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Ultrasound in Emergency Medicine

INFERIOR VENA CAVA FILTER LIMB FRACTURE WITH EMBOLIZATION TO THE RIGHT VENTRICLE

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Abstract—Background: Inferior vena cava (IVC) filter and filter limb embolization is a known phenomenon, with a prevalence of up to 25% for certain filter types. Most commonly, the site of embolization is to the heart. Point-of-care ultrasound is an easily accessible imaging modality that should be utilized when considering IVC filter complications. **Case Report:** A 28-year-old woman with a history of metastatic sarcoma and IVC filter placement for deep venous thrombosis presented to the Emergency Department (ED) for chest pain. Chest radiography was reviewed and originally thought to have no abnormalities. Chest computed tomography angiography was negative for filling defects or foreign bodies. A possible foreign body in the heart was noted by a radiologist's over-read of the original chest radiograph. An echocardiogram done by Cardiology was negative for foreign bodies or other abnormalities. Next, an emergency physician performed a bedside echocardiogram, with focused attention to the right side of the heart. An echogenic foreign body was visualized in the right ventricle. The patient was subsequently taken to the cardiac catheterization laboratory, where fluoroscopic visualization of a limb wire of an IVC filter within the right ventricle was obtained. That foreign body was subsequently removed successfully, along with removal of the broken IVC filter. **Why Should an Emergency Physician Be Aware of This?:** This case report highlights the utility of point-of-care ultrasound

in the work-up of a patient with an embolized IVC filter wire. Chest pain patients frequently receive point-of-care echocardiography in the ED, and these ultrasound findings should be recognized and used to guide further treatment and consultation. © 2017 Elsevier Inc. All rights reserved.

Keywords—point-of-care ultrasound; ultrasound; PO-CUS; echocardiography; IVC filter fracture; inferior vena cava filter; embolization

INTRODUCTION

There has been a 25-fold increase in inferior vena cava (IVC) filter placement from 1979 to 1999 in the United States, with an estimated 167,000 filters placed in 2007 (1). In a communication released in 2010, the Food and Drug Administration noted receiving more than 900 reports over the prior 5 years of adverse events associated with IVC filters, including filter perforation, device migration, filter fracture, and filter embolization (2). One legal Web site listed IVC filters among the top five current mass tort cases for plaintiff lawyers to pursue (3). Recently, the PRESERVE Trial, a multi-center nonrandomized open-label study, was initiated to determine the safety and effectiveness of commercially available IVC (2). Until more information is obtained from this study, IVC filters continue to be used in patients with contraindications to, or failure of, anticoagulation therapy. This then raises the question: In a patient with a known IVC filter, what sensible

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strategies could be employed to properly identify a suspected complication?

CASE REPORT

A 28-year-old woman with a history of metastatic soft tissue sarcoma currently undergoing chemotherapy, and a history of deep venous thrombosis status post-IVC filter placement presented to the Emergency Department (ED) complaining of chest pain and mild shortness of breath. The patient reported sudden-onset chest pressure and heaviness the evening prior to presentation. She described a pleuritic component to her chest discomfort. On evaluation, initial vital signs were blood pressure 105/64 mm Hg, pulse 125 beats/min, respiration 18 breaths/min, oxygen saturation 99% on room air, and temperature 37.1°C. The patient was alert and in no apparent distress, with normal lung sounds, and no reproducible chest discomfort; cardiac examination revealed a regular rhythm with tachycardia. The electrocardiogram revealed sinus tachycardia with an unchanged T-wave inversion in lead III without any ST-wave abnormalities. Laboratory evaluation was concerning for a troponin of 0.26 ng/mL.

A portable chest radiograph was obtained (Figure 1) and was believed by the emergency physician to be negative for any abnormalities. Chest computed tomography (CT) angiography was performed to evaluate for pulmonary embolism given her cancer history, tachycardia, and history of deep venous thrombosis. It was ultimately read as negative for filling defects or foreign bodies.

