Case – Endoscopic and endovascular management of inferior vena cava filter erosion into the right proximal ureter

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Introduction

Inferior vena cava (IVC) filters are commonly implanted to prevent thrombotic events from the lower extremities[1]. IVC filter struts, designed to exert outward radial force, can penetrate through the caval wall and into surrounding organs.[1] A recent systematic review reported penetration rates of 33.9% with 19% of those cases showing evidence of organ/ tissue involvement on CT (computed tomography) scan[1]. However, symptomatic IVC filter erosion has a reported incidence of less than 0.5%.[2] Frequency of erosion into the renal collecting system is difficult to estimate due to limited case studies reporting these events. We present a rare case of IVC filter struts eroding into the ureter. Endovascular removal of the IVC filter alone in this case would result in perforation of the renal pelvis, therefore, a combined endoscopic and endovascular approach was used.

Case report

A 47-year-old woman presented with right flank pain. She had a retrievable IVC filter (Celect™, Cook Medical) placed eight years ago, prior to an elective gynecologic surgery due to her increased risk of thrombosis secondary to May-Thurner syndrome. Sixteen months after IVC filter insertion she presented with right flank pain; CT scan did not reveal hydronephrosis nor any cause for her pain. One month later she underwent an attempted filter removal, which failed due to significant filter tilting and leg penetration beyond the IVC wall (Figure 1A). Six years later she underwent percutaneous nephrolithotomy to remove a 1.4cm right lower pole stone. Post-operatively, one stone fragment fell into the ureter and she presented with renal colic after 11 days (Figure 2A) CT scan revealed the stone was lodged at the location of IVC filter leg protrusion into the right proximal ureter, associated with proximal hydroureteronephrosis.

Right ureteroscopic laser stone extraction was performed and follow-up imaging confirmed resolution of the hydronephrosis. At the time of PCNL and ureteroscopy, there was no foreign body visualized in the ureteric lumen. Despite resolution of hydronephrosis, her right sided flank pain continued to worsen. Two years later CT scan revealed new hydroureteronephrosis above the level of IVC filter leg protrusion into the proximal ureter (Figure 2C).

Hoping to resolve her symptoms, she consented to re-attempt filter removal. A multidisciplinary discussion recommended deferring endovascular removal pending endoscopic removal of the ureteral component, given the protrusion of the IVC filter strut into the collecting system. She underwent a right ureteropyeloscopy to endoscopically treat the IVC filter leg that had eroded into the ureter. The IVC filter leg was visualized within the proximal ureter and noted to have a hook-like configuration protruding into the ureteric lumen (Figure 4).

Given this hooking, endovascular removal of the IVC filter could not be performed until this was treated. Retrograde pyelogram confirmed moderate hydronephrosis above the level of the erosion (Figure 3A). Ureteropyeloscopy was then performed using a flexible ureteroscope inserted into the ureter over a safety wire. The hook-like configuration was protruding into the proximal ureteric lumen 3cm below the UPJ (Figure 4). This was completely lasered using a 272µ Holmium laser fibre at 0.5J and 10Hz until the entire hook portion of the filter was obliterated to dust, leaving the straight filter leg to allow for less traumatic endovascular removal. A 7Fr 24 cm double J stent was inserted at the end of the operation.

Six weeks later the patient underwent endovascular IVC filter retrieval with right internal jugular vein access under general anaesthesia. An 18Fr x 30cm Cook vascular sheath was placed after serial dilation over wire and a 14Fr vascular sheath was advanced telescopically coaxially with the tip placed just above the level of the filter. The filter's retrieval hook was found to be embedded within the caval wall (Figure 1). Lymol (#4162) endobronchial forceps were used to dissect the fibrin cap off the tip-embedded-filter, the IVC filter hook base was engaged with forceps and the filter was removed entirely (Figure 1). Three weeks later a cystoscopy and retrograde pyelogram revealed no ureteric stricture or contrast leak and stent was removed. CT scan 4 months later revealed resolution of hydronephrosis and patients' pain had almost completely subsided.

