Case Report
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대한영상의학회지

Fracture and Embolization of a Celect Inferior Vena Cava Filter Strut to the Liver: A Case Report

하대정맥에 삽입된 Celect 필터의 골절과 그 파편의 간으로의 이동: 증례 보고

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Inferior vena cava (IVC) filters are typically used for prophylaxis against pulmonary embolism. A new version of the Günther Tulip filter, the Celect IVC filter was introduced in April 2007. To the best of our knowledge, there are no reports commenting on Celect IVC filter fracture and fragment embolization to liver. We report a case in which the strut of the Celect IVC filter embolized to the liver.

Index terms
Vena Cava Filters
Pulmonary Embolism
Computed Tomography

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INTRODUCTION

Over the decades, there has been a notable increase in the placement of a retrievable inferior vena cava (IVC) filter for the prevention of pulmonary embolism. With increased use of IVC filters and prolonged in-dwelling times, filter-related complications have also increased (1). Considering the adverse events of indwelling IVC filter placement, the U.S. Food and Drug Administration (FDA) issued a general warning about filter fracture, migration, embolization and IVC perforation, in addition to the long-term risk of lower limb deep vein thrombosis (DVT) (2).

Most filter fractures and fragment embolizations were clinically asymptomatic and were identified incidentally (3). However, a fracture is a serious device failure due to the potentially fatal complications, which include strut embolization to heart leading to pulmonary embolism, arrhythmia, or cardiac perforation (4). To our knowledge, till date there have been no reports on fractured filter fragment embolization to the liver, in Celect IVC filters (Cook, Bloomington, IN, USA).

This report presents a case of fractured Celect IVC filter and strut embolization to the liver. Additionally, we present the possible reasons for such events. This study was approved by the Institutional Review Board, and the requirement for informed consent was waived.

CASE REPORT

A 35-year-old man presented with a 1-week history of right upper quadrant abdominal pain. The pain had commenced subsequent to a fall face-down, and hitting his chest on the ground. The pain was exacerbated by deep inspiration. His history revealed implantation of a Celect IVC filter 5 years prior at another hospital, because of recurrent pulmonary embolisms due to DVT. In the absence of any abnormal laboratory findings, radiologic images were taken to evaluate the right upper quadrant abdominal pain.

Simple chest radiography showed a linear metallic shadow and 3 long limbs of the Celect IVC filter in the right lower lung field (Fig. 1A). No rib fractures were seen at the tender point. An enhanced computed tomography (CT) of the chest was also performed. The coronal view of the chest CT demonstrated the IVC filter was located in the IVC, without tilting or penetrating the vessel walls (Fig. 1B). The renal veins and IVC were patent, and no intraluminal thrombus was identified. However, a linear density was noted in the right hepatic lobe extending to the lower anterior chest wall (Fig. 1C). Axial view of the chest CT showed a missing filter strut (Fig. 1D). Despite the embolization of the fractured strut into the liver, no fluid collection or fatty infiltration in the perihepatic space was observed.

