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# Migrated Inferior Vena Cava (IVC) Filter Strut: A Rare Cause of Chronic Distal Pancreatitis with Likely Malignant Transformation

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**Conflict of interest:** None declared

**Patient:** Female, 44-year-old  
**Final Diagnosis:** Pancreatic adenocarcinoma  
**Symptoms:** Abdominal pain  
**Medication:** —  
**Clinical Procedure:** Neoplasm  
**Specialty:** Surgery





**Objective:** Unusual clinical course  
**Background:** Inferior vena cava (IVC) filters are indicated for patients with recurrent venous thrombosis despite proper anticoagulation or whenever anticoagulation is contraindicated. IVC filter deployment is an invasive procedure with various complications. One example is IVC filter limb fracture and migration, which is associated with significant morbidity and/or mortality. Extravascular migration toward pancreas may induce pancreatitis. Patients with chronic pancreatitis are known to have an increased risk of pancreatic malignancy.

**Case Report:** We report an extremely rare case of IVC filter fractured limb in 44-year-old woman, which had migrated into the pancreatic tail and manifested as chronic distal pancreatitis. A pancreatic adenocarcinoma was found by biopsy at the pancreas tail. It is likely that a foreign body promoted this metaplasia and neoplastic transformation.

**Conclusions:** Early detection and retrieval of a displaced foreign body in organs, such as the pancreas, seem to be essential to reduce risk of subsequent complications, including chronic inflammation and possibly neoplasia.

**Keywords:** Pancreatic Neoplasms • Pancreatitis • Vena Cava Filters

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## Background

Inferior vena cava (IVC) filters are indicated for patients with recurrent venous thrombosis whenever anticoagulation is contraindicated or if the patient is not a suitable candidate for it [1].

The number of IVC filter-related complications has increased with their growing utilization; these include [2,3] IVC thrombosis, filter migration, erosion or fracture. A broken filter strut can migrate inside the cardiovascular system, or penetrate vessels walls toward extravascular structures [4,5]. We report an extremely rare case of IVC filter fractured limb that migrated toward the pancreatic tail, manifested as chronic distal pancreatitis and possibly promoted metaplasia and neoplastic transformation.

## Case Report

A 44-year-old nonsmoker woman with no history of drinking alcohol had systemic lupus erythematosus (SLE) for the last 15 years, complicated by SLE nephritis (stage 4), osteoporosis, antiphospholipid syndrome, renal vein thrombosis, and pulmonary embolism 10 years ago. She had a temporary (suprarenal) Denali™ Vena Cava filter deployed 10 years ago for recurrent thrombotic events; the reason for suprarenal placement of the filter was because the medical team was worried about a left renal vein thrombus migrating to the heart/pulmonary arteries. The patient then missed the follow-up appointment with her caregiver for retrieval of the filter and has been on oral anticoagulation since then.

The patient presented to the clinic with vague, intermittent, long-standing, epigastric and left upper-quadrant abdominal pain that radiated to the back. She also reported frequent rigors, but no fever was documented. A few episodes of vomiting were also reported. Upon diagnostic work-up, blood tests revealed normal leukocyte count, normal bilirubin, alkaline phosphatase (ALP), and gamma-glutamyl transferase (GGT). Alpha amylase ranged from 496 to 550 and on several occasions, lipase levels were 180-200.

The initial ultrasound excluded gallbladder calculi and cholecystitis. Computerized tomographic (CT) scanning showed the main filter body inside the IVC (**Figure 1**) and a migrated IVC filter strut in the tail of the pancreas with surrounding focal pancreatitis and chronic splenic vein thrombus (**Figure 2**). The patient was prescribed oral antibiotics and sent home with instructions. A follow-up CT scan at 6 weeks showed no changes from the previous results, with persistent pancreatic hypodensity in the area surrounding the filter strut containing a few cystic lesions. (**Figure 3**) CA 19-9 level was 1692.



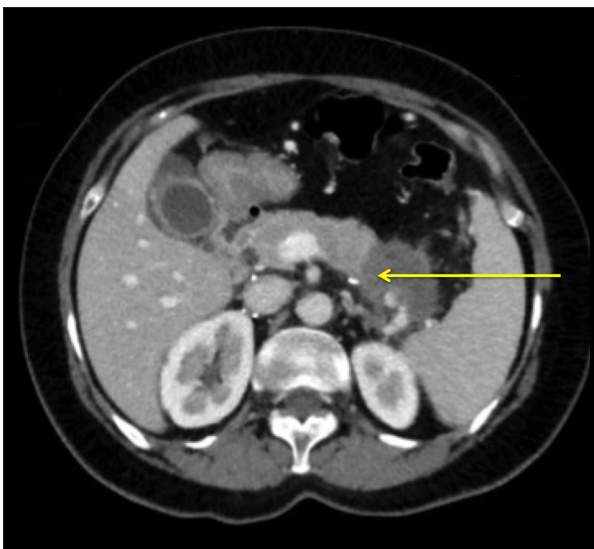
**Figure 1.** An enhanced CT scan (sagittal view) shows the main filter inside the inferior vena cava (yellow arrow).

