system leading to complete atrioventricular block and the aforementioned valve dysfunction. The rates of filter retrieval remain low even in patients who no longer have an indication for the filter or contraindication to anticoagulation.³

After receiving reports of adverse events related to the IVC filters, the Food and Drug Administration (FDA) released a safety communication update in 2014. The recommendation is that "... implanting physicians and clinicians responsible for the ongoing care of patients with retrievable IVC filters consider removing the filter as soon as protection from pulmonary embolism is no longer needed." The FDA is concerned that retrievable IVC filters are not always removed once the risk of pulmonary emboli subsides allowing for the possibility of device complications. In order to facilitate the decision-making process for dealing with these devices, the agency developed a quantitative decision analysis published in the *Journal of Vascular Surgery*, October 2013.⁴ In the analysis, the risk/benefit profile favors removal of the filter between 29 and 54 days after implant once the transient risk for pulmonary embolism has passed. This case illustrates the importance of removing IVC filters promptly when appropriate and assessing for filter strut fractures and embolization or before performing an extensive right heart procedure.⁵

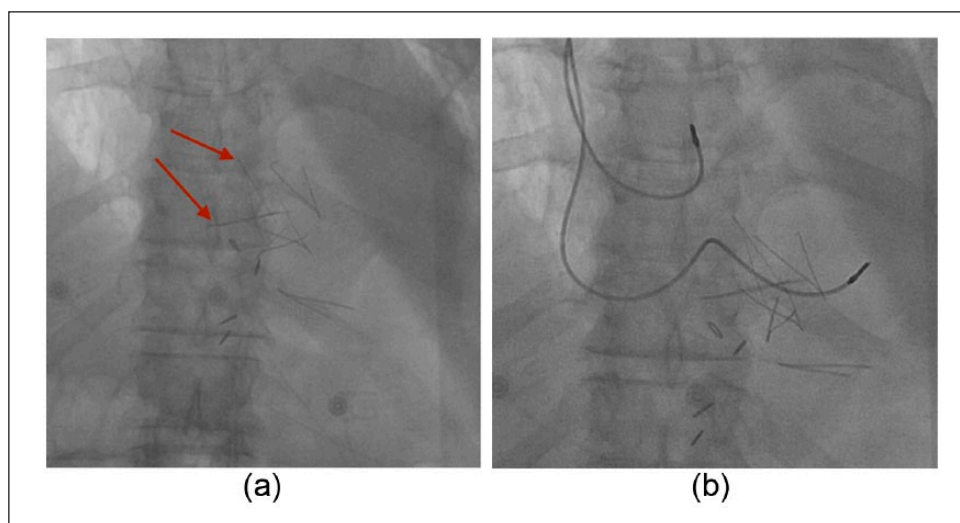


Figure 3. (a) Fractured and immobilized IVC filter struts in the right side of the heart and across the tricuspid valve and (b) post-pacemaker implant image showing no change to the filter strut position.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

Written informed consent was obtained from the patient for his anonymized information to be published in this article.

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