Late complication from a retrievable inferior vena cava filter with associated caval, aortic, and duodenal perforation: A case report

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Inferior vena cava filters are an excellent therapeutic method for those patients in whom anticoagulant therapy is contraindicated or ineffective. However, filter placement is associated with a high rate of serious complications (>30%), with death occurring in 3.7% of patients. The most common complication is an asymptomatic inferior vena cava penetration and perforation. In some rare circumstances, however, therapeutic intervention may be required because of perforation of adjacent organs. We report a clinical case of a patient with simultaneous caval, duodenal, and aortic perforation resulting from penetration of inferior vena cava filter hooks. A brief review of the literature discusses presenting symptoms and treatment of such rare complications. (J Vasc Surg 2008;48:223-5.)

Anticoagulant therapy is the treatment of choice of deep venous thrombosis (DVT), and secondary prevention of pulmonary embolism is achieved in up to 95% of patients.[1-3] However, when warfarin and heparin are contraindicated or ineffective, especially in those patients who are at high risk for major bleeding, the placement of an inferior vena cava (IVC) filter could be appropriate.[3-5] Insertion of IVC filters may result in clinically significant complications, such as IVC thrombosis and perforation of inferior vena cava and adjacent organs.[4,6,7]

We report the unique case of multiple late complications of a retrievable ICV filter that caused a complete IVC thrombosis and wall perforation, with penetration of the filter's hooks in the aorta, duodenum, and retroperitoneal space.

CASE REPORT

A 46-year-old woman was referred to our institution because of diffuse swelling to her left leg. A Recovery (Bard Peripheral Vascular, Tempe, Ariz) nitinol IVC filter had been placed in 2005 at another institution after the patient had recurrent DVT with pulmonary embolism while taking warfarin. The patient was discharged with anticoagulant therapy and did well for 2 years.

An echo color Doppler study demonstrated a complete occlusion of the left iliac vein and a moderate reduction of arterial flow to both legs (ankle-brachial index, 0.75). A thoracoabdominal computed tomography (CT) angiography confirmed the diagnosis of complete thrombosis of the left iliac vein extending to the inferior vena cava. The IVC filter was completely fractured, with multiple perforations of the IVC wall, producing a perforation of the aortic wall with a mural thrombus (Fig 1). There were no signs of pulmonary embolism.

The patient's anticoagulant therapy was transitioned from warfarin to heparin, and she underwent abdominal exploration. The duodenum and the right colon were completely reflected, and the IVC and aorta were exposed. The dissection of the duodenum from the anterior surface of the IVC revealed a filter strut had perforated the IVC wall into the duodenum (Fig 2). The strut was removed from the duodenal lumen and trimmed flush with the IVC, and hemostasis was obtained. The duodenal perforation was found to be no larger than the diameter of the strut itself and was closed by a simple suture. Further dissection of the IVC revealed two struts had perforated the IVC wall into the retroperitoneal space.

After a careful dissection, the infrarenal aorta was clamped and opened longitudinally, revealing a mural thrombus occupying about one-third of the aortic lumen (Fig 3). The strut, which protruded through the right lateral aortic wall, was trimmed flush and an aortic thrombectomy was performed; then, the aortotomy was sutured.

A careful dissection of suprarenal IVC and a longitudinal cavotomy confirmed the complete thrombosis of the IVC. The extraction of the filter was technically difficult because the prongs at the distal ends of the struts were included into the posterior wall of IVC. A thrombectomy of the iliac vein and ICV was attempted without restoring a satisfying caval flow, and the IVC wall was closed by reducing its diameter to less than one-third of the original lumen to avoid thrombus migration.

The patient's postoperative course was uneventful, and she was resumed on anticoagulant therapy with warfarin because of the presence of caval thrombosis. The leg swelling gradually reduced, and the patient was discharged on postoperative day 10. During the 6 months after surgery, the patient remained symptom free. An abdominal CT angiography confirmed the residual thrombosis of the IVC, with a partial restoring of caval flow.

DISCUSSION

There is a general consensus that an IVC filter is indicated for secondary prophylaxis in the setting of acute DVT that is accompanied by an absolute contraindication to

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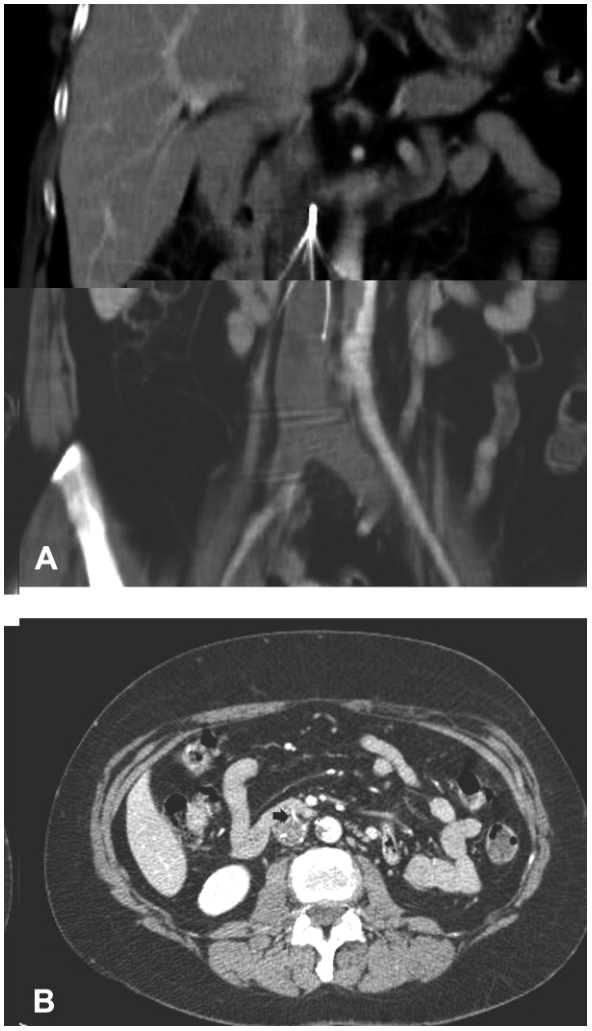

