Introduction

The relationship between deep venous thrombosis (DVT) and subsequent development of pulmonary embolism (PE) is well established and placement of a permanent inferior vena cava (IVC) filter is more effective in preventing symptomatic PE than anticoagulation alone. However, patients who had permanent IVC filters have an increased risk of lower limb DVT with no survival benefit. So optional IVC filters are recommended, since they can be removed or left in the vena cava permanently.

Retrieval of vena cava filters is a valuable addition to the management of DVT. However, retrieval failure occurs due to technical difficulties. This is a case of successful retrieval of OptEase filter using the balloon-trapped technique after failure of the standard retrieval techniques.

Case

An 82-year-old man presented with acute onset of swelling and pain of his left leg. Computed tomography revealed proximal DVT. He was administered a therapeutic dose of heparin, but the symptoms continued to worsen. Catheter-directed thrombolysis was performed, and then an OptEase filter was placed prophylactically against PE.

Seven days after successful catheter-directed thrombolysis, we tried to retrieve the IVC filter. After sterile preparation and draping of the patient, local anesthetic (1% Lidocaine) was injected in the right groin. Then, the right femoral vein was cannulated using 10 French sheath (23 cm, Cordis) using Seldinger technique. The standard technique of retrieval was tried several times, but it failed to catch the hook of the filter. Therefore, we used the buddy wire technique for IVC filter retrieval; however, we were not successful in its retrieval. So, the failure was thought to occur because the hook of the filter was close to the vena caval wall. An angled guide wire (0.035 inch, Terumo) was passed through the filter and then a 4.0 mm...
(diameter) by 20mm (length) over-the-wire type percutaneous transluminal angioplasty (PTA) balloon (Synergy™, Boston Scientific, USA) was delivered between the struts of the basket filter. After that, the balloon was inflated at nominal pressure to trap it between the struts of the lower basket. After that, the filter was moved about 10mm by pulling the trapped balloon catheter, the guiding catheter, and guide wire in the downward direction (Fig. 1A). After changing the position of the filter, we deflated the PTA balloon catheter and removed it with a guidewire. Then the filter was removed successfully using the standard technique (Fig. 1B and 1C). The procedure did not result in any complications. The patient was discharged under Warfarin sodium treatment.

**DISCUSSION**

IVC filter placement in patients with DVT with or without pulmonary embolism protects against short-term and long-term development of PE. However, permanent filter placement can result in chronic complications such as filter occlusion and increased risk of DVT. The Prevention du risque d’embolie pulmonaire par interruption cave (PREPIC) study suggests that in the case of patients in whom short-term prevention of PE is required, it might be more attractive to use a retrievable filter over a permanent one, since it helps avoid the long-term complications associated with a permanent filter. Therefore, the demand for retrievable IVC filters, which have high
rates of successful retrieval, has increased.\(^3\)\)

Currently, the following 3 retrievable IVC filters for temporary insertion are available in Japan: Günther Tulip filter (Vena Cava MReye Filter Set, William Cook Europe); ALN filter (ALN Implants Chirurgicaux, Ghi sonaccia, France); and OptEase filter (Cordis, Roden, Netherlands). Retrieval failure due to technical reasons is a commonly occurring problem. In case of the use of optional filters other than the OptEase filter, particularly in the case of the Günther Tulip filter, numerous reports have been published on alternative techniques (e.g., snare-over-guidewire loop technique).\(^4\)\(^-\)\(^6\)\)

Failure to retrieve the OptEase filter owing to technical reasons has been reported in 2 cases by using the expression “potentially retrieval” filter.\(^7\) The structural design of the OptEase filter facilitates retrieval since the retrieval hook is supposed to be at the center of the IVC. However, in some cases, as in the case of lumbar scoliosis, the course of IVC may be curved. Therefore, in such cases, the retrieval hook may be in contact with the IVC wall, thereby making filter retrieval impossible. One possible means of resolving this problem is using the buddy wire technique. In this technique, a stiff guidewire is passed through the OptEase filter and positioned parallel to the major axis of the vena cava. In this way, the retrieval hook is separated from the venous wall, thus enabling easier snaring; 4 this appears to be a simple and effective technique. However, in practice, the operator should have some level of experience or skill to perform this technique successfully.

In balloon trapping presented in this report, a guidewire is passed through the OptEase filter, and then the PTA balloon is inflated between the upper and lower baskets. Then, the trapped balloon in the lower basket is pulled downward to change the position of the filter, thus enabling snaring of the retrieval hook. In this technique, the guidewire can be easily passed, and complex manipulation is not required, as opposed to that in the buddy wire technique in which the wire needs to be passed through the opposite side of the upper region after passage between the hook and the adjacent venous wall. One advantage of pulling in the downward direction is prevention of injury to the IVC wall caused by the upward directed barbs of the OptEase filter, which are designed to provide resistance to migration. Moreover, this maneuver enables the guiding catheter to be as close as possible to the filter, thereby resulting in safer filter retrieval.

This technique enabled safe and reliable retrieval of the filter after the filter could not be retrieved by applying the standard technique. Moreover, the retrieved filters were intact. This technique is promising because it is simpler, more reliable, and safer than the buddy wire technique for filter retrieval. Balloon trapping is an alternative technique that can be used by interventionists who are unfamiliar with the buddy wire technique. To the best of our knowledge, we may be the first to use balloon trapping in the successful retrieval of the OptEase filter.

In case of failure of the standard technique for OptEase filter retrieval, balloon trapping is an effective and a safe retrieval technique that can be performed using commonly available tools and is familiar to most interventionists.

**References**

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