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## IVC Filter Perforation through the Duodenum Found after Years of Abdominal Pain

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**Conflict of interest:** None declared

**Patient:** Female, 67  
**Final Diagnosis:** IVC filter perforation through duodenum  
**Symptoms:** Abdominal pain  
**Medication:** —  
**Clinical Procedure:** Esophagogastroduodenoscopy  
**Specialty:** Gastroenterology and Hepatology

**Objective:** Challenging differential diagnosis

**Background:** The number of IVC filter-related complications has increased with their growing utilization; however, IVC filter perforation of the duodenum is rare. It can manifest with nonspecific abdominal pain, gastrointestinal bleeding, cava-duodenal fistula, or small bowel obstruction.

**Case Report:** A 67-year-old female presented with several years of right upper quadrant abdominal pain which was exacerbated by movement and food intake. She had a history of hepatic steatosis, cholecystectomy, and multiple DVTs with inferior vena cava filter placement. Physical exam was unremarkable. Laboratory tests demonstrated elevated alkaline phosphatase and transaminases. Esophagogastroduodenoscopy revealed a thin metallic foreign body embedded in the duodenal wall and protruding into the duodenal lumen with surrounding erythema and edema, but no active hemorrhage. Further evaluation with non-contrast CT scan revealed that one of the prongs of her IVC filter had perforated through the vena cava wall into the adjacent duodenum. Exploratory laparotomy was required for removal of the IVC filter and repair of the vena cava and duodenum. Her post-operative course was uneventful.

**Conclusions:** In patients with history of IVC filter placement with non-specific abdominal pain, a high clinical suspicion of IVC filter perforation of the duodenum should be raised, as diagnosis may be challenging. CT scan and EGD are valuable in the diagnosis. Excellent outcomes have been reported with open surgical filter removal. Low retrieval rates of IVC filters have led to increased complications; hence, early removal should be undertaken as clinically indicated.

**MeSH Keywords:** Duodenum • Endoscopy, Digestive System • Vena Cava Filters

**Full-text PDF:** <http://www.amjcaserep.com/abstract/index/idArt/893541>



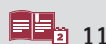
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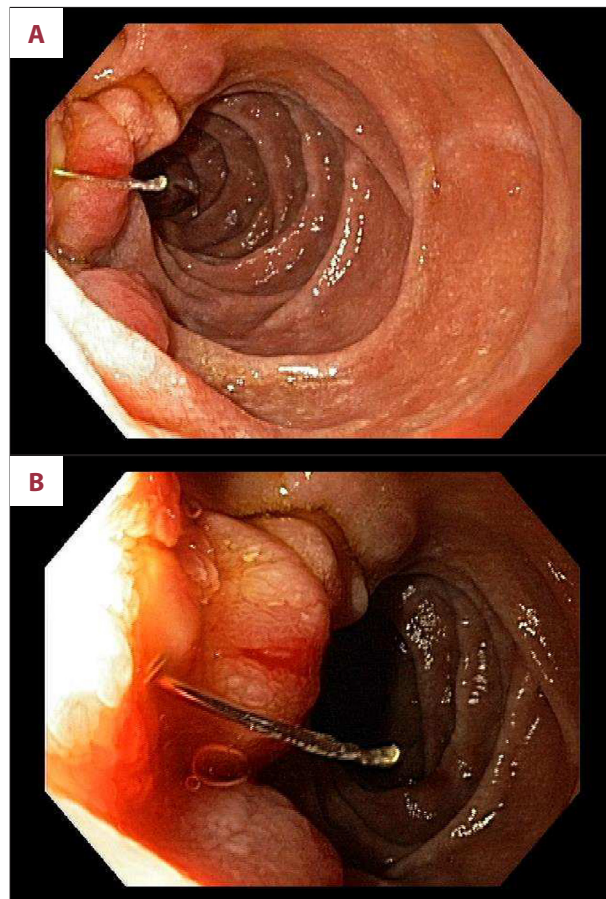


