

Case Report

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A Case of Invisible Vena Cava Filter: Can Intravascular Implants Always Be Identified?

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Background: The patient admitted with the signs and symptoms of deep venous thrombosis (DVT) was diagnosed and hospitalized for inferior vena cava (IVC) filter implantation preceding a pharmaco-mechanical thrombolysis. Despite the lack of a preoperative history and a radiological finding resembling an IVC filter, intraoperative fluoroscopy revealed a previously implanted permanent device.

Case: The present case study is showing that some IVC filters may be hard to be visualized preoperatively in the roentgenogram.

Key words: Venous thrombosis, inferior vena cava, vena cava filter

Introduction

The definition of venous thromboembolism (VTE) indicates a wide spectrum from the deep venous thrombosis (DVT) to the pulmonary emboli (PE). According to the US data, the incidence of first-time VTE is 100/100,000 per year. This ratio increases with age, 500/100,000 per year in the elderly over 80-years-old whereas it is <5/100,000 in younger than 15-year-old (1). The golden standard for VTE treatment is still anticoagulation (2).

Nevertheless, inferior vena cava (IVC) filters are frequently used as a precaution in the risk of PE or where the anticoagulation is contraindicated. Filter usage has been dramatically increased over the last 40 years with the improvements in the percutaneous techniques and also the production of retrievable filters (3). According to the official data from the US, the number of implanted IVC filter folded 24 times between the years 1979-1999 while it was two times between 1999 and 2008 (4). These statistical data indicate

the presence of a rapidly growing population carrying a filter inside.

Case Presentation

A 38-year-old male admitted with the acute complaints of increased diameter, pruritus and pain on his left leg after a hard sports activity. Duplex ultrasound (DUS) investigation revealed a DVT extending from the popliteal up to the femoral vein. Both of the veins were unable to be compressed with the DUS probe while a partial circulation was established. The DVT was thought to have chronic background by these DUS signs and confirmed by the history taken from himself. The patient stated a previous episode of DVT, nine years before, and the DUS examination suggested signs of the thrombosis being old.

The previous treatment was probably an anticoagulation therapy, and no IVC filter implantation history was taken. No document or discharge report

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concerning the applied treatment were available. The patient denied the insertion of a previous IVC filter during the anamnesis. In the light of this information, he was diagnosed as acute recurrent DVT over the chronic basis. Anticoagulation treatment was immediately started. A pharmaco-mechanical thrombolysis following the implantation of an IVC filter was planned.



Figure-1: Preoperative Abdominal X-ray (*standing position*).

At physical examination of the left leg, 4,5 cm increase in the diameter comparing with the contralateral side, erythema, edema, and warmth were identified. Abdominal roentgenogram investigation revealed no abnormal opacity or silhouette resembling an IVC filter over the expected anatomical position (*Figure-1*).

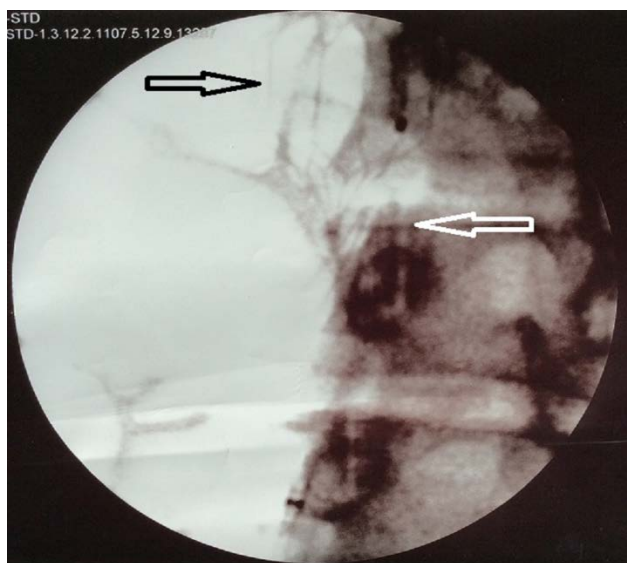


Figure-2: Intraoperative fluoroscopic image (*black arrow is pointing the new-temporary, white arrow is pointing the old-permanent filter*).

During the operation, as the deep venous system was checked with fluoroscopy, a previously implanted IVC filter which was not noticeable by the radiological technique of the plain abdominal radiography was observed. An additional temporary IVC filter (*AngelTM Catheter*) was inserted percutaneously as a precaution, as the patency status, and composition of the pre-implanted filter could not be evaluated. The fluoroscopic image displaying both filters together was recorded (*Figure-2*). The rotational pharmaco-mechanical thrombolysis (*with CleanerTM*) was performed successfully, and the process was concluded with the withdrawal of the temporary IVC filter.

The anticoagulation with low molecular weight heparin was continued during the postoperative period for ten days before switching to warfarin. Patient was discharged on postoperative day six with a complete resolution of the symptoms.

Discussion

In the US, the number of implanted IVC filter increased up to 49,000/year while it was only 2,000/year in 1979. Regarding the indications, most of the implanted filters are addressing DVT (45%) and PE (36%), while the remaining 19% is attributed to prophylactic use without existing PE or DVT (3). Statistical data reveals an increased tendency for using IVC filter during the last twenty years. The amount of implanted filters for DVT overtook the number of the filters for PE. This indicates the increase in DVT incidence. But the percentage of PE patients having filter is still higher than the DVT patients have. In 1999, the patient who were considered as high risk without either having DVT or PE, constitutes the 19% of all implanted filters (5).

When evaluated from the radiological perspective, while bone-like tissues needs higher energy photon sources relatively, tungsten anode in the roentgen device runs in 3 different phases and higher voltages (50-150 kVp) in order to create refracted radiation. Thus, a refractive radiation is generated. Bone tissues and metals are denser than the surrounding, and they absorb more photons causing the background details to be erased. If two dense structures superimpose during shooting, denser structure blocks the vision of the less dense object (6). In this case, the image of the filter might be camouflaged by the dense and coarse bony structure of the planarly overlapped vertebral column. Besides, the remaining part of the filter silhouette might be covered with the flatulence.

As the history of the IVC filters inspected, all filters from the first description of Greenfield™ (1973) until present, are made of a metal alloy, titanium and recently nitinol, making them all radio-opaque (7). They don't lose their opacity even if they are covered with fibrin in time (6). While comparing the relative powers of the direct roentgenogram and the fluoroscopy, it should be remembered that the fluoroscopy was designed for capturing moving images in contrary to the roentgenogram which was only designed to capture fixed images. Additionally, the radiation emission of the fluoroscopy was kept less than the roentgenogram as it has closer and longer interaction with both the operator and the patient. This made the fluoroscopy poorer compared to the roentgenogram in terms of the image quality (6).

In the light of all these information, the possible problem was thought to be the inappropriate radiation dosage applied by the roentgen operator. If multiple sequential images were taken with different doses of radiation, the filter could probably be identified. Similarly, if a CT imaging was performed, it could again be identified.

Conclusion

As a conclusion, if a formerly implanted IVC filter is unable to be identified radiologically, sequentially taken multiple images of different radiation doses and different angles should be carefully examined by the surgeon before planning the further steps. CT is alternatively recommended if the roentgenogram fails.

Conflict of Interest & Acknowledgement

The authors declare that no conflict of interest exists in publishing this article. Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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