Radiology Case Reports 18 (2023) 2911–2917

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journal homepage: www.elsevier.com/locate/radcr

Case Report

A case of percutaneous retrieval of a catheter without a free end that was fractured during a totally implantable venous access port removal ☆,☆☆

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ARTICLE INFO

Article history:
Received 6 April 2023
Revised 6 May 2023
Accepted 15 May 2023

Keywords:
Catheter fracture
Catheter retrieval
Peel-away sheath
Snare
Totally implantable venous access port

ABSTRACT

Totally implantable venous access ports (TIVAPs) are widely used for chemotherapy and other purposes in patients with cancer. Their convenience and safety make them ideal for long-term use. However, sometimes there are cases in which TIVAPs remain in the vessel following the completion of long-term chemotherapy and are difficult to remove due to the adhesion of the catheter to the vessel wall. In this study, we encountered a case in which a TIVAP catheter adhering to a blood vessel was fractured during removal and the catheter left in the vessel could not be retrieved by a snare because it had no free end. Finally, the catheter was successfully removed using a peel-away sheath. No complications or residual catheters were associated with the removal procedure.

Introduction

A totally implantable venous access port (TIVAP) was first reported in 1982 by Niederhuber et al. [1] and has since been widely used for chemotherapy and central venous nutrition, etc. [2]. TIVAPs can be used in hospitals and outpatient settings and their suitability for long-term use makes them safe and convenient. However, instances, where TIVAPs remain for a long time complicate their removal due to the adhesion of the catheter to the vessel wall. Although several cases of percutaneous retrieval of central venous catheter fragments have been reported [3,4], only a few reports mention percutaneous retrieval of catheters that adhere to blood vessels.

Case report

A TIVAP (5F Celsite port; TORAY) was implanted in a 61-year-old man via the left subclavian vein approximately 6 years ago for advanced gastric cancer treatment. We opted to re-

☆ Acknowledgments: The authors state that this work has not received any funding.
☆☆ Competing Interests: The authors have declared that no competing interests exist.
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https://doi.org/10.1016/j.radcr.2023.05.046