Discussion

IVC filters are known to be effective, however, complications including penetration into organs and tissues are possible, and this risk increases with indwelling filter time[1,2,3]. The PRESERVE trial is currently underway to better understand the long-term safety of IVC filters.[4] A review of the literature reveals 16 cases of IVC filters eroding into the renal pelvis or collecting system. Of these cases, presentation and symptoms varied: 4 were asymptomatic (found incidentally)[5,6,7,8], 1 was observed during filter placement [9], 3 presented with abdominal and back or flank pain[10,8,11], 5 with hematuria with or without flank or abdominal pain[8,**Error! Bookmark not defined.**, 12], and 2 with flank pain with or without dysuria[8].

Management options vary widely in the literature. Of the 16 cases, there was no intervention in 2 [8], ureteral repositioning in 1 [8], ureteric stents in 4 [8,11], right gonadal vein ligation and filter removal in 1 **Error! Bookmark not defined.**, life-long nephrostomy to drain kidney (after failed stenting) in 1 [5], hemostatic clips placed robotically on exposed wire in 1 [6], robotic dissection to free up the prongs in 1 [7], and open excision with or without caval reconstruction (after endovascular techniques failed) in 5 [7-10, 12].

There are several learning points from our unique case. Although rare, IVC filters can erode into the ureter so should be removed as soon as thrombotic protection is no longer needed.**Error! Bookmark not defined.** This case provides a reminder to be suspicious of caval penetration if a patient with an IVC filter presents with flank pain. If a filter leg has eroded into the ureter, a patient can be symptomatic without hydronephrosis therefore removing the filter may resolve symptoms. Though treatment of IVC filter erosion into the renal pelvis and collecting system remains uncertain due to few reported cases and limited experience, combined endoscopic and endovascular approaches may be successful in avoiding the morbidity associated with a major operation.

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Figures and Tables

Fig. 1.

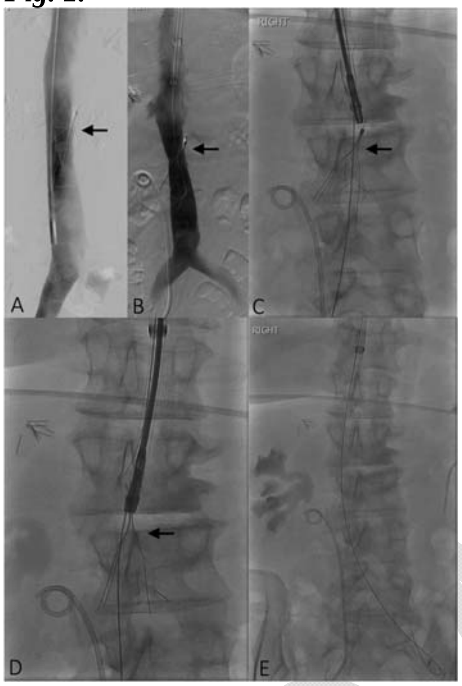


Fig. 2.

Fig. 3.