Fig 1. A, Computed tomography angiography of the abdomen demonstrated the complete thrombosis of the inferior vena cava, just above the renal veins, which were not involved by thrombosis. The filter's hooks perforated the inferior vena cava wall and aorta, in which a mural thrombus is clearly evident. **B,** Computed tomography axial view showed the perforation of duodenum by the filter's hook *(arrow)*. Note the partial thrombosis of aortic lumen.

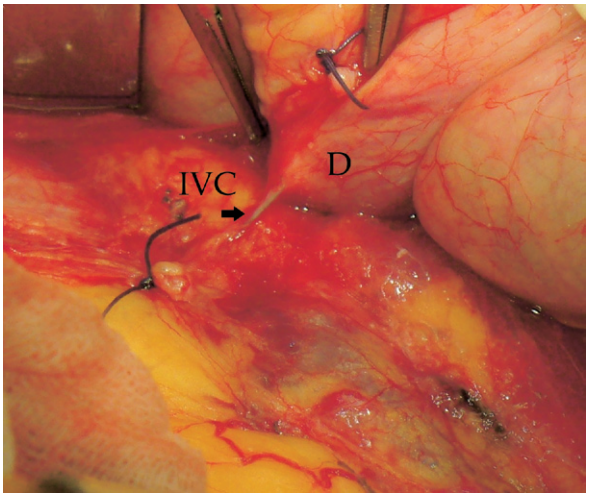

Fig 2. This intraoperative view shows that the filter strut *(arrow)* has perforated the inferior vena cava *(IVC)* wall into the duodenum *(D)*.

Fig 3. Intraoperative view shows the perforation of the right lateral aortic wall by the filter strut.

anticoagulant therapy, such as major bleeding, need for surgery ≤2 weeks, severe and prolonged thrombocytopenia, or in patients with recurrent DVT disease despite anticoagulation.[1-3,5,8]

Only one randomized trial[3] has compared anticoagulant therapy and IVC filter on the efficacy of thrombosis rate reduction in high-risk patients, demonstrating the initial efficacy of filters in the prevention of pulmonary embolism, albeit without any long-term reduction in death.

A large variety of permanent, temporary, and retrievable caval filters are currently available, all of which are roughly equivalent in efficacy.[1,9] Retrievable filters may be considered as the best option for prophylactic filter insertion because the risk of pulmonary embolism is for a short time[1,5,10]; however, although most retrievable filters are inserted with the intention of removal, about 50% of these filters are not retrieved.[11]

Each type of IVC filter may have risks associated with filter insertion, device failure, and long-term complications arising from the filter device itself.[12] The reported rate of complications is extremely variable, from 0% to 69%, with death occurring in 3.7% of patients.[1,5,9,13] Delayed complications of IVC filters may include recurrent pulmonary embolism (2% to 5.6%), IVC thrombosis (3.6% to 30%), DVT (5.9% to 32%), and filter migration (3% to 69%).[1,2,9,13]

To the best of our knowledge, this is the first report of simultaneous caval, duodenal and aortic perforation caused by an IVC filter. The clinical evolution in our patient was determined by the progressive penetration of IVC filter's hooks in the vena cava wall, with consequent perforation and penetration in aortic wall, duodenum, and retroperitoneal space. The patient was clinically asymptomatic, except

for a swelling of the left leg related to the iliac vein thrombosis.

Inferior vena cava penetration and wall perforation are relatively common complications of IVC filters but are not clinically relevant in most patients. In as many as 38% of patients, aorta pulsation and respiratory motion may contribute to caval penetration by filter hooks, which are necessary to attach the filter to the IVC.[7,14,15] Inferior vena cava penetration may be asymptomatic in most patients,[15] but some symptomatic patients[16] may require therapeutic intervention for duodenal perforation[11,15-17] and aortic penetration.[18-20]

Duodenocaval fistula may exceptionally occur in patients who have undergone IVC filter placement: a recent review of the literature[16] reported 37 cases, 10 of which were associated with an IVC filter. Duodenocaval fistula is usually a late complication, with an average of 6 years between filter placement and the occurrence of a fistula. Duodenal perforation is usually asymptomatic, but rarely may present as abdominal pain.[12] A prompt diagnosis and surgical intervention is mandatory to achieve a better prognosis and a low mortality rate (10%).[16] Aortic perforation after IVC filter placement is exceptional[19] and may be associated with mural thrombus,[18] which may eventually cause a peripheral arterial occlusion.

CONCLUSION

Our rare clinical entity demonstrates that IVC filters are an excellent therapeutic method for the prevention of pulmonary embolism in patients with DVT; however, they may be rarely associated with serious complications that may evolve in an asymptomatic fashion and may occasionally be diagnosed late in the follow-up. When complications are suspected, a prompt diagnosis is mandatory to prevent dramatic clinical consequences such as aortic embolism from a luminal thrombus, massive bleeding from a caval perforation, or a duodenocaval fistula. In this view, a careful CT scan imaging follow-up should be performed, even in asymptomatic patients, every 6 months. The surgical treatment is challenging, but it may guarantee the best outcome.

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