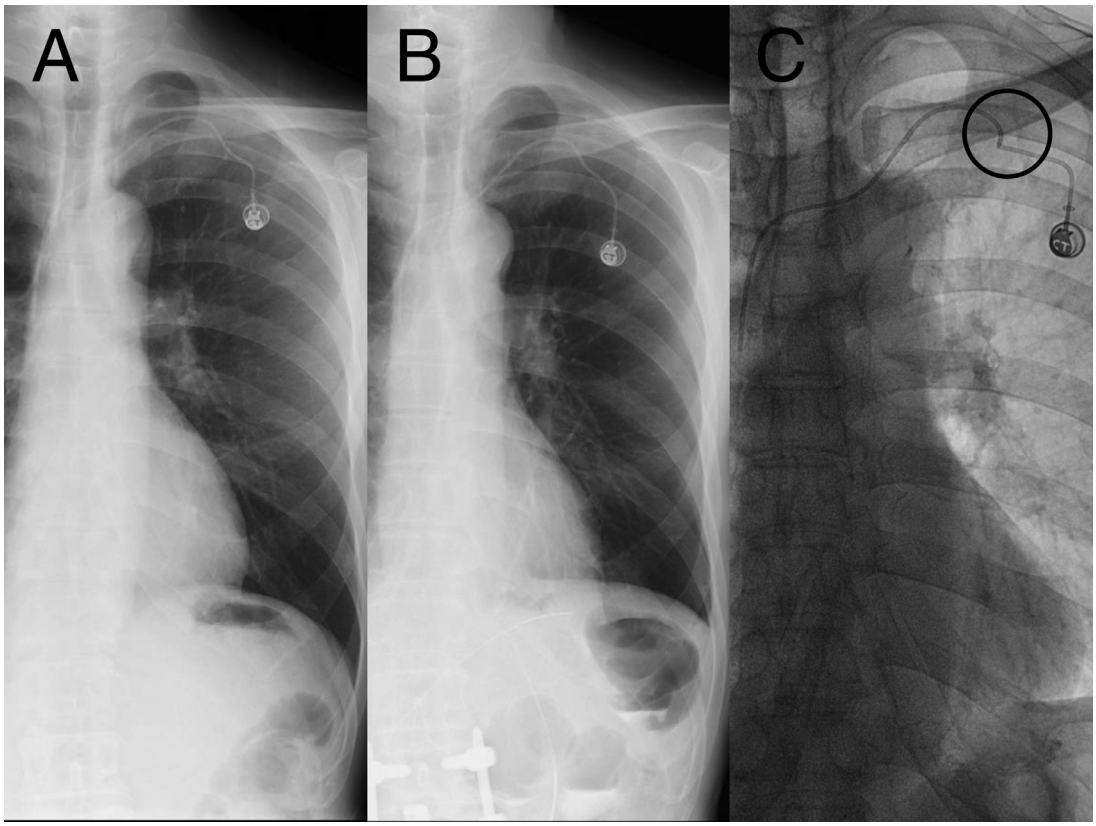

Fig. 1 – Chest radiographs in PA projections. (A) Standing position on implantation day and (B) 70 months after implantation show no abnormality of the port body or the catheter; (C) bent catheter (black circle) in the supine position just before removal.

move the TIVAP since it was occluded. A preprocedural fluoroscopic examination of the TIVAP catheter revealed that it was bent (Fig. 1). Local anesthesia was administered and an incision was made. The catheter was partially fractured approximately one-third of the way around 16 cm from the catheter tip. We then detached the catheter into the pectoralis major muscle and pulled the catheter with forceps at the apical side of the partially broken area; however, a strong resistance prevented us from pulling it out. After inserting a guidewire (Amplatz Extra Stiff Wire Guide 0.035 145 cm; COOK MEDICAL) via the catheter lumen, we grasped and pulled the catheter and the guidewire together. The catheter was pulled slightly but the guidewire was completely removed. Failing to reinsert the guidewire, we used a Radifocus guidewire (0.025 180 cm; TERUMO) instead and inserted it into the superior vena cava via the catheter lumen. A further attempt to remove the catheter resulted in a fracture at a site approximately 5 cm from the catheter tip and it remained in the vessel (Fig. 2). We explained the situation verbally to the patient and obtained his understanding and consent to continue the procedure.

The guidewire was inserted into the inferior vena cava, and a sheath (8.0 F 11 cm; MEDIKIT) was placed into the right femoral vein. Next, we inserted a microsnare (AMPLATZ GOOSE NECK Microsnare Kit 175 cm dia. 4 mm. 018; Medtronic) via a cobra-type catheter (4.0F 80 cm COB; MEDIKIT) lumen inserted from the right femoral vein sheath, and then caught the guidewire (Fig. 3) and pulled it out of the body through the sheath, such that the guidewire was formed outside the body on the sides of both the left subclavian and the right femoral veins. After inserting the microsnare, we attempted to grasp the fractured catheter (FC) left in the vessel but failed because the FC lacked a free end. Therefore, we inserted a sheath (T-handle peel away sheath introducer 7F 140/200 mm; Create Medic) carefully from the left subclavian vein to cover the FC, and with repeated pushing and pulling, scraped away the adhesive tissue bridging the blood vessels and the FC; the FC was then released from the vessel wall (Fig. 4). After removing the peel-away sheath from the left subclavian vein, we inserted a catheter (5F 100 cm JR-4.0; TERUMO), whose tip was cut off approximately 10 cm, and pushed it toward the right femoral vein. Most of the FC was pushed into the sheath of the right femoral vein (Fig. 5). We connected a 20 mL syringe to the right femoral vein sheath, and removed the sheath and the FC together with the application of strong negative pressure. White, thickened fibrin adhered to the FC (Fig. 6). The procedure was completed with compression hemostasis of the right femoral vein and closure of the left anterior thoracic region.

No complications or catheter residuals were associated with this procedure (Fig. 7), and the patient was discharged the day after removal. No complications were observed approximately 4 months after discharge.

