CASE REPORT

Expectoration of an inferior vena cava filter strut

Stephen Mehanni,¹ Meghan Higley,² Ryan C Schenning³¹University of California San Francisco, Hospital Medicine, San Francisco, California, USA²Department of Diagnostic Radiology, Oregon Health and Science University, Portland, Oregon, USA³Department of Vascular and Interventional Radiology, Oregon Health and Science University, Portland, Oregon, USA

Correspondence to

Dr Stephen Mehanni,
stephen.mehanni@ucsf.edu

Accepted 10 December 2016

SUMMARY

Inferior vena cava (IVC) filter use is widespread in patients with venous thromboembolism (VTE) and temporary contraindication to anticoagulation, though timely removal is often not performed. We report the case of an expectoration of an IVC filter strut. Review of the patient's prior imaging confirmed an infrarenal Bard G2 filter with an absent strut, which was visualised in the left lung base. The strut was presumed to have embolised to a pulmonary artery branch and eroded into an adjacent bronchus. Subsequent fluoroscopically guided filter retrieval was successful. The incidence of IVC filter fractures increases with longer dwell times. Filter fragment embolisation has resulted in major adverse events, including sudden death and cardiac tamponade. Recent evidence has suggested that retrieval of IVC filters with prolonged dwell times is feasible and safe. This report brings awareness to the range of complications with indwelling IVC filters, and highlights the importance of timely removal.

BACKGROUND

The use of retrievable inferior vena cava (IVC) filters is widespread in patients with documented venous thromboembolism (VTE) and a temporary contraindication to anticoagulation. Timely removal of the filter is often not performed, resulting in a number of late complications, local and embolic.

CASE PRESENTATION

We report the case of a man aged 49 years who presented after expectoration of an IVC filter strut. Medical history was significant for short bowel syndrome following a remote episode of diverticulitis which was complicated by abscesses, spontaneous bowel perforation and enterocutaneous fistulae requiring multiple abdominal surgeries. An infrarenal Bard G2 filter (Bard Peripheral Vascular, Tempe, Arizona, USA) was placed at an outside institution in 2005, subsequently removed and replaced in 2006. This was in the setting of provoked deep venous thromboses during prolonged hospitalisations and numerous abdominal surgeries. The second Bard filter was not removed, as the patient was felt to be too medically fragile to tolerate a potential complication associated with filter removal. Eight years following placement, the patient presented to our institution's emergency department after expectoration of a 5 cm IVC filter strut, which he brought with him (figure 1A). He reported 2 weeks of preceding symptoms, with dry cough and a sensation that a bone was caught in his throat. He denied history of haemoptysis or dyspnoea.

INVESTIGATIONS

On retrospective review of his imaging, the IVC filter appeared intact on CT scan of the abdomen 4 years earlier, but was missing a strut 13 months prior (figure 1B,C). The strut was presumptively identified in the left lung base on axial CT and fluoroscopic spot images obtained for other reasons during the year prior to the expectoration event (figure 2A,B). After expectoration, a contrast CT of the chest showed no evidence of pulmonary abnormalities, including pseudoaneurysm, arteriovenous fistulae or additional fractured IVC filter components.

TREATMENT

After discussions with vascular surgery and interventional radiology, the risk of subsequent filter fracture and embolisation was felt to be high and fluoroscopy guided filter retrieval was pursued. Given the high risk and technical complexity inherent to the procedure, the patient was prepped for the possibility of emergent cardiac surgery. Standard technique with vascular sheath and snare device was ineffective, as the filter was tilted and the retrieval hook was adherent to the IVC wall. This necessitated adjunctive retrieval techniques which included the use of endobronchial forceps and construction of a snare through the apex of the filter.

OUTCOME AND FOLLOW-UP

The procedure was ultimately successful, without immediate or late complications. The IVC filter was removed intact, minus the previously fractured strut. There was no bleeding or contrast extravasation on postfilter removal digital subtraction cavogram.

DISCUSSION

Several important features of this case deserve highlighting, including the time-dependent nature of IVC filter complications, and the feasibility of filter retrieval in this setting.

The presumed sequence of events in our case included filter fracture, embolisation of the fractured strut to a distal pulmonary artery branch, erosion into the lung parenchyma and adjacent bronchus, with subsequent expectoration. Several reviews have described a high incidence of Bard filter fractures, with one institution reporting a 12% observed fracture rate.¹ The incidence of fracture has been shown to increase with longer filter dwell times, with reported incidence 1.9% at <180 days, and 30.8% at >3 years.¹ A separate review of the Bard G2 filter estimated a 5-year fracture prevalence of 38%.² When filter fragments

CrossMark

To cite: Mehanni S, Higley M, Schenning RC. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2016-218159

Figure 1 (A) Photograph provided by the patient of the expectorated metallic fragment. (B) Three-dimensional reconstruction of the IVC filter 13 months prior demonstrates the absence of the right anterolateral linear strut. (C) Source axial CT image of the abdomen in bone window is also provided.

