CASE REPORT

Gross haematuria associated with penetration of an inferior vena cava filter into the right renal collecting system

Antonio Cusano,¹ David Rosenberg,² Peter Haddock,¹ Anoop Meraney¹¹Department of Urology, Hartford Hospital, Hartford, Connecticut, USA²Manchester, Connecticut, USA**Correspondence to**Antonio Cusano,
cusanoa@bu.edu

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SUMMARY

Inferior vena cava (IVC) filters are a viable alternative for patients with venous thromboembolic disease for whom standard anticoagulation therapy is contraindicated. Rare complications associated with their use, however, include misplacement and IVC penetration. We report a case of a 63-year-old woman who developed gross haematuria following IVC filter penetration into both the right renal collecting system and renal pelvis, for which open caval removal and reconstruction was required. This is an unusual case of IVC filter penetration causing symptomatic haematuria and requiring surgical intervention.

BACKGROUND

Implanted inferior vena cava (IVC) filters are a comparatively safe and effective means of minimising pulmonary emboli in patients for whom standard anticoagulation therapy is contraindicated.^{1–6} However, postsurgical complications (eg, filter migration, tilting, strut fracture, filter thrombosis and penetration into a range of tissues and organs) occur in 25% of cases, with 10% requiring surgical intervention.^{6–10} We present a rare case of IVC filter penetration of the renal collecting system in a 63-year-old Caucasian woman, for which corrective surgery was required.

CASE PRESENTATION

A 63-year-old woman with a medical history including high cholesterol, hypertension, atrial fibrillation, deep vein thrombosis (DVT) and pulmonary embolism, presented to our urology clinic with recurrent haematuria. While the patient was asymptomatic, prophylactic Coumadin treatment to treat her atrial fibrillation and pulmonary embolism/DVT was continued.

INVESTIGATIONS

On reviewing her medical notes, it was established that 3 years prior to presentation the patient had undergone bilateral total knee replacement surgery. Notably, a Cook Celest (http://www.cookmedical.com) IVC filter had been implanted in preparation for the knee replacement surgery. The IVC filter remained in place for 3 years as a result of the patient being lost to follow-up. Subsequent computed topography, fluoroscopic and ureterscopic imaging revealed that several prongs from the filter were protruding extravascularly in the IVC (figures 1 and 2). CT images obtained

Figure 1 Fluoroscopic images illustrating (A) before and (B) after the removal of the inferior vena cava filter.

preoperatively indicated that the IVC filter had penetrated the right ureter (figure 3).

DIFFERENTIAL DIAGNOSIS

Standard patient work up involved cystoscopy, CT imaging and urine cytology. Both cystoscopy and

Figure 2 Ureterscopic viewing of the inferior vena cava filter prong located in the renal pelvis.

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Figure 3 Preoperative CT of the inferior vena cava filter penetrating the ureter.

cytology were negative for any pathology, and no stones or tumours were detected. *In addition, there was no microscopic haematuria from the osteum at cystoscopy.* Further examination of the patient's medical history revealed that she had previously had an IVC filter implanted, raising the possibility that an IVC prong may have infiltrated into the renal pelvis. CT imaging and subsequent ureteroscopy confirmed this diagnosis.

TREATMENT

CT imaging revealed that prongs from a previously implanted IVC filter had migrated into the renal pelvis and penetrated the right renal collecting system, resulting in episodes of gross haematuria. Given the duration of time (3 years) between her original IVC placement and progression, endovascular stent removal and caval reconstruction were performed. Intraoperatively, the patient underwent a right ureteral stent exchange followed by endovascular removal of the IVC filter (figure 1A, B). A retrograde pyelogram revealed a large renal pelvis; there was no extravasation of contrast from the pelvis, ureter or from any of the rest of the visualised collecting system. There was excellent visualisation of the renal calices, which demonstrated delicate architecture and no hydronephrosis. A 6 Fr×22 cm double-J ureteral stent was placed in good position within the right ureter, and the case was terminated without complication.

OUTCOME AND FOLLOW-UP

At 3 months following surgical intervention, the patient did not report any further episodes of gross haematuria, and denied any flank pain or urinary symptoms. The prior haematuria was believed to have occurred as a direct result of IVC filter erosion. The patient continues to receive urological follow-up when required.

DISCUSSION

Venous thromboembolic disease is a significant cause of morbidity and mortality in the USA.^{2 11 12} In patients with venous thromboembolic disease, in whom the use of pharmacological anticoagulants is contraindicated, IVC filters provide a useful means to capture emboli. However, their use is also associated with a number of potential complications that typically arise as a result of IVC misplacement, erosion or tissue penetration. IVC filter penetration of surrounding tissues typically occurs over extended periods of time^{9 13} in patients, who can often be asymptomatic.¹⁴

Asymptomatic ureteral impingement and symptomatic hydronephrosis caused by the penetration of an IVC filter have been previously described.^{15 16} In most cases, a plain abdominal radiograph and CT imaging reveal the tissues that are affected, while an inferior vena cavogram prior to surgery is useful in identifying the venous anatomy. The restorative treatment of choice depends on the tissue and/or organs involved, and complete removal of the filter may not always be possible. Since the filter prongs penetrated the collecting system, a venotomy was required in our patient to avoid fistula formation between the collecting and venous systems.

In general, IVC filters are durable and safe. Across a range of IVC filters, the overall complication rate is 0.3% of procedures.¹⁴ These complications are related to filter deployment, filter retrieval and filter fracture and migration. Across a range of filter types, the incidence of IVC penetration ranges from 40% to 95%.^{10 17} In our case, the IVC filter in question was a Cook Select IVC filter. Zhou *et al*¹⁸ have previously reported a high rate of penetration in patients receiving this filter, with limb penetration in 86.1% of patients. Of note, however, is that patients with IVC penetration may present with an array of symptomatology. Since symptomatic IVC penetration is uncommon, clinical awareness is necessary in successfully detecting IVC filter-related complications.

Learning points

- ▶ Postsurgical complications associated with the use of inferior vena cava (IVC) filters include filter migration, tilting, strut fracture, penetration and IVC filter thrombosis.
- ▶ While filter struts should be contained within the IVC, in our case they protruded extravascularly into the ureter from the IVC, causing haematuria.
- ▶ IVC penetration of surrounding tissues should be considered as a causative factor in patients presenting with gross, recurrent haematuria.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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