## Background

Inferior vena cava (IVC) filters are a useful mechanical adjunct in the management of venous thromboembolic (VTE) disease and have been shown to be effective in the prevention of pulmonary embolism (PE) [1,2]. These filters are generally safe but can cause several clinically significant, albeit rare, complications which have been infrequently reported in the literature [3]. Low retrieval rates have led to increased complications from short- and long-term filter placement; hence it is important to remove these filters as early as clinically indicated [3,4]. Breaching of the vena cava wall by an IVC filter is common, but usually asymptomatic. IVC filter perforation of the duodenum is fairly uncommon, but can present as non-specific abdominal pain, gastrointestinal hemorrhage or obstructive gastrointestinal symptoms [1]. We report a case of abdominal pain with esophagogastroduodenoscopy (EGD) revealing a prong of the IVC filter perforating into the duodenum.

## Case Report

A 67-year-old African American female presented to her primary care physician with a complaint of persistent mild right upper quadrant abdominal pain of 4-year duration. She described the pain as a constant dull ache of moderate severity exacerbated by movement and food intake and partially relieved by analgesics. She did not report any fever, chills, nausea, vomiting, hematemesis, constipation, hematochezia, or melena. She had a past history of irritable bowel syndrome, cholecystectomy, coronary artery disease type 2 diabetes mellitus, hypertension, and severe spinal stenosis with ambulatory dysfunction. She also had a history of multiple DVTs and hypercoagulability work-up in the past was negative for factor V Leiden deficiency and showed normal protein C, protein S and antithrombin III activity. A Günther tulip vena cava filter was placed prophylactically 5 years ago prior to decompressive laminectomy with bilateral foraminotomy and lumbar fusion for spinal stenosis. Prior to the placement of the IVC filter, she was also anti-coagulated with coumadin, which was held later because of risk of falls from ambulatory dysfunction. Her medications included aspirin (81 mg daily), amlodipine (80 mg daily), pravastatin (40 mg daily), insulin NPH (30 units every morning), insulin aspart (20 units 3 times daily with meals), and furosemide (80 mg twice daily). She denied taking any herbal medications or OTC supplements. She had a 50 pack-year history of smoking, but quit almost 20 years ago, and denied any alcohol usage or illicit drug abuse. On exam her vitals were stable; the abdomen was soft, non-tender with normal bowel sounds, and did not reveal any hepatosplenomegaly or rebound tenderness. Her blood work showed elevated transaminases and she was referred to gastroenterology for further evaluation.

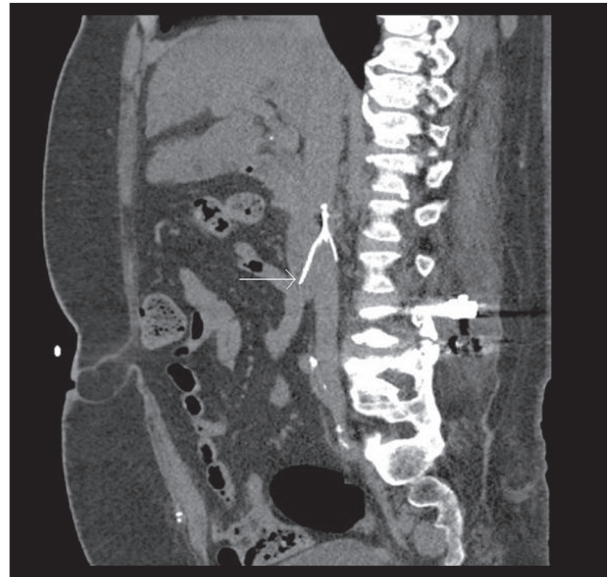


**Figure 1.** (A, B) Esophagogastroduodenoscopy revealing a thin metallic foreign body in the third portion of the duodenum, embedded in the duodenal wall and protruding into duodenal lumen, with surrounding inflammation but no active hemorrhage.