Figure 2 (A) Axial CT through the lung bases 13 months prior to the expectoration event confirms a linear metallic density in the left medial lung base (arrow), visible only on 2.5 mm slices thickness reconstructions. (B) Coned-down and aggressively windowed spot fluoroscopic view 6 months prior demonstrates a 2–3 cm linear metallic density projecting over the heart (arrow).

embolise, they tend to rest in the right ventricle or pulmonary artery branches, and have resulted in major adverse events, including sudden death and cardiac tamponade.^{1 3 4}

While filter fracture with embolisation occurred in our case, it is worth highlighting the range of adverse events reported with longstanding IVC filters, including thrombotic, thromboembolic and mechanical complications.⁵ Notably, IVC thrombosis and lower extremity deep venous thrombosis rates are increased.^{5 6} Mechanical complications of filters left in situ for >50 days include adherence to the IVC wall, and displacement or tilting.⁵ Both of these occurred in our case, adding complexity to filter retrieval. In response to the numerous reports of IVC filter complications, the US Food and Drug Administration has issued safety communications urging clinicians to consider removing filters as soon as possible.⁷ The risks and benefits of removal have been suggested to be most favourable 29–54 days after implantation.⁸

It is accepted that early filter removal is preferable, but a common clinical question remains. Do the benefits of filter retrieval outweigh the risks in patients with longstanding IVC filters? In our case, a filter-related complication was the impetus for pursuing complex retrieval. Recent evidence suggests retrieval of IVC filters with prolonged dwell times is feasible

and safe with modern techniques.⁹ While adjunctive retrieval techniques are more likely to be necessary, high rates of technical success can be achieved, and rates of adverse events do not appear increased.⁹

This report brings awareness to the range of clinical complications observed with prolonged indwelling IVC filters. It highlights the importance of timely retrieval of IVC filters. Finally, it bolsters recent evidence for the safety and feasibility of filter retrieval even after prolonged dwell times.

Learning points

- ▶ A wide range of local and embolic complications is observed with indwelling inferior vena cava (IVC) filters.
- ▶ Timely retrieval of IVC filters is important.
- ▶ Recent evidence suggests filter retrieval is safe and feasible even after prolonged dwell times.

Acknowledgements The authors thank Oregon Health and Science University's Diagnostic and Interventional Radiology departments for their assistance with this report.

Contributors SM contributed to the conception and drafting of the manuscript, and agrees to be accountable for the article and to ensure that all questions regarding the accuracy or integrity of the article are investigated and resolved. MH and RCS contributed to the design, acquisition, analysis and interpretation of data, revising the article critically, and approval of the final version to be published.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Vijay K, Hughes JA, Burdette AS, *et al.* Fractured bard recovery, G2, and G2 express inferior vena cava filters: incidence, clinical consequences, and outcomes of removal attempts. *J Vasc Interv Radiol* 2012;23:188–94.
- 2 An T, Moon E, Bullen J, *et al.* Prevalence and clinical consequences of fracture and fragment migration of the bard G2 filter: imaging and clinical follow-up in 684 implantations. *J Vasc Interv Radiol* 2014;25:941–8.
- 3 Dinglasan LA, Trerotola SO, Shlansky-Goldberg RD, *et al.* Removal of fractured inferior vena cava filters: feasibility and outcomes. *J Vasc Interv Radiol* 2012;23:181–7.
- 4 Nicholson W, Nicholson WJ, Tolerico P, *et al.* Prevalence of fracture and fragment embolization of bard retrievable vena cava filters and clinical implications including cardiac perforation and tamponade. *Arch Intern Med* 2010;170:1827–31.
- 5 Ho KM, Tan JA, Burrell M, *et al.* Venous thrombotic, thromboembolic, and mechanical complications after retrievable inferior vena cava filters for major trauma. *Br J Anaesth* 2015;114:63–9.
- 6 Decousus H, Leizorovicz A, Parent F, *et al.* A clinical trial of vena caval filters in the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis. Prévention du Risque d'Embolie Pulmonaire par Interruption Cave Study Group. *N Engl J Med* 1998;338:409–15.
- 7 US Food and Drug Administration. Removing Retrievable Inferior Vena Cava Filters: FDA Safety Communication. *Fda.gov*. 2014 (cited 24 November 2016). <http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm396377.htm>.
- 8 Morales JP, Li X, Irony TZ, *et al.* Decision analysis of retrievable inferior vena cava filters in patients without pulmonary embolism. *J Vasc Surg Venous Lymphat Disord* 2013;1:376–84.
- 9 Desai KR, Lewandowski RJ, Salem R, *et al.* Retrieval of inferior vena cava filters with prolonged dwell time: a single-center experience in 648 retrieval procedures. *JAMA Intern Med* 2015;175:1572.

Copyright 2016 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow