Cardiovasc Intervent Radiol (2023) 46:682–685
https://doi.org/10.1007/s00270-023-03373-6

Peripheral Venous Thrombectomy and the Use of IVC Filters: A Challenging Equation

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Received: 11 January 2023 / Accepted: 23 January 2023 / Published online: 6 February 2023

Dear Editor,

There has been a steady increase in peripheral thrombectomy procedures the last few years due to the development of devices designated for that purpose [1–3]. We would like to report a case from our experience and share some technical considerations.

A 27-year-old COVID-19-positive female was admitted via the acute medical pathway with extensive left leg swelling and chest pain. A positive d-dimer test was followed by an ultrasound scan that revealed thrombus of mixed echogenicity extending from the left popliteal vein to the IVC. A computed tomography (CT) scan revealed bilateral emboli in the right lobar pulmonary artery with extension into segmental branches and presence of deep vein thrombosis from the left popliteal vein via the common iliac bifurcation to the mid segment of the infra renal inferior vena cava (IVC) (Fig. 1a). Given the extensive amount of thrombus, a multidisciplinary decision was made to perform mechanical thrombectomy with the use of a large bore thrombectomy device. The device that was considered appropriate for the case was the ClotTriever catheter (INARI Medical) and was planned to be inserted with retrograde access from the left popliteal vein. The device has an outer diameter of 11Fr and is formed by a nitinol coring element that measures 45 mm and a braided collection bag that measures 19 cm when open and 24 cm when collapsed. The device is used in conjunction with the 13Fr ClotTriever sheath (INARI Medical) that consists of a 14-mm self-expanding nitinol mesh funnel to facilitate clot removal and a large bore side port for rapid aspiration. In our case, it was also considered necessary to deploy an IVC filter to prevent further clot migration towards the pulmonary circulation during the retrieval. The main concern, however, was based on the risk to displace the barbs of the IVC filter with the sac of the thrombectomy device. Therefore, the insertion of a 16 Fr, 33 cm aortic sheath

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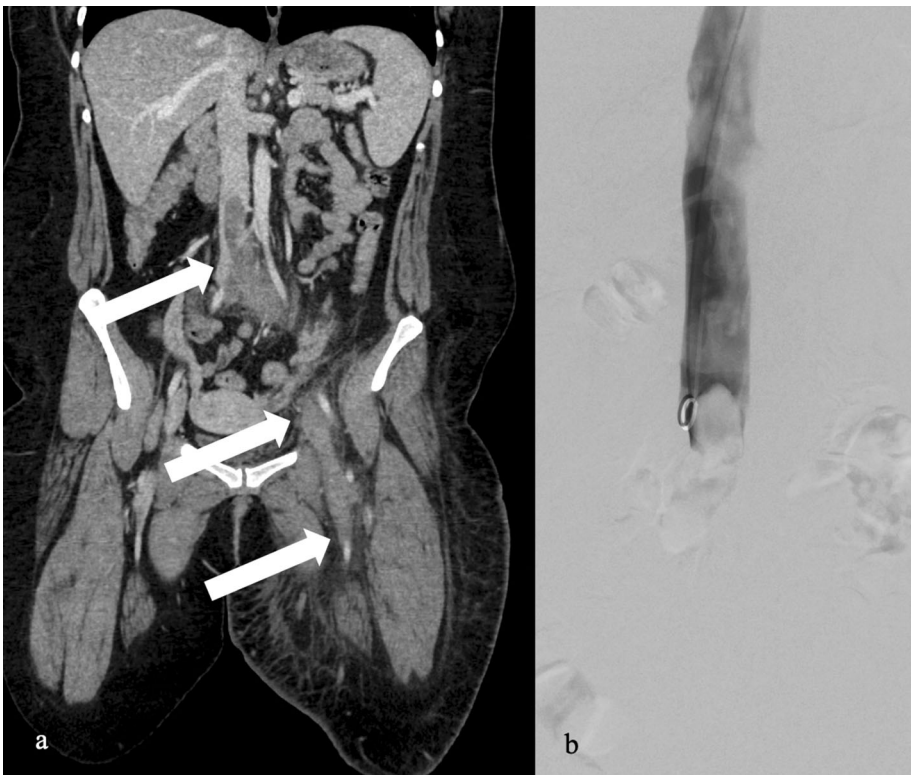

Fig. 1 **a** CT scan in coronal view confirming the extend of thrombus from the left popliteal vein to the mid segment of the infrarenal IVC (arrows). Note the edematous left lower limb. **b** Pigtail venogram with access from the right internal jugular vein confirms the level of clot

(DrySeal Flex, W.L. Gore) and of a through-n-through wire was planned to cage the sac of the device during the thrombectomy manoeuvres without displacing the filter.