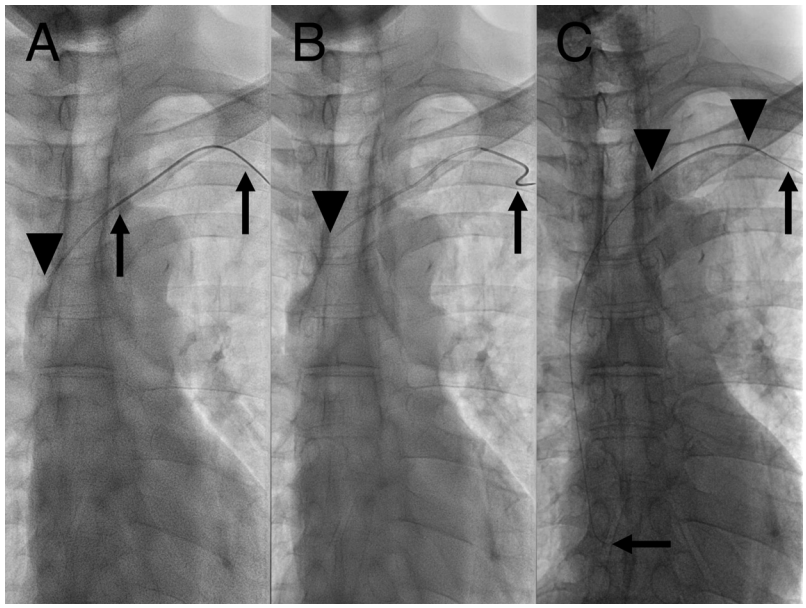

Fig. 2 – Angiography during removal. (A) A guidewire (black arrow) was inserted into the catheter (black arrowhead), (B) but only the guidewire was completely removed, and reinsertion was impossible. (C) A Radifocus guidewire (black arrow) was inserted; the catheter was fractured.

