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Duodenal perforation by an inferior vena cava filter in a polyarteritis nodosa sufferer

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ABSTRACT

INTRODUCTION: Inferior vena cava (IVC) filters are currently used in the management of pulmonary embolism (PE) and lower limb venous thromboembolism (VTE). Despite their widespread use, associated complications including duodenal perforation have been reported.

PRESENTATION OF CASE: We describe a unique case of duodenal perforation 2 years post IVC filter insertion in a patient with polyarteritis nodosa (steroid dependent) and thrombocytopenia secondary to chronic cyclophosphamide use.

DISCUSSION: IVC filters are commonly employed in the management of VTE. Associated complications have been reported including filter migration, fracture and adjacent organ perforation. There is growing consensus that temporary IVC filters should be retrieved as soon as possible with dedicated IVC filter registries to ensure patients are not lost to follow-up post insertion.

CONCLUSION: Duodenal perforation is a rare complication of IVC filter insertion. This case however illustrates the potentially catastrophic consequences of a relatively common endovascular procedure. Caution should be taken when considering the insertion of IVC filters in patients with longstanding vasculopathies who are on immunosuppressants.

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1. Introduction

Inferior vena cava (IVC) filters are currently used in the management of pulmonary embolism (PE) and lower limb venous thromboembolism. Their role is limited to patients at risk of life-threatening bleeding and those with recurrent PE despite therapeutic anticoagulation. Despite their widespread use, associated complications have been noted post insertion including IVC filter migration, fragment embolisation and erosion through the IVC wall with penetration of adjacent structures (e.g. aorta, duodenum). We describe a unique case of duodenal perforation 2 years post IVC filter insertion in a patient with polyarteritis nodosa (steroid dependent) and thrombocytopenia secondary to chronic cyclophosphamide use.

2. Presentation of case report

A 60 year old female presented to the Emergency Department (ED) with severe epigastric pain and bleeding into her colostomy bag. This is on a background of a two year history

of Polyarteritis Nodosa (steroid dependent) and a recent Hartmann's procedure for perforated diverticular disease. She has had a number of complications associated with her PAN including persistent thrombocytopenia due to previous cyclophosphamide use requiring regular platelet transfusions every three months and multiple artery aneurysms (common hepatic, splenic, intercostal, inferior mesenteric and bilateral common iliac) requiring numerous endovascular coiling and embolisation procedures previously. One year prior to presentation, she developed a pulmonary embolism and left leg DVT concurrently with life-threatening aneurysmal bleeding from her intercostal and common hepatic arteries. At the time, a retrievable IVC filter (Cook Select) was inserted. Anticoagulation was not initiated due to her history of severe aneurysmal bleeding. She was lost to follow-up.

On arrival to ED, she was hypotensive with a systolic blood pressure of 65 mmHg. Her blood tests revealed severe thrombocytopenia at $40 \times 10^9/L$ (reference range: $150\text{--}450 \times 10^9/L$) and a haemoglobin of 93 g/L (reference range: 120–150 g/L). She was fluid resuscitated and was transfused packed red blood cells and platelets. An abdominal computed tomography (CT) scan revealed IVC filter limb extension into the duodenum (Figs. 1 and 2). Urgent Esophagogastroduodenoscopy (EGD) revealed that the filter limb had perforated the duodenum at D2. After stabilisation, she was taken for a laparotomy with removal of IVC filter and repair of

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Fig. 1. CT abdomen (coronal view) showing duodenal penetration by right lateral IVC filter limb.

IVC and duodenal defect. The vascular surgery, general surgery and interventional radiology teams were involved in a hybrid operating theatre.

Intraoperatively, it was noted that she had extremely friable tissues due to her PAN and long term steroid use with hemostasis being difficult to achieve. Multiple attempts to retrieve the IVC filter via the right internal jugular route were made without success. An endovascular balloon catheter was inserted into the infrarenal IVC via a percutaneous femoral puncture to control bleeding. It was noted at this stage that this balloon had caused a split in her infrarenal IVC with periods of severe hypotension and an episode of ventricular fibrillation that responded to defibrillation. Hemostasis was achieved with a combination of external



Fig. 2. CT abdomen (axial view) showing duodenal penetration by right lateral IVC filter limb.

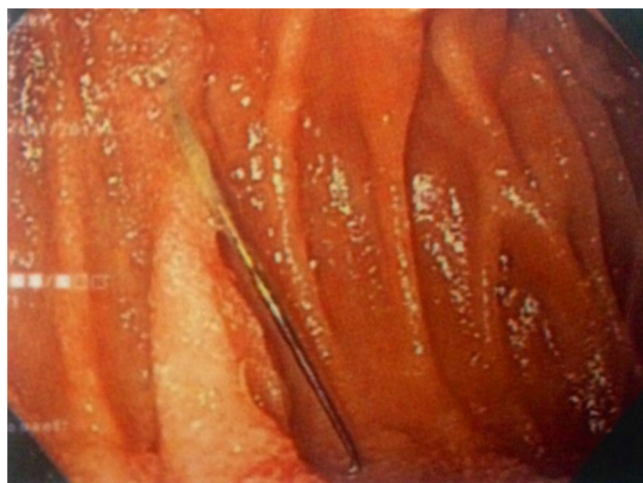


Fig. 3. Surveillance esophagogastroduodenoscopy findings showing IVC filter perforation at D2 (4 weeks after initial presentation).

