# Surgical removal of venous filter and snare complex in a patient with solitary left pelvic kidney

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## ABSTRACT

Anticoagulation is used to prevent thromboembolism; inferior vena cava filters are an alternative in patients with contraindications to anticoagulation. Although it is safe and effective, there are recognized complications related to inferior vena cava filter placement. We describe the case of a young man with congenital solitary left pelvic kidney who required unique filter placement to suit the anatomy and surgical removal after entrapment of the filter-snare complex in the left internal iliac vein. Patients may also acquire solitary pelvic kidneys after renal transplantation. This anatomy poses unique challenges to venous filter placement and requires tailored management. (J Vasc Surg Cases and Innovative Techniques 2018;4:201-3.)

**Keywords:** Venous interruption filter; Abnormal anatomy; Filter entrapment; Surgical removal

Venous thromboembolism represents a major health care burden and accounts for significant morbidity, mortality, and health care costs.[1] Anticoagulation is used to prevent thromboembolism; in patients with contraindications to anticoagulation, alternative methods such as inferior vena cava (IVC) filters can be used.[2]

IVC filters form a physical barrier that prevents thrombus migration into the pulmonary arteries in some cases. They are used in up to 15% of patients with venous thromboembolism.[3] Although it is safe and effective, there are recognized complications related to IVC filter placement, including misplacement, pneumothorax, hematoma, and air embolism in the short term and deep venous thrombosis, IVC thrombosis, filter migration, IVC penetration, filter tilt, and fracture in the long term.[1]

We describe the case of a young man with congenital solitary left pelvic kidney who required unique IVC filter placement to suit the anatomy and subsequent surgical removal of the filter-snare complex that became lodged in the orifice of the left internal iliac vein. This report was approved by our Institutional Review Board, and the patient provided consent for publication.

## CASE REPORT

A 19-year-old man with a recent diagnosis of unprovoked pulmonary embolism was admitted to the hospital with left-sided chest streptococcal empyema, thought to be secondary to lung infarction. His fever failed to resolve despite appropriate antibiotic therapy and chest tube drainage; empyema decortication was recommended by the thoracic surgeon. This required interruption of anticoagulation because of the high risk of postoperative bleeding. The hematology service recommended insertion of an IVC filter to prevent postoperative pulmonary embolism. Just before filter insertion, the patient reported having a solitary pelvic kidney.

At the time of filter insertion, angiography was performed, and an abnormal network of venous drainage from a solitary left pelvic kidney to the internal iliac vein was visualized but not well defined (Fig 1). Bilateral iliac vein filters were planned to avoid filter placement proximal to the level of the left renal vein (Fig 2). Placement in the left common iliac vein would have been above the left pelvic renal vein inflow, and a decision was made to place a Bard Denali nitinol filter (Bard Peripheral Vascular, Tempe, Ariz) into the left external iliac vein (Fig 3). This was the only retrievable venous filter available in our institution. The left filter tilted on deployment as the struts did not open appropriately; the apex-hook became engaged in the orifice of the internal iliac vein, and the filter became lodged in the left external iliac vein with suboptimal positioning. This precluded snaring of the hook to remove the device. Nevertheless, a snare was used to try to retrieve or to reposition the filter. The snare became trapped with the filter in the orifice of the left internal iliac vein. Efforts to remove the filter and snare complex were abandoned after multiple unsuccessful attempts by two experienced interventional radiologists during a period of 2 hours.

The snare wire was cut at skin level at the insertion site, over the right internal jugular vein, and left in the venous system. The patient was subsequently brought to the operating room. After the emergency left empyema decortication, we proceeded with retroperitoneal exploration of the left iliac vein during the same anesthesia.

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**Fig 1.** Venography image showing venous drainage of left pelvic kidney.