The procedure was performed under general anaesthesia, and access via the right IJV was obtained in supine position. Venogram confirmed the level of thrombus (Fig. 1b), and an IVC filter was deployed in an infrarenal position (Celect Platinum, COOK Medical). A 16 Fr, 33 cm DrySeal Flex introduced sheath was advanced via the barbs of the filter, and a wire was advanced towards the iliac bifurcation. The patient was then turned prone, and access via the left popliteal vein was obtained. A snare was advanced and with the use of two operators the wire advanced from the right IJV was retrieved and through-n-through access was established (Fig. 2a). The ClotTriever was then advanced, and 16 passes were followed to retrieve the clot. The sac of the device was secured within the 16 Fr sheath during these passes, and the IVC filter was protected (Fig. 2b). Balloon dilatation was also performed, and a satisfactory outcome was obtained; at the end of the procedure clot was trapped in the IVC filter that would have otherwise migrated towards the pulmonary circulation (Fig. 3). The patient remained in anticoagulation with apixaban for two months, and the IVC filter was removed after that period.

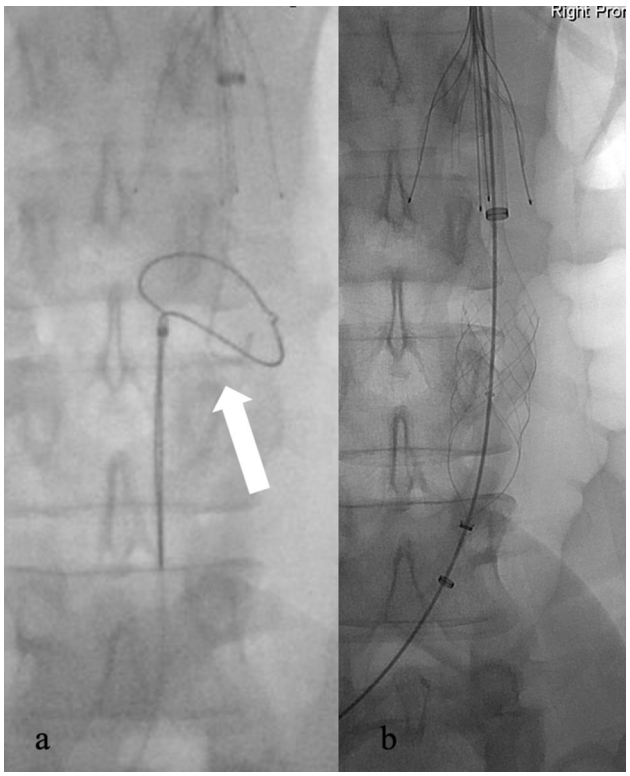

Fig. 2 **a** A wire was advanced via the 16Fr sheath towards the iliac bifurcation and was snared to achieve a through-n-through access and avoid damaging the IVC filter with the sac of the thrombectomy device (arrow). **b** The sac of the thrombectomy device was advanced within the 16Fr sheath without displacing the barbs of the IVC filter, while the nitinol coring element was used to retrieve the clot

This case, in our view, indicates the technical challenges that may be faced for similar cases, when IVC filters need to be deployed. Another potential option would have been to use the extra-large version of the first-generation FlowTriever Catheter (INARI Medical) which features three self-expanding nitinol mesh discs that were also designed to trap clot; however, in our view this would have been less effective than the proper IVC filter. These technical challenges were considered from INARI Medical that has now developed the Protrieve Sheath which consists of a wall apposing funnel (like a temporary IVC filter) and in addition offers the possibility of aspiration when the funnel is deployed. This latter device, which is for the moment available only in the US, may resolve technical challenges related to the insertion and retrieval of IVC filters.

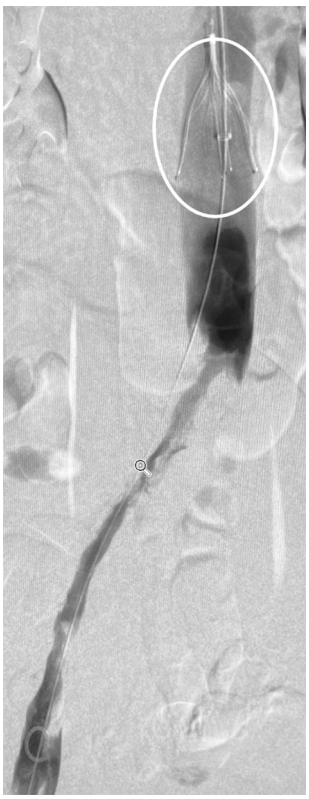

Fig. 3 Venogram from the popliteal vein confirmed satisfactory outcome of the recanalized segment. There is, however, presence of residual thrombus within the IVC filter that would otherwise have migrated towards the pulmonary circulation (circle)

Funding This study was not supported by any funding.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Consent for publication Consent for publication was obtained for every individual person's data included in the study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. For this type of study, formal consent is not required.

Informed Consent For this type of study, informed consent is not required.

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