and endovascular balloon pressure, IVC ligation, direct suture repair as well as multiple blood products. The planned removal of IVC filter was abandoned. Her abdomen was packed due to the difficult haemostasis and she was taken to the intensive care unit. A re-look laparotomy the following day revealed no further bleeding; the packs were removed and her abdomen was closed. Her post-operative recovery was characterised by multiple platelet transfusions (>20 units). A surveillance EGD revealed that the IVC filter limb had not moved any further into the duodenum (Fig. 3). She recovered and was weaned off her steroids under the guidance of the immunology team to optimise any further surgery. She was discharged 3 months after her initial presentation.

Considering previous attempts to remove the IVC in its entirety had been unsuccessful, it was decided that the most appropriate solution was to remove the IVC limbs that had perforated her duodenum whilst leaving the filter portion within the IVC in situ. She was readmitted for the excision of IVC filter limbs 4 months after her initial presentation with pre-operative platelet transfusion to reduce her risk of operative bleeding. The IVC filter limbs were excised as flush to the IVC as possible and the duodenal defect was repaired. Her post-operative course was unremarkable and she was discharged on post-operative day 10. Repeat imaging 2 months post operation revealed no evidence of further IVC filter migration. Her thrombocytopenia stabilised to the point where she has been platelet transfusion free since the operation. She is to remain on long term immunology and surgical follow-up surveillance.

3. Discussion

The concept of inferior vena cava interruption was first introduced in 1865 by Trousseau.¹ Insertion of IVC filters was pioneered in the 1960s but was used infrequently until Greenfield pioneered his percutaneous technique in 1973.¹ Currently, they are used in patients at risk of life-threatening bleeding (e.g. trauma patients, thrombocytopenia) and those with recurrent PE despite therapeutic anticoagulation.² There are numerous brands of filters on the market however they can be classified as either permanent or temporary. Once deployed, permanent filters are left in situ and are incorporated within the vein wall. Temporary or retrievable filters are removed within a certain time frame when their use is no longer required.

IVC filters are not immune to complications with long term complications including filter thrombosis, migration, filter fracture, fragment embolisation and filter erosion through the IVC wall

with penetration of adjacent organs.³ Whilst instances of duodenal perforation post IVC filter insertion have been reported in the literature, to our knowledge this is the first reported case in a vasculitic patient on long term corticosteroids and concurrent thrombocytopenia. Polyarteritis Nodosa, an autoimmune necrotising vasculitis of medium sized arteries that can cause aneurysms, strictures and thrombus formation; provided unique challenges in this instance.

Whilst PAN affects medium sized arteries and is unlikely to affect the inferior vena cava, the fact that this patient was on long term corticosteroids and had been on numerous immunosuppressants previously would have contributed significantly to vessel wall friability. This was a significant risk factor in the filter migrating and eroding through the IVC. A 2013 systematic review on the effects of steroids on wound healing revealed that chronic corticosteroid use (>30 days) increased the risk of wound complications by two to five times.⁴ This included increased rates of wound infection and dehiscence as well as reduced tissue tensile strength. On a cellular basis, it has been suggested that corticosteroids increase tissue fragility by decreasing collagen accumulation and suppressing platelet and myofibroblast activity.⁴ This patient's cyclophosphamide induced thrombocytopenia also complicated tissue handling and increased the bleeding risk during attempts to remove the filter.

Overall, there has been a paucity of quality evidence on when temporary IVC filters should be retrieved.⁵ A 2013 audit by the British Society of Interventional Radiology suggested that successful retrieval was significantly reduced for filters left in situ for greater than nine weeks versus those with a shorter dwell time.⁶ They hypothesised that this was due to a higher risk of device incorporation in the caval wall.⁶ Retrieval rates from different institutions vary with some being as low as 34%.⁷ There is growing consensus, however, that temporary IVC filters should be retrieved as soon as possible with dedicated IVC filter registries to ensure patients are not lost to follow-up post insertion.^{6,8}

4. Conclusion

Duodenal perforation is a rare complication of IVC filter insertion. This case however illustrates the potentially catastrophic consequences of a relatively common endovascular procedure. Caution should be taken when considering the insertion of IVC filters in patients with longstanding vasculopathies who are on immunosuppressants. Whilst filters have a role in the management

of venous thromboembolism, they should be retrieved as soon as possible if alternative methods of treatment are possible. To better analyse the risks associated with IVC filter placement, greater research is required in this field and should be done with a large scale randomised trial.

Conflict of interest

None.

Funding

None.

Ethical approval

Consent has been obtained from the patient via written form.

Author contributions

Anthony Dat, John Quinn, Shinn Yeung: Conceived study design, data collection and analysis, writing, editing, approval of final draft.

Andrew McCann: Involved with writing/editing of manuscript and approval of final draft.

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