The patient underwent an EGD, which revealed normal mucosa of the esophagus and mild erythema of the mucosa of the stomach body and antrum; multiple cold forceps biopsies were performed. Rapid urea test was negative. Upon further advancement of the scope, a thin metallic foreign body was found in the 3<sup>rd</sup> portion of the duodenum, appearing to be sticking through the wall and with surrounding inflammation, but no active hemorrhage (Figure 1A, 1B). Possible differential included foreign body ingestion or perforating IVC filter through the wall of the duodenum. Post-procedure, she was clinically stable and denied any inadvertent foreign body ingestion. She was immediately sent to the emergency department for further evaluation. Her lab work showed persistently elevated liver enzymes with alkaline phosphatase of 162 (normal range 38–110 IU/L), AST 59 (9–33 IU/L), ALT 102 (2–38 IU/L), normal total and direct bilirubin, total protein, albumin, and INR. A non-contrast computerized tomography (CT) abdomen was obtained, which showed diffuse hepatic steatosis. Moreover, 1 of the anterior prongs of the IVC filter was projecting through



**Figure 2.** CT abdomen pelvis axial view revealing 1 of the anterior prongs of the IVC filter projecting through the vena cava wall into the adjacent third portion of the duodenum (white arrow). One of the posterior prongs is also projecting beyond the confines of the wall of the IVC into the anterior prevertebral fat (black arrow).



**Figure 3.** CT abdomen pelvis sagittal view revealing 1 of the anterior prongs of the IVC filter projecting through the vena cava wall into the adjacent third portion of the duodenum (white arrow).

the vena cava wall into the adjacent third portion of the duodenum (Figures 2 and 3). One of the posterior prongs was also projecting beyond the confines of the wall of the IVC into the anterior prevertebral fat (Figure 2). The patient was evaluated by a vascular surgeon, who felt no immediate surgical intervention was needed as the patient did not have any obstructive symptoms, there was no evidence of periduodenal inflammation or hemorrhage, and removal of the filter would require a major surgical procedure.

A few weeks afterwards she was seen in follow-up visit and continued to complain of right upper quadrant abdominal pain. She was referred for vascular evaluation at a tertiary care center for a 2<sup>nd</sup> opinion regarding her IVC filter leg perforation through the duodenal wall. Initial attempt at removal of IVC filter by interventional radiology was unsuccessful and resulted in perforation of IVC, which was contained and stable in retroperitoneum. Subsequently she had a CT abdomen/pelvis, which showed a pericaval hematoma with air present in it. She underwent exploratory laparotomy with removal of the IVC filter with repair of IVC with 14-mm Dacron interposition graft and primary repair of duodenum with intraoperative EGD. She received IV antibiotics in the hospital because of contaminated operative field from duodenum perforation. Her diet was advanced gradually as her bowel function improved. She was discharged home in stable condition on general diet. Her postoperative course was uneventful and the right upper quadrant pain completely resolved.

## Discussion

IVC filters are a potentially important, but poorly evaluated, therapeutic modality in the prevention of pulmonary emboli [5]. IVC filters have been used since the early 1970s for the treatment of venous thromboembolic disease and retrievable IVC filters have been increasingly utilized since their introduction in 2001 [4,6]. Due to a lack of sufficient randomized controlled trials comparing various types of IVC filters, there is no ideal filter that is more efficacious or provides an improved safety profile over the other, though some situations do call for specific filters [5,7]. According to the Society of Interventional Radiology's multidisciplinary consensus guidelines, absolute indications for use of IVC filters in patients with proven VTE include recurrent VTE despite adequate anticoagulation, inability to achieve/maintain adequate anticoagulation, contraindication to anticoagulation (e.g., allergy, planned major surgery) and complication of anticoagulation (e.g., hemorrhage), in addition to several relative indications in patients with proven VTE and prophylactic indications in patients without VTE [1]. Anticoagulant therapy, if not contraindicated, should be used in conjunction with filters, especially in high-risk patients with a known hypercoagulable state or DVT as well as PE [1,7].