A ‘Tru-Cut’ needle-biopsy was then obtained under CT guidance. Microscopic examination showed needle-core biopsies of a tissue infiltrated by malignant tumor cells that were immunoreactive for CK7 and CK10 immunostains, focally positive for CDX2 immunostain, but were negative for CK20 immunostain. The diagnosis of invasive moderately differentiated adenocarcinoma was established. This lesion was shown to be hypermetabolic on positron emission tomography (PET) scan, with no evident metastasis. The patient then underwent active lupus nephritis, and treatment with systemic steroids was initiated. Upon control of the lupus manifestations, the case was discussed in the hospital Multidisciplinary Conference (MDC) and referred for neoadjuvant chemotherapy.

A retrospective review of the imaging studies showed that the fractured limb was missed in an older CT scan 3 years prior to the current admission, and the limb position has not changed since then. A consent form was obtained from the patient for publication of this material.



**Figure 2.** An enhanced CT scan (coronal view) shows the migrated (fractured) IVC filter limb inside the tail of the pancreas (yellow arrow).



**Figure 3.** An enhanced CT scan (cross sectional view) shows pancreatic tail hypodensity (arrow) in the area surrounding the filter strut, containing a few cystic lesions.

## Discussion

Fracture of the IVC strut occurs in 3.4% of patients who have had an IVC filter [5]. Different mechanisms [6,7] were proposed for the limb fracture, including tilting of the filter, continuous strain on the engaged strut, and metal fatigue. Migration of fractured IVC filter limb is occasionally reported, with an estimated incidence of 5% [5]. Filter migration was defined as change of position of more than 1 cm in either cephalic or caudal direction compared to the immediate post-placement film [8]. Penetration is referred to as perforation when the strut extends more than 3 mm outside the IVC wall [9]. The reported rate of IVC penetration ranges from 9% to 40% [10,11]. Only 10% of IVC penetrations secondary to filter limbs are found to be symptomatic [12].

Causes of delayed migration are variable. Some physiologic factors, similar to bending, coughing, Valsalva maneuvers, or even prone position may result in temporary dysmorphism of the inferior vena cava and thus allow dislodgement or fracture of the filter. Rossi et al [13] attributed the cephalad migration of conical filters to the “sail effect”, also known as the “blood flow effect”. The force of a large thrombus striking the filter may also be enough to cause dislodgement. Most of the migrated limbs were directed to the superior vena cava, right atrium [13], right ventricle [6,14] and pulmonary artery [15,16]. Some authors reported perforation and penetration through adjacent organs, including the duodenum [17], head of the pancreas [9], descending aorta [18], renal pelvis [19], ureter [20], liver [21], and even the vertebral body [22].

Pancreas penetration or recurrent pancreatitis secondary to a migrated limb is extremely rare. To the best of our knowledge, this is the first report of IVF limb migration into the tail of the pancreas, leading to chronic traumatic pancreatitis. In fact, a broken filter strut is less likely to settle in the pancreatic tail because of the counter-force generated by aortic pulsation, along with the “sail effect” of the blood flowing upward, as discussed above.

Inflammation has been implicated in the pathogenesis of many cancers, likely due to the increased cell proliferation in the presence of growth factors [23]. It has been widely accepted that patients with chronic pancreatitis are at increased risk of pancreatic cancer [24]. The risk rises 16-fold after 2 years following diagnosis of chronic pancreatitis [24]. An excess risk is noted among smokers and patients with alcoholic pancreatitis. In spite of the strong link between chronic pancreatitis and pancreatic malignancy, it is estimated that only 5% of patients with chronic pancreatitis will develop pancreatic cancer over a period of 20 years [25].

The mechanism that transforms chronic pancreatitis into pancreatic cancer has not been completely defined [25]. This pathway includes multiple steps with increased DNA damage and development of pancreatic intraepithelial neoplasms before frank malignancy is established [26]. The foreign body inflammation was maintained for many years in our case, induced the process of chronic pancreatic. Based on the “landscaper theory” proposed by Vogelstein and Kinzler [27], the chronic inflammation leads to damage of stromal cells followed by subsequent healing. The defective population of cells arising from stromal tissue makes epithelial cells more susceptible to malignant transformation as a result of an abnormal microenvironment.

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## Conclusions

In conclusion, although extravascular migration of a fractured inferior vena cava filter strut toward the pancreas is rare, it can be manifested as chronic traumatic pancreatitis. It may also promote metaplasia and neoplastic transformation. Early detection and retrieval of the foreign body seems to be critical to reduce subsequent complications.

## Conflict of Interest

None.