After some time, a radiologist interpreted the initial chest radiograph on a video imaging system. By making

fine adjustments to the screen's contrast, a linear, radiopaque structure, possibly within the right atrium of the heart, was visualized (Figure 2). A lateral plain film was then performed to attempt to help localize this structure. However, no foreign body could be visualized on that view. Next, the previously obtained CT scan of the chest was reviewed again by a radiologist, with attention to the heart. However, due to the nongated modality and use of contrast, an intracardiac foreign body could not be ruled in or ruled out. After that, an echocardiogram was obtained through Cardiology. That echocardiogram was interpreted as negative for any abnormal masses, foreign bodies, or other abnormalities.

At this point, the emergency physician performed a bedside point-of-care echocardiogram, with special attention to the right side of the heart (Figures 3 and 4; Video 1, available online). During this echocardiogram, the emergency physician did not constrain imaging to the standard cardiac views. In this manner, the echo obtained demonstrated a linear, hyperechoic structure within the right ventricle, near the tricuspid valve. The structure moved with cardiac wall motions and demonstrated an intermittent reverberation artifact.

Based on the chest radiograph and bedside echocardiogram images, the patient was taken to the cardiac catheterization laboratory. Under fluoroscopic visualization, she was confirmed to have a single, fractured IVC filter limb just below the tricuspid annulus in the inferobasal portion of the right ventricle. After discussions with cardiothoracic and vascular surgery, the patient underwent successful percutaneous retrieval of the embolized fragment from

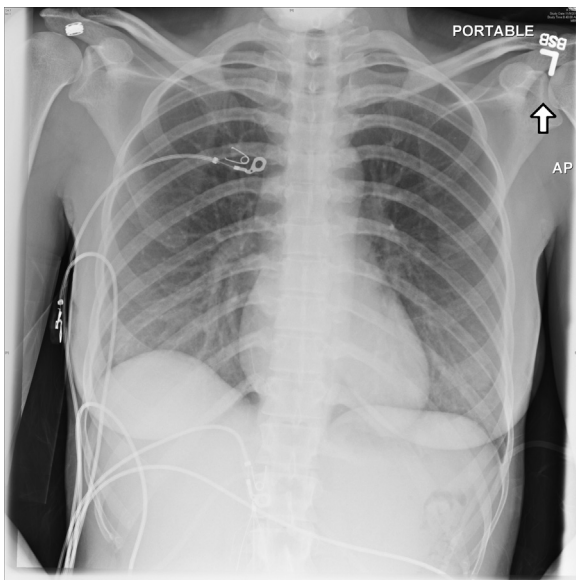


Figure 1. Anterior-posterior chest radiograph.

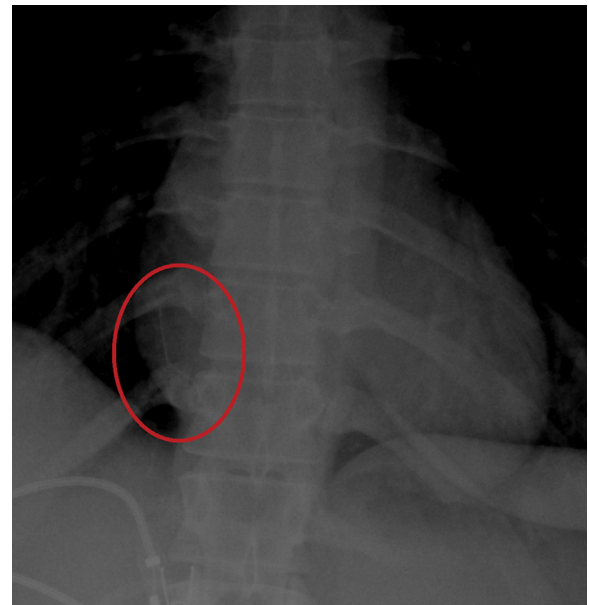


Figure 2. Same chest radiograph, zoomed and contrast-adjusted, demonstrating thin, radiopaque foreign body.

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