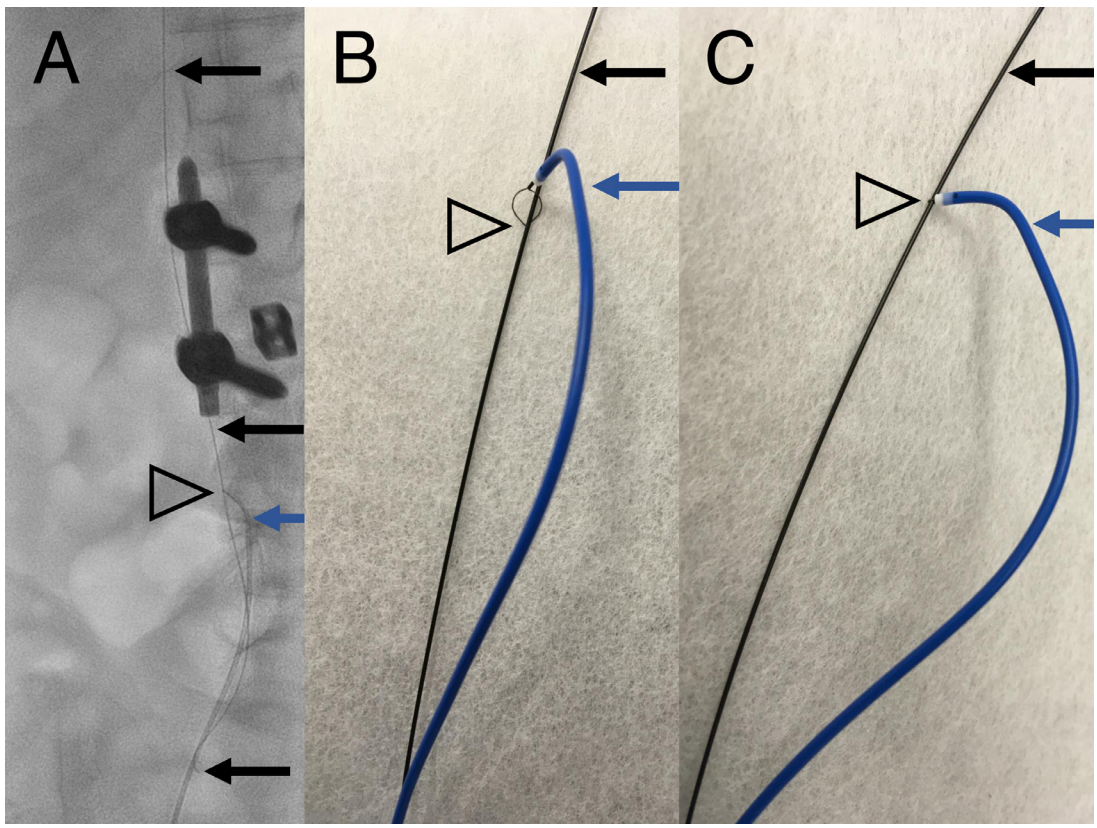

Fig. 3 – Angiography showing (A) Radifocus guidewire (black arrow) caught (empty arrowhead) with the microsnare via the cobra-type catheter (blue arrow) lumen and withdrawn via the right femoral vein sheath. (B, C) Photographs of the procedure.

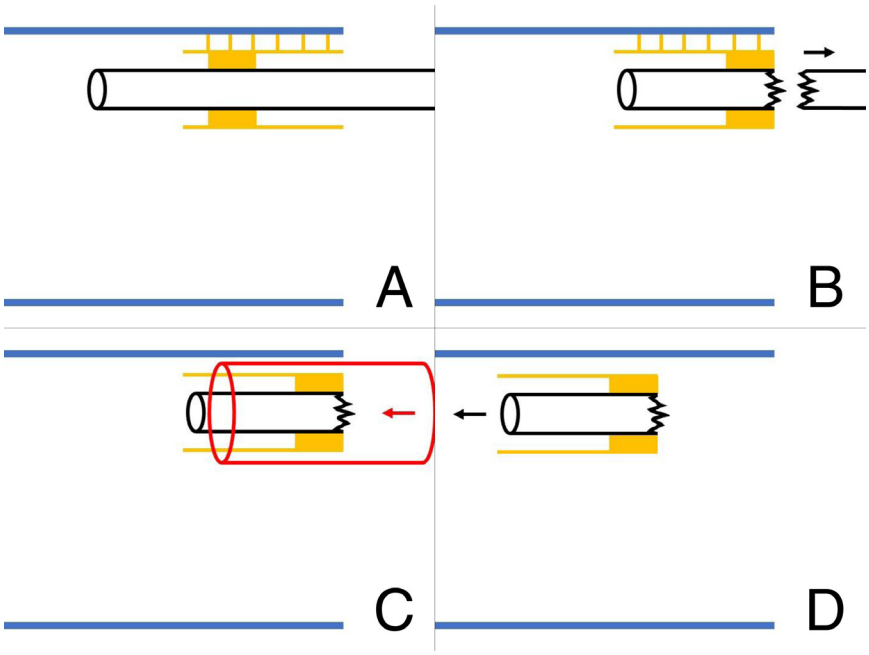

Fig. 4 – Schema. (A) catheter; black cylinder, thick fibrin; orange square, fibrin sheath; orange horizontal line, bridging tissue; orange vertical line. (B) Catheter and fibrin moved, but catheter was fractured. (C) Peel-away sheath (red cylinder) scraped away bridging tissue, (D) releasing catheter.

