



A Case Report of Endovascular Removal of Celect Inferior Vena Cava Filter after 1843 Days of Indwelling Time with Review of Literature

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Abstract

As the residence time increases, filter retrieval becomes more difficult. We present a case of Celect IVC filter (Cook Medical Inc, American) with dwell time of 1,843 days, treated successfully with endovascular filter removal. The use of IVCF should strictly comply with the indications and it is vital to retrieving filters during the retrieval time window, which could minimize the risk of IVCFs related complications.

Keywords: IVCF; Retrieval; Long indwelling time

Case Presentation

The patient is a 53-year-old female, she has a history of bilateral deep vein thrombosis of lower limbs five years ago and received Celect Inferior Vena Cava (IVC) filter (Cook Medical Inc, American) placement at our hospital on May 12th, 2014. The patient requested to remove the IVCF strongly. After discussion in the department, the CTV image of the patient's lower limbs showed that the filter support foot protrudes outside the IVC (Figure 1), which may damage the surrounding organs and cause serious complications. Given the strong willingness of the patient to remove the filter, we decided to remove the filter finally. The patient was informed about the risks of surgery and the possibility of failure to remove the filter in detail and signed the informed consent for the operation. We performed the surgery on May 29th, 2019.

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Description of the procedure

The surgery was performed under local anesthesia. A 6 Fr × 12 cm Fast-Cath introducer sheath (Abbott Laboratories, America, Chicago) was introduced through the right internal jugular vein. The 4Fr × 100 cm Vertebral catheter (SCW Medicath Ltd, China, Shenzhen) was introduced for IVC angiography and the angiographic image showed the filter support foot was located outside the IVC, but the filter position was still in the middle and the shape was normal (Figure 2A). The BARD Snare Retrieval Kit (BD, America, State of New Jersey) was used to catch the filter retrieval hook (Figure 2B). After the capture succeeds, the filter was retrieved into the sheath (Figure 2C). The 4



Figure 1: CTV showed that the filter support foot protrudes outside the IVC.

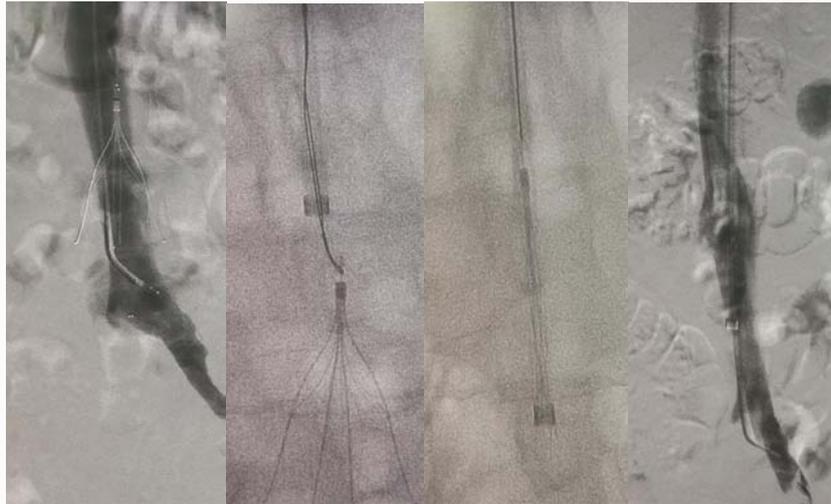


Figure 2: A) Filter support B) The retrieval C) The filter D) Angiography foot was located outside hoop caught the filter was retrieved into the after the filter retrieval, the IVC hook sheath no obvious damage to IVC.



Figure 3: The shape of Celect filter was complete and small amount of tissue residue was visible.

Fr Vertebral catheter was introduced for IVC angiography again after the filter was taken out and no obvious damage was seen (Figure 2D). The shape of the Celect filter was complete with no defect or fracture. A small amount of tissue residue was visible around the retrieval hook and the top of the filter which was sent for medical examination (Figure 3). The pathological results showed fibrous tissue hyperplasia, vitrification with calcification, and remote hemorrhage.