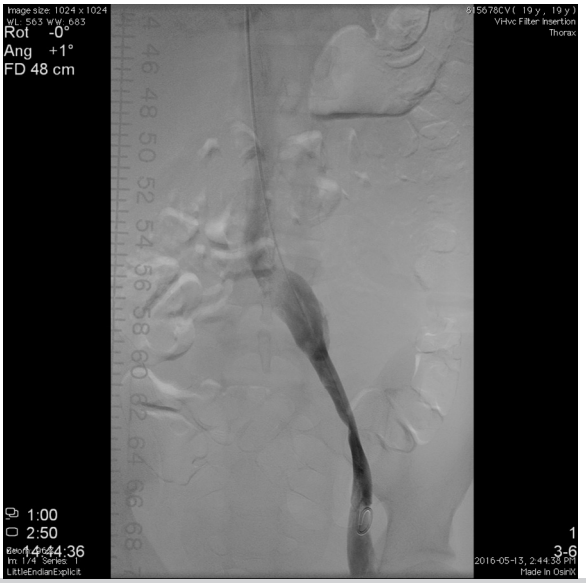

**Fig 3.** Venography image outlining anatomy of left iliac vein.

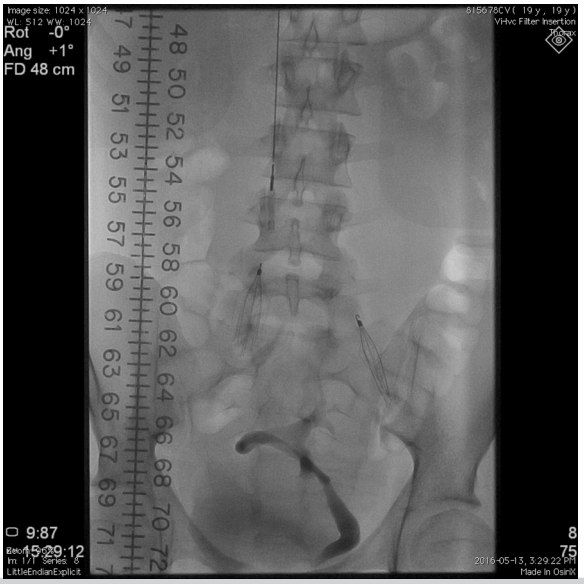

**Fig 2.** Early venography image showing left pelvic kidney and introduction of bilateral filters.

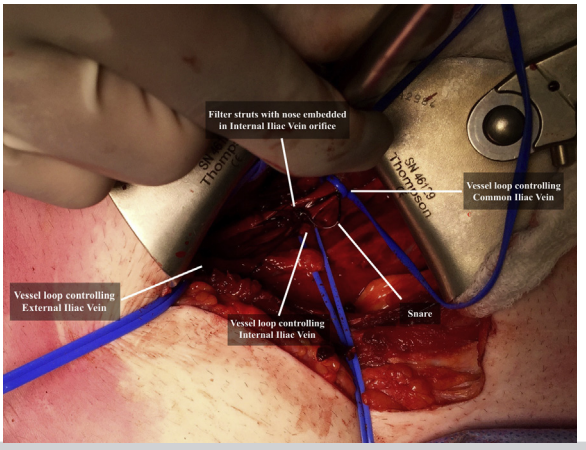


**Fig 4.** External iliac vein is opened at site of filter entrapment and thrombus is removed. Filter struts are dissected from vessel wall. Filter nose is seen embedded in the internal iliac vein orifice.

The vein was dissected. There was no hematoma around the vein, but there was evidence of full-thickness penetration of the filter's struts through the vein wall. On creation of a venotomy over this area, the filter was found clotted and lodged with the proximal blunt nose embedded in the orifice of the left internal iliac vein. Fig 4 shows the filter lodged in the vessel once the thrombus was removed. The filter was gently dislodged from the vessel wall along with the snare. A venous thrombectomy was performed using a Fogarty catheter, and the vein was then repaired primarily with a running 6-0 Prolene suture. The patient was anticoagulated in the postoperative period. A follow-up venous duplex ultrasound study 48 hours later showed a patent left iliac vein. The right iliac vein filter was retrieved without complication on postoperative day 7, and oral anticoagulation was resumed. At 4 months postoperatively, the patient was functioning at baseline with no leg pain or swelling.

## DISCUSSION

This case documents a complication of IVC filter insertion in a patient with uncommon anatomy: a solitary left pelvic kidney. It highlights the approach to venous interruption filter placement in such anatomy and the steps taken to address its entrapment.

Whereas congenital solitary left pelvic kidney is an uncommon occurrence, many patients undergo kidney transplantation and therefore have "acquired" pelvic

kidneys. According to the 2014 Organ Donation and Transplantation Activities report by the World Health Organization, there were 79,948 kidney transplantations worldwide that year.[4] In the United States, Australia, and Europe, there are 45 or more kidney transplantations per million population per year. The most common location in which to implant the kidney is the right lower quadrant.[5] Thus, kidney transplantation patients also have an acquired pelvic kidney, making our case report of filter placement in a patient with solitary pelvic kidney relevant to the renal transplantation population.

IVC filters are conventionally placed below the level of the renal vein inflow. In this case, because the solitary kidney was situated in the pelvis and drained by abnormal branches from the internal iliac vessels, it was decided to deploy bilateral filters in the external iliac veins. The safety and efficacy of filters in iliac vessels have been reported previously.[6,7] In a 2011 series by Van Ha et al,[8] of 20 filters placed in the common iliac vein, there were no procedure-related complications, no clinically evident pulmonary embolus, and a 100% filter retrieval rate. In our case, filter placement in the common iliac vein would be above the renal inflow, so it was placed in the external iliac vein. Whereas the aforementioned reports show safety of distal filter placement, the IVC has less mobility and greater blood flow than iliac veins; filter insertion here may be less susceptible to thrombosis, with the added advantage of requiring only one filter. Further studies comparing outcomes of these two approaches would help clarify the optimal strategy to employ.

Although the overall reported complication rate is low with IVC filters, a retrospective compilation of case series reported misplacement in 1.3% of insertions.[1] Our case appears to be unique in reporting venous interruption filter placement in a patient with a solitary pelvic kidney. It highlights that surgical exploration may be the safest option for removal in the case of entrapment, as forceful withdrawal and aggressive manipulation can result in injury to the vessel wall, filter fracture, and filter fragment embolization, potentially leading to arrhythmias.[9] Using a retroperitoneal approach to extract the filter worked well because it avoided the pelvic kidney.

## CONCLUSIONS

Our case highlights one possible complication with venous interruption filter placement in patients with aberrant anatomy. We pictorially document a filter's lodgment in the vessel wall and the steps taken to surgically remove the filter. Further institutional reports of bilateral iliac vein filter insertion and retrieval will help identify patients suitable for this approach and techniques to optimize their periprocedure outcomes.

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