



## Full Abstract Sample: Clinical Inquiry

### IVC Filter: A Safety Device That Can Kill A Primary Care Primer of IVC Filter Indications, Complications, and Recommendations for Removal

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#### INTRODUCTION

After the first inferior vena cava (IVC) filter was placed in 1967, the filters have evolved and their use has increased to over 259,000 in 2013. Since there are few true indications for IVC filter placement, the vast increase in utilization has been secondary to relative indications and prophylactic usage. Complications related to filters remain low, however, increasing utilization combined with low retrieval rates will likely lead to more patients presenting with long-term adverse events. Between referral for retrieval and early identification of filter pathology, there is a vast opportunity for primary care physicians to decrease morbidity related to filter usage.

The corresponding case recounts a 59-year-old male who had an IVC filter placed for a true indication in 2007. Despite resolution of his contraindication to anticoagulation, his filter was not removed. When the patient presented six years later with vague symptoms of abdominal pain and blood in his stools, a wide differential diagnosis failed to include iatrogenic perforation. Due to a physical exam finding that triggered concern for appendicitis, the patient was triaged to the emergency department, where he was ultimately found to have perforation of his duodenum and aorta by the IVC filter.

#### CASE DESCRIPTION

A 59-year-old male presented to the Family Medicine clinic with one week of cramping, 8/10 RLQ abdominal pain and blood in his stool. His past medical history included ulcerative colitis, remote pulmonary embolism, Greenfield IVC filter placement six years earlier and coronary artery disease status post triple bypass surgery with subsequent hemothorax. Prior to presentation, the patient had attempted one week of mesalamine enemas as discussed with his family physician by phone. He reported no improvement with this treatment. A review of systems was otherwise negative. On examination, he was hemodynamically stable in no distress. His abdominal exam was notable for tenderness to palpation of McBurney's point with radiation to the epigastrium. There was no rebound tenderness, guarding, or rigidity. Rectal exam revealed no masses or tenderness, and the stool was guaiac positive without visible blood.

Due to his positive Aaron's sign, the patient was transferred to the Emergency Department to obtain an emergent CT scan of the abdomen and pelvis to rule out appendicitis. The scan revealed evidence of IVC filter extravasation with multiple lower limbs eroding through the walls of the IVC with limb perforation into the duodenum and aorta. After admission to the Family Medicine Service, an upper endoscopy was performed and identified metal wire penetrating the 3rd portion of the duodenum. CT angiogram (CTA) confirmed ulceration of the aorta at the level of the duodenum. Interventional radiology and vascular surgery performed a joint percutaneous transjugular retrieval of the IVC filter without complication. The patient was monitored in the ICU overnight and remained stable. Repeat CTA performed on postoperative day 1 did not reveal any active bleeding in the area of aortic perforation. The patient's symptoms quickly resolved with filter removal, and he was soon stable for discharge with a return visit in Family Medicine clinic.

#### DISCUSSION OF PRACTICE GUIDELINES

Approximately 1 in 1000 patients experience the new onset of venous thromboembolism (VTE) each year in the United States. The presence of VTE confers a 6 and 12 percent mortality within one month of diagnosis of DVT and PE, respectively<sup>1</sup>. Similar to anticoagulation, the goal of IVC filters is to decrease the morbidity and mortality associated with VTE<sup>2</sup>.

Indications for the use of IVC filters in place of anticoagulation remain controversial. The widely accepted indications include:

- Presence of VTE with contraindication for anticoagulation
- Recurrent VTE in the setting of therapeutic anticoagulation
- Cases of massive PE that might be fatal with additional clot burden
- Severe cardiopulmonary disease with DVT<sup>3</sup>.

There has been a steady increase in the use of IVC filters in the United States since 1979<sup>4</sup>. Retrospective reviews of coding revealed that the greatest increase in use was for relative indication or prophylaxis. Relative indications are present in patients with a large free-floating thrombus in the IVC, fall risk, or poor compliance with anticoagulation. Filter placement for prophylaxis is considered in patients undergoing orthopedic or high risk surgical procedures, patients with active malignancies but contraindication for anticoagulation, or in cases of severe trauma<sup>5</sup>.

While IVC filters appear to be effective in prevention of pulmonary embolism, they have also been associated with numerous reports of adverse effects<sup>6</sup>. Complications of filters are divided into three categories: insertion, long-term risk, and removal. Procedural risks include bleeding, hematoma formation, infection, inadvertent arterial puncture, and malposition. The risks of IVC removal include exposure to large clot burden, epithelialization with inability to remove the filter, and extended procedural times due to difficult removal<sup>7</sup>.

A greater emphasis will be placed on long-term risks and the role of surveillance by the primary care physician. Delayed adverse events secondary to implanted IVC filters include device migration, embolization, perforation, and fracture. Previous case reports have described injury to the aorta, portal vein, diaphragm, kidneys, ureters, intestines, and spinal column from IVC penetration<sup>3</sup>. Migration and embolization into the heart valves, right ventricle, and pulmonary outflow tract have also occurred. Furthermore, numerous studies have identified increased risk for recurrent DVT and even IVC thromboembolic occlusion in patients with long-term filters<sup>8</sup>.

Between 2005-2010, 921 long-term adverse event reports were placed to the US Food and Drug Administration (FDA), including 328 device migrations, 146 embolizations, 70 perforations, and 56 filter fractures. Due to these reports, the FDA issued a safety warning in 2011 recommending primary care providers to refer patients for retrieval of IVC filters when indications are no longer met<sup>9</sup>. At present, there are no widely accepted guidelines for surveillance imaging. While up to 25% of filters have evidence of erosion or perforation on radiologic tests, only 0.4% are believed to be clinically significant<sup>10</sup>. This creates a diagnostic challenge for physicians hoping to preempt clinically apparent filter pathology.

With the wide use of retrievable filters in the 21st century, there is an area of opportunity for family physicians to decrease adverse events by promoting removal when no longer indicated. Of note, the current retrieval rate for temporary filters is only 34% in the US, as compared to 81% in the UK<sup>3</sup>. Loss of follow up is the most common reason cited for failure to remove temporary filters<sup>11</sup>.

A significant responsibility remains for family physicians to recognize patients that no longer meet the indication for filter placement and make the appropriate referrals for removal. For those who are not candidates for removal, physicians must maintain a high index of suspicion for filter pathology. The differential diagnosis for nonspecific intraabdominal symptoms should include complications of implanted filters in the appropriate population. Through familiarity with indications, complications, and recommendations for removal, family physicians can increase detection of adverse events, improve clinical outcomes, and help prevent iatrogenic morbidity and mortality associated with IVC filters.

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