Complications from IVC filters can be categorized as insertion-related, device failure, and late complications [3]. Insertion-related complications include hematoma formation, pneumothorax, hemorrhage, filter misplacement, excessive tilt, and vascular injury. Insertion of a IVC is generally safe with an overall major complication rate believed to be less than 0.5% [1,8].

Incidence of complications rises 30 days after placement of a filter [1]. Late complications include recurrent pulmonary embolus, IVC occlusion, filter migration, filter fracture with fragment embolization, and filter leg perforation. Asymptomatic perforation of IVC (defined as >3 mm beyond the IVC lumen) by 1 or more filter struts is exceedingly common [1], and the risk of perforation is estimated to be as high as 40–95% [2], although clinical symptoms are far less uncommon in patients with these complications [8]. However, the filter can damage surrounding organs and cause severe complications involving the aorta, small or large intestine, pancreas, portal vein, diaphragm, spinal column, or organs of the genitourinary system, but these cases are very rare [1]. The exact mechanism of IVC perforation is poorly understood but the design and long-term placement of the filter and filter tilt during deployment are thought to be important risk factors.

IVC filter perforation through the duodenum may manifest with abdominal pain, gastrointestinal bleeding, cava-duodenal fistula, or small bowel obstruction [9]. Generally, a high clinical suspicion should be raised for patients with a history of IVC filter placement, if they complain of atypical or persistent abdominal pain, or had an episode of a gastrointestinal bleed. Diagnostic evaluation should include plain abdominal radiographs and CT scan is a valuable adjunct in the follow-up of IVC devices when a complication (especially IVC perforation) is suspected [4,10]. Excellent outcomes with low complication rates have been reported in cases where an open procedure was performed with either extraction of the filter or removal of the offending struts [6]. Complications rate of up to 1.7% have been reported with removal of IVC filters, which include failure of retrieval, IVC intussusception, and vena caval injury with hemorrhage [11].

Strikingly, the number of cases of IVC perforating the duodenum reported in the literature has increased over the past 4 decades, and 25 cases were reported in a systematic review

from 2012 [6]. This could be from widely available diagnostic modalities such as CT and EGD to aid in the diagnosis or the dramatically increased rate of IVC filter placement in the last few years, with almost 259,000 expected placements in the United States in 2012 according to the FDA [4]. Increasing incidence could also be because of a longer course required to produce the perforation. Continuous improvement in spatial design aiming for more durable and stable filters are required in order to prevent filter tilting and the subsequent complications, including perforation of intra-abdominal structures such as the duodenum. Currently, only 50% of retrievable IVC filters are removed from patients, with most of the remaining retrievable IVC filters remaining asymptomatic and without clinical consequence. However, in order to prevent potential sequelae caused by IVC filter leg penetration, like that reported in this case, the removal of the IVC filter, when possible, is preferred and the FDA in the United States has recommended that “implanting physicians and clinicians responsible for the ongoing care of patients with retrievable IVC filters consider removing the filter as soon as protection is no longer needed [3].” Retrieval success decreases as duration of placement increases, thus the success of late filter retrieval is dependent upon the degree of strut epithelialization that has occurred.

## Conclusions

Even though IVC filters are generally safe, rarely complications can arise from perforation of the filter through the vena cava with damage to surrounding structures. Most cases of IVC perforation through the vena cava are asymptomatic, but physicians should have a high clinical suspicion for IVC perforation through the duodenum if patients complain of atypical or persistent abdominal pain, obstructive gastrointestinal symptoms, or anemia is detected on laboratory testing. Generally, the outcomes with surgical repair are excellent.

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