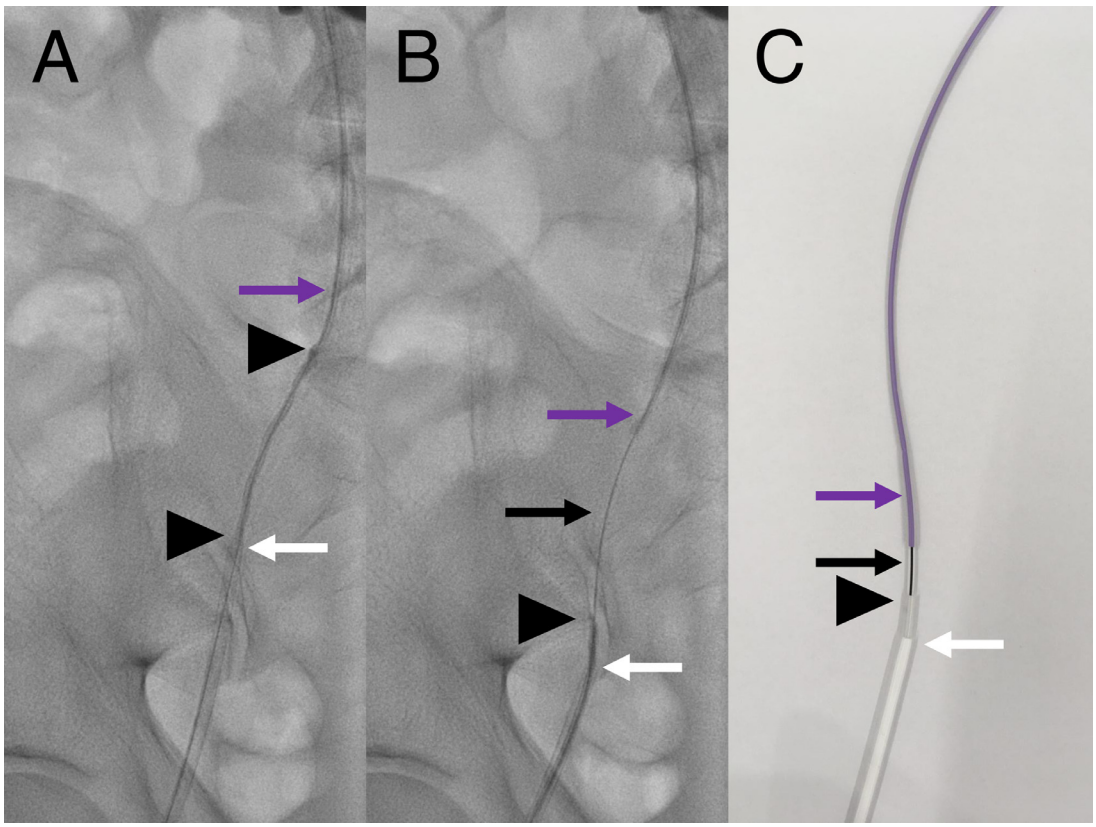

Fig. 5 – Pushing the FC into the sheath. (A) A catheter (purple arrow) was inserted from the left subclavian vein, and the FC (black arrowhead) was pushed (B) into the sheath (white arrow). Black arrows indicate the guidewire. (C) Procedure.