Under general anesthesia, the lower anterior chest wall was

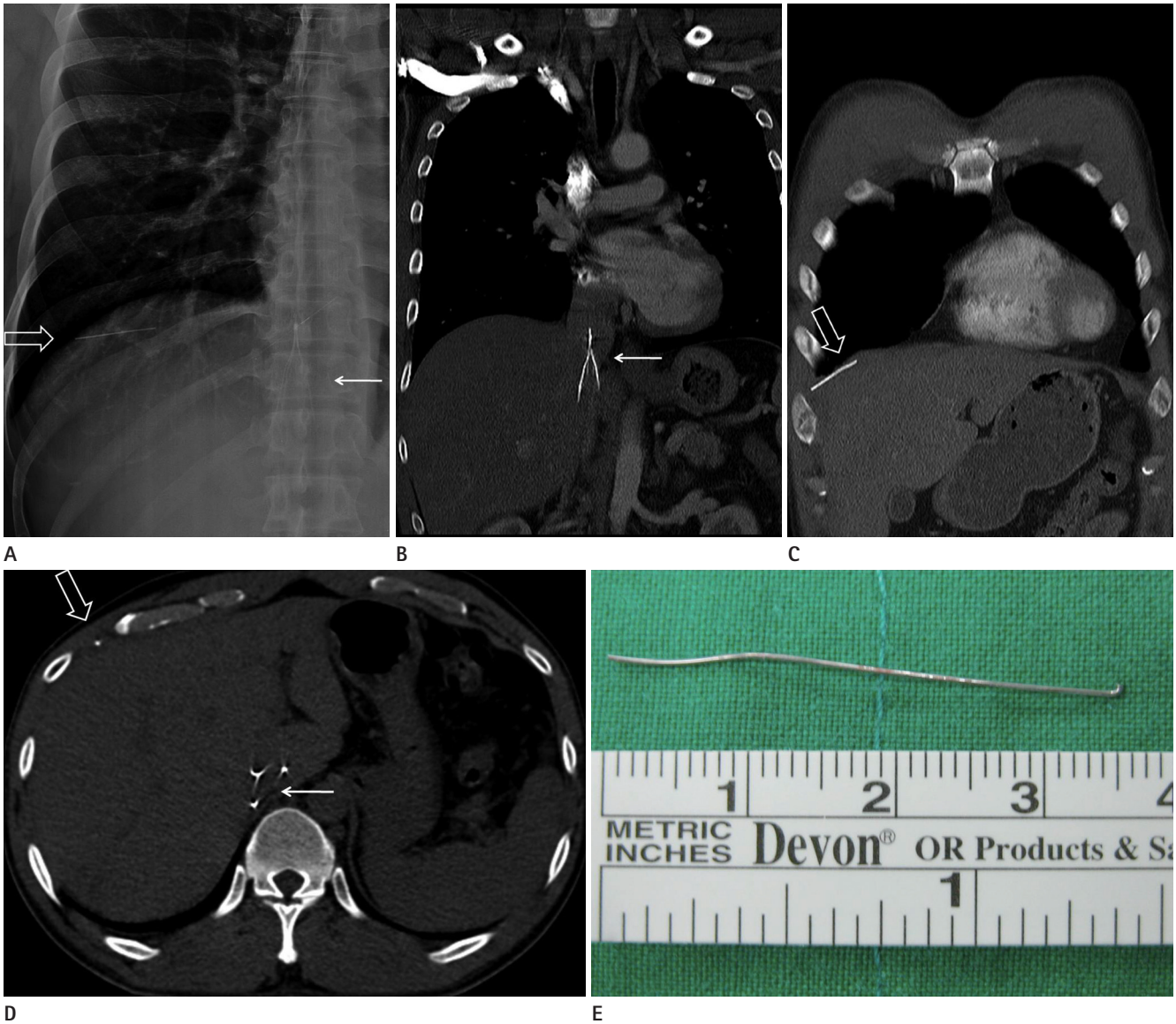

Fig. 1. Fracture of an IVC filter strut and its embolization to the liver, in a 35-year-old man.
A. Simple chest radiograph shows a linear radiopaque shadow (open arrow), and three long limbs of the Celect IVC filter (white arrow) in the right lower lung field.
B. Coronal CT scan shows no tilting of the Celect IVC filter (white arrow).
C. Coronal CT scan shows the fractured long leg of the filter (open arrow) in the liver extending to the lower anterior chest wall.
D. Axial CT scan shows a missing filter strut (white arrow) and embolization of the filter strut (open arrow) to the liver, with extension to the lower anterior chest wall.
E. A 3.5-cm sized Celect filter strut was surgically removed.
IVC = inferior vena cava

surgically exposed. The surgeons removed a linear 3.5-cm sized metallic structure that was anchored in the liver and extended to the lower anterior chest wall (Fig. 1E). This structure was identified as the missing IVC filter strut. There was improvement in the abdominal pain, and the patient was discharged the following day. The patient was scheduled to retrieving the fractured filter in IVC, but was lost to follow-up.

DISCUSSION

IVC filter placement is a relatively safe and effective method for preventing pulmonary embolism in patients who have contraindications to anticoagulation or who have proved unresponsive to therapy. The increased use of IVC filters and the number of reported adverse events in the Manufacturer and User Facility Device Experience (MAUDE) Database, led the FDA to release an initial communication on August 9, 2010, which warned that IVC filters have the risks of fracture, migration and organ perforation (2).

In a review of the MAUDE Database, Andreoli et al. (5) reported fractures to be the most common complication associated with IVC filters. The risk of filter fracture is related not only to malfunction, but also to embolization (1). Most embolizations remain asymptomatic; however, they can cause life-threatening complications such as arrhythmia and pericardial tamponade. Since incidence of IVC filter fragmentation and embolization is time dependent, these complications are more frequent with longer duration of implantation (3). Also, it is device dependent (6).

Most fractures and limb embolizations have occurred with the earlier models of Bard Recovery and G2 filter (Bard Peripheral Vascular, Tempe, AZ, USA), which are no longer marketed (3, 6). So far, there have been no adverse reports with the Cook Celect filter, in the previous large cohort study (7). The Celect IVC filter, a new version of the Günther Tulip filter, was introduced in April 2007. The Celect filter is a conical-shaped filter constructed from a cobalt chromium alloy with four long limbs (primary legs) and eight short limbs (secondary legs).

Other possible factors which result in filter fracture include metal fatigue due to repetitive flexion of the strut from strenuous physical activity, strain from the Valsalva maneuver or respiratory motion (8).

We assume that filter fracture and embolization in our patient were due to trauma and Valsalva. Additionally, the stress from trauma could have altered the shape of the filter, and the internal and external pressures of the IVC. Despite the presence of the filter, the IVC tends to decrease in size and increase in pressure during Valsalva (9). We hypothesized that the fractured fragment prolapsed into the hepatic vein, and that the pain was exacerbated by respiratory motion. Ganguli et al. (10) have previously reported that stress of labor in a pregnant patient resulted in a suprarenal recovery filter fracture and fragment embolization to the liver.

The optimal management of fractured and embolized struts of an IVC filter is unclear, due to the low incidence of this complication. However, these incidents are underestimated because they are typically asymptomatic, especially with the newer filters. We suggest a conservative approach with close observation would be effective, especially in patients whose IVC filter has been stressed due to strenuous physical activity.

To summarize our study, we report a symptomatic filter fracture of a newly introduced Celect IVC filter, and embolization to the liver. Despite the very low fracture rate of the Celect IVC filter, it is not free of symptomatic fracture and embolization events. Although this case did not result in a life-threatening event, potential catastrophes associated with the use of the Celect filter still exist. It is therefore necessary to prevent IVC filter patients from being lost to follow-up, and they should be vigilantly monotored after trauma or strenuous physical activity.

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하대정맥에 삽입된 Celect 필터의 골절과 그 파편의 간으로의 이동: 증례 보고

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하대정맥 필터는 폐색전증의 예방을 위해 일반적으로 사용된다. 2007년 4월, Günther Tulip filter의 새로운 버전인 Celect 하대정맥 필터가 소개되었다. Celect 하대정맥 필터의 골절 및 그 골절편의 간으로의 이동에 대해서 현재까지 보고되지 않았다. 저자들은 Celect 하대정맥 필터의 골절편이 간으로 이동한 증례를 보고하고자 한다.

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