DR. WARREN CLEMENTS (Orcid ID : 0000-0003-1859-5850)

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Prolonged balloon tamponade in the initial management of inferior vena cava injury following complicated filter retrieval, without the need for surgery.

Jonathan TL Lee¹

Gerard S Goh^{1,2}

Tim Joseph¹

Jim Koukounaras¹

Tuan Phan¹

Warren Clements^{1,2}

¹Department of Radiology, Alfred Health, VIC, Australia

²Monash University, VIC, Australia

Corresponding Author:

Dr Warren Clements

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Department of Radiology, Alfred Health

55 Commercial Road, VIC, 3004

E-mail: w.clements@alfred.org.au

Telephone: +61 3 90762118

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Abstract

Advanced techniques have been described to remove embedded inferior vena cava (IVC) filters including the loop snare and modified loop snare (Hangman) techniques. Retrieval of embedded filters have been associated with higher rates of complications including IVC injury and stenosis. We report two challenging embedded retrievals complicated by IVC injury and haemorrhage.

Haemostasis was successfully achieved with prolonged balloon tamponade, suggesting that injury to the IVC during filter retrieval may not need urgent surgery. However, both patients received short-term complications related to caval thrombosis and patients in this cohort should be closely observed after retrieval. These cases support rigorous attention to filter indication and follow-up.

Introduction

With the growing use of retrievable inferior vena cava (IVC) filters, there has been a rise in filter-related complications. Whilst the majority of retrievals are uneventful, when the filter tip becomes embedded then advanced endovascular methods such as the loop snare and Hangman techniques may be employed to increase retrieval success¹⁻³. Retrieval of embedded filters has been associated with higher complication rates⁴ and these have been treated with a variety of techniques including endovascular balloon tamponade, stent placement, and open surgery⁴⁻⁶. We report two challenging retrievals complicated by IVC injury which were managed via endovascular methods.

Case 1

A 70-year-old female received an IVC filter (Celect Platinum, Cook Medical, USA) following pulmonary embolus requiring open thrombectomy. There was a dwell time of 6 months upon retrieval. A Gunther-tulip retrieval kit was used (Cook Medical). Cavography demonstrated a tilted filter with penetrating legs (figure 1a). A loop snare¹ technique was successful, however upon

retrieval, venography showed a pseudoaneurysm and haemorrhage (figure 1b). Bleeding ceased after inflation of a 16x40mm balloon across the injured segment for 20 minutes (figures 1c and 1d). Post-procedure computed tomography (CT) showed minimal perivascular haematoma (figure 2a and 2b). Anticoagulation was not continued after the filter retrieval.

Two weeks following the injury, the patient re-presented with abdominal pain and bilateral lower limb oedema. A CT venogram revealed IVC and iliofemoral vein thrombosis (figure 2c). She was managed with warfarin therapy and compression stockings, with significant improvement in her lower limb swelling at 10 months post-injury and no venous claudication.

Case 2

A 30-year-old male received an IVC filter (Celect Platinum) for prophylaxis in the setting of cervical spine fracture-dislocation and epidural haematoma. There was an 18-month dwell time after initially being lost to follow-up. Cavography demonstrated a tilted and embedded filter (figure 3a). The Hangman technique² was used initially (figure 3b), but the filter could not be retrieved. A Loop snare¹ was then applied in addition to the Hangman loop. Traction on both wires with advancement of the sheath was successful in removing the filter, but venography demonstrated haemorrhage into the retroperitoneum through a caval injury (figure 4a). A Coda balloon (Cook Medical) was inflated across the injured segment for 5 minutes (figure 4b) and repeat cavography demonstrated no further bleeding (figure 4c). CT confirmed a moderate volume of retroperitoneal haematoma (figure 5a and 5b), but transfusion was not required. Therapeutic anticoagulation was started after the injury and continued for a planned period of 6 months.

Over the next 2 months the patient experienced bilateral leg swelling and mild venous claudication, and venography showed development of prominent collaterals around a stenotic infrarenal cava (figure 5c). A multi-disciplinary decision was made, in conjunction with the patient, to not proceed with IVC stent insertion as the patients' symptoms improved and his venous claudication slowly ceased. The IVC eventually occluded, but the patient was asymptomatic from collateral flow at 1 year following filter removal and remains on anticoagulation.

Discussion

Inferior vena cava filters have an important role in the prevention of pulmonary embolism, but with a growing number of filter insertions and inconsistent follow-up, stakeholders should be wary of an increase in complex filter retrievals. The risk of attempting complex retrieval should be deliberated, as both leaving a filter in-situ and iatrogenic injury on removal may result in complications and similar central venous symptoms^{3,4}.

The incidence of IVC pseudoaneurysm secondary to filter retrieval has rarely been reported in the literature beyond case reports or case series. In a series of 50 cases with complex retrieval, five were reported to have a small focal pseudoaneurysm (<2 cm)⁶. Lesne also described pseudoaneurysm and the use of balloon tamponade to control haemorrhage following filter removal in a case report⁵.

In both the cases from this series, there was subsequent caval thrombosis and occlusion with clinical symptoms of central venous stenosis, highlighting the need to carefully monitor after discharge. This was in spite of anticoagulation being started post-procedure in case 2. These patients are also at risk of developing lower limb and pelvic deep venous thrombosis, including subsequent post-thrombotic syndrome. However, these risks exist even if the retrieval attempt is abandoned and the embedded filter is left in-situ, and overall, many of these patients remain on long-term anticoagulation despite a lack of long-term prospective studies⁷.

In the cohort of patients with persisting post-thrombotic symptoms, stent or stent-graft placement is an option with reported patency rates upwards of 80% at 12 months^{8,9}. Longer-term outcomes of stent placement in the inferior vena cava are currently lacking and limits their routine use.

Practitioners should be reminded that indications for IVC filter placement need to be reviewed on a case-by-case basis, and a greater effort should be made to remove filters as soon as they are no longer indicated in order to reduce the incidence of device-related adverse events.

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Figure legends

Figure 1

The inferior vena cava filter is tilted and there are penetrating legs (a). Post-retrieval there is a pseudoaneurysm and haemorrhage (b). Inflation of 16 x 40 mm balloon across the injured segment (c). Cessation of haemorrhage after inflation of balloon for 20 minutes (d).

Figure 2

a) Axial and b) coronal reformats of post-procedure computed tomography (CT) showing small volume of retroperitoneal haematoma (arrows) but patent inferior vena cava. Coronal MIP CT venogram (c) reformats showing thrombosis of the infrarenal inferior vena cava (arrow) which occurred 2 weeks after the procedure.

Figure 3

Venogram shows embedded hook and penetrating legs (a). Hangman technique was initially used to snare the filter (b).

Figure 4

Post-retrieval there is caval injury and haemorrhage into the retroperitoneum (a). Coda balloon inflated across the injured segment (b). No further haemorrhage post-balloon inflation and good inferior vena cava flow (c).

Figure 5

a) Axial and b) coronal computed tomography (CT) post-procedure showing moderate volume of retroperitoneal haematoma but patent inferior vena cava (arrows). Venogram 2 months post-procedure (c) shows stenosis of the injured caval segment (arrow) and prominent collaterals (open arrow)

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Author/s:

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