Discussion

Deep Vein Thrombosis (DVT) is a disorder of venous return caused by abnormal blood clotting in the deep veins of the lower extremities, usually manifested as swelling, pain of unilateral limbs. The most dangerous complication of DVT is Pulmonary Thromboembolism (PE) caused by thrombus shedding to the pulmonary artery. According to literature reports, the incidence of PE in DVT patients is approximately 40% to 50%, of which 4% to 8% are fatal PE [1]. At present, the IVCF has been widely used to prevent PE, and its effectiveness has been verified. Stein and colleagues reported that the use of IVCF can reduce the incidence of PE by 35% [2]. However, it should be noted that the IVCF cannot

prevent the occurrence of PE completely, it can only intercept emboli with a diameter of >4 mm. Therefore, the use of the IVCF can never replace the regular treatment of anticoagulation [3]. According to the PREPIC study, filter implantation combined with anticoagulation compared to the anticoagulation alone, the 8-year follow-up results showed that although the incidence of PE in the former was lower, the incidence of DVT was higher, and it did not improve the long-term survival rate [4]. The guidelines do not recommend routine placement of filters based on anticoagulation, the filter should be used only when there are contraindications of anticoagulation or the anticoagulation is not effective [3].

Although the IVCF can prevent the occurrence of PE effectively, its complications cannot be ignored. Despite the permanent filter can reduce the occurrence of fatal PE, it does not improve the long-term survival rate of patients and the recurrence rate of DVT is also greater than that of patients who did not receive the filter [5]. The permanent filter exists in the body for a long time, there are also many other long-term complications including thrombosis in the filter, filter tilt, filter fracture, filter displacement, filter deformation, IVC thrombosis, and obstruction, the incidence is approximately 30% to 50% [6-8]. There may also be serious complications such as filter puncturing the IVC causing intestinal fistula, puncturing the lumbar artery causing retroperitoneal hematoma, and other serious complications that endanger the life of the patient [9,10]. With the appearance and application of retrievable filters, retrieving the filters after the risk of PE eliminated, reducing the filter indwelling time can avoid the occurrence of complications. However, retrievable filters cannot replace the permanent filter, if the retrievable IVCF is placed for too long, the same complications as the permanent filter will occur, and the incidence is higher than that of the permanent filter [11]. Many studies have shown that the longer the filter is placed, the higher the probability of complications and the lower the success rate of removal [12]. The timely retrieval of the filter within the time window has been widely recognized worldwide. The U.S. Food and Drug Administration (FDA) recommend that the retrievable filter should be taken out within 29 to 54 days after implantation [13]. China's latest guidelines for IVCF also recommend that retrievable filters should be used as much as possible and they should be taken out as soon as possible after the filter protection period within the

retrieval time window [6].

The Celect filter is the second-generation product improved by the Tulip filter, and the auxiliary leg is a freely split design. Its distal end is not connected to the main leg to better maintain the center location of the filter and increase the sealing zone to improve stability [14,15]. The retrieval time window of Celect filter is generally 90 days, Lyon and colleagues reported that the retrieval rate of Celect filter with an average implantation time of 179 days (range 5 to 466 days) was 96.6%, and was successfully removed after being placed for up to 466 days [14]. Doody et al. reported the retrieval rate of Celect filter with an average implantation time of 114.9 days (range 14 to 267 days) was 93.4% [16]. In the series of cases that MJ et al. reported, a Celect filter was successfully retrieved 1210 days after implantation [17]. Jia et al. reported a case of Celect filter removed with the indwelling time of 1389 days [18]. In our case, the Celect filter was implanted for 1,843 days. During the CTV examination of the lower extremities, the filter support foot intruded outside the IVC, which may damage the surrounding organs, and the patient was under great psychological pressure because of the filter with a strong desire for surgery. So, we made the final decision to remove the filter. During the operation, the angiography showed that the filter was normally in shape without fracture or deformation; the position of the filter was centered and there was no obvious migration and thrombosis in the filter. The patient had no discomfort during the operation, and the postoperative angiography showed no damage to the IVC [19].

Conclusion

In summary, the use of IVCF should be strictly controlled for indications. When filters are essential to prevent PE, retrievable filters should be selected as much as possible, and they should be removed as soon as possible after the risk of PE is eliminated, to avoid filter-related long-term complications. The retrieval rate of filters is approximately 8% to 45%. The management of the IVCF should be strengthened. For the filter beyond the retrieval time window, it should be removed as much as possible if the filter is likely to cause serious complications.

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