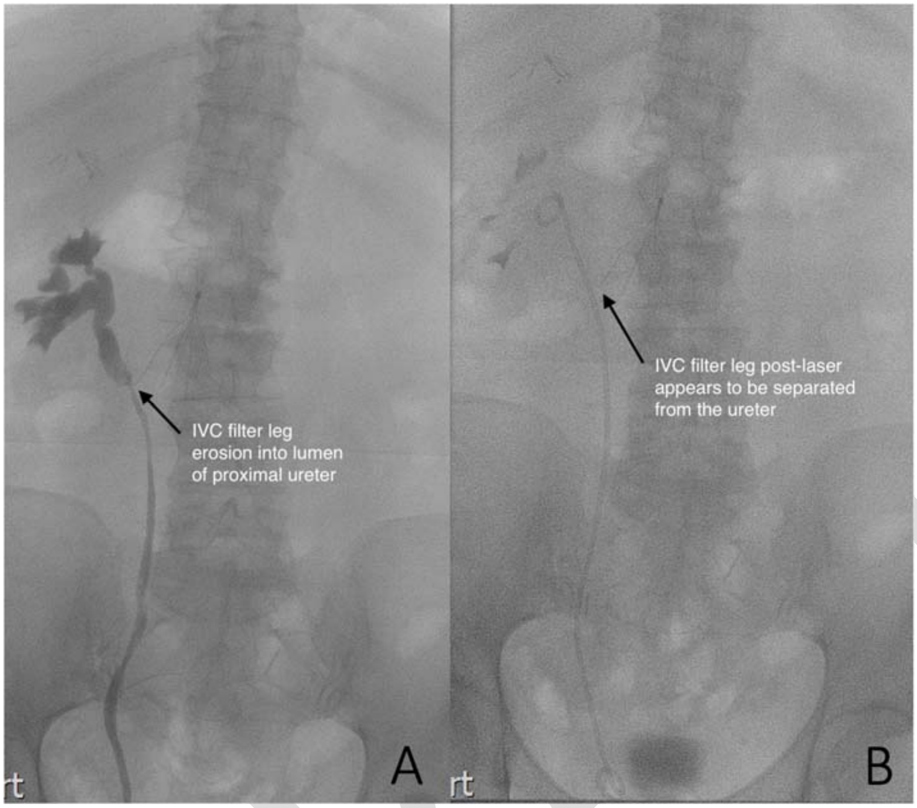
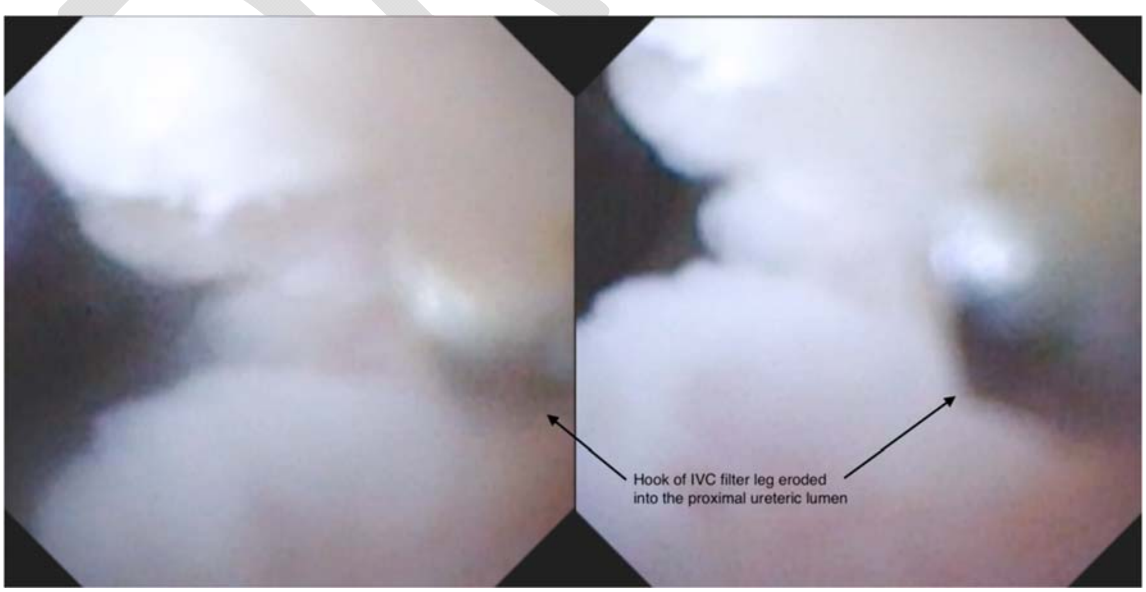

IVC filter leg
erosion into lumen
of proximal ureter
A
rt
IVC filter leg post-laser
appears to be separated
from the ureter
B
rt

Fig. 4.


Hook of IVC filter leg eroded
into the proximal ureteric lumen