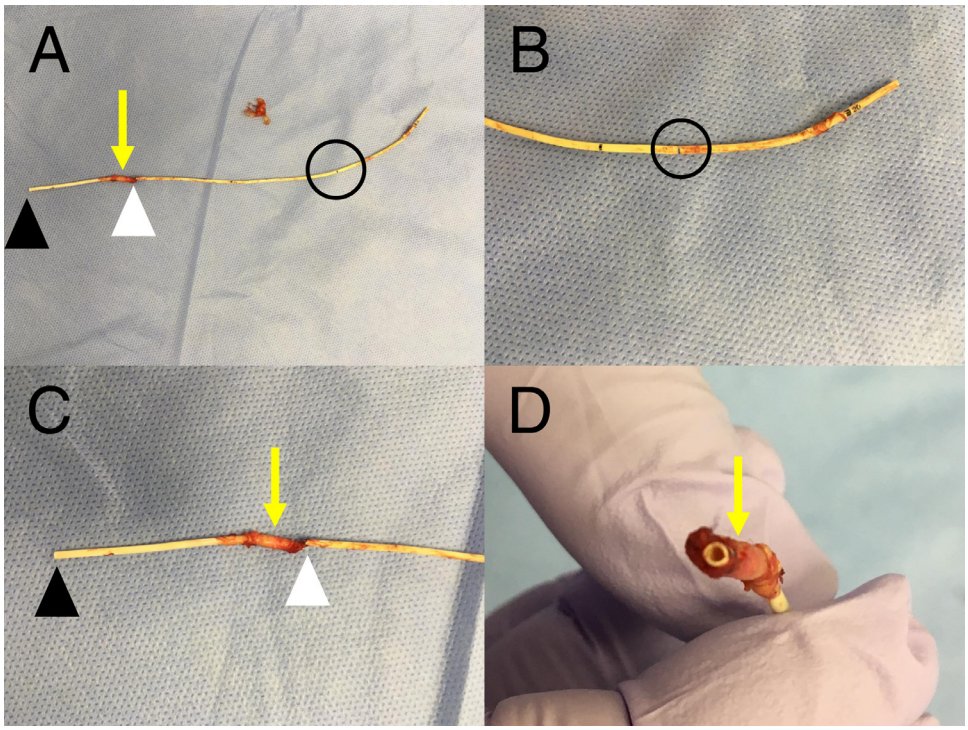

Fig. 6 – Photos of the removal catheter. (A) Black arrowhead indicates the FC tip, and white arrowhead indicates fractured site. (B) Partially broken site (black circle), which was cut during extraction. (C) Fibrin (yellow arrowhead) wrapped around the FC. (D) Fibrin thickness.

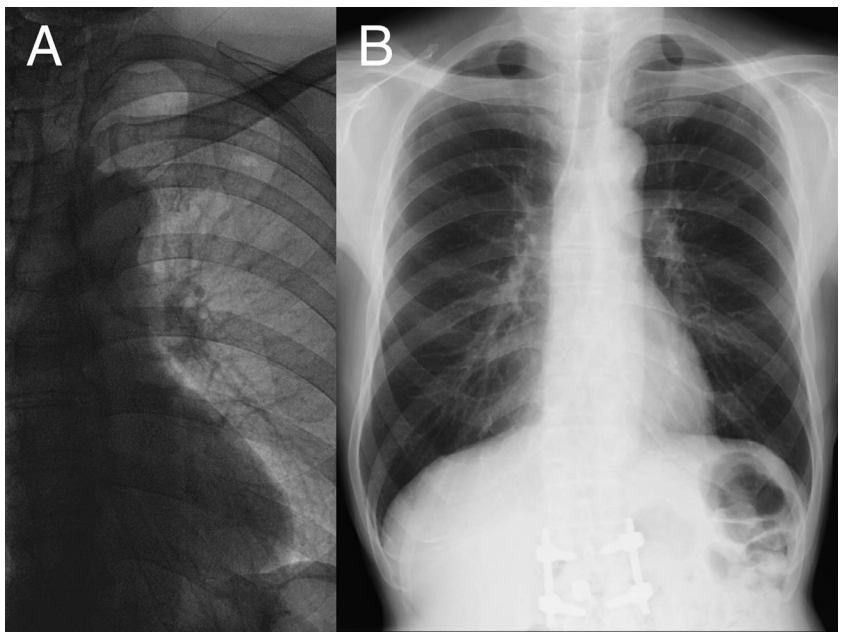

Fig. 7 – Chest X-rays immediately after removal (A) and the next day (B) show no evidence of the catheter fragment.

Discussion and conclusion

There have been many reports of catheter deviation and injury [3–9] in TIVAP implants despite their reported safety and convenience. Hinke et al. [10] reported pinch-off syndrome (POS), in which the catheter is fractured between the clavicle and the first rib when placed via the subclavian vein, since then, many similar cases have been reported [3,8,9]. The internal jugular vein is considered safer than the subclavian vein for TIVAP placement [11], but several reports of fractured TIVAP catheters inserted through the internal jugular

vein exist [4,6,7]. The present case was an ultrasound-guided TIVAP placed through the left subclavian vein. A chest radiograph obtained in the standing position 70 months after placement showed no catheter bending. A chest radiograph taken 72 months after implantation, just before removal, shows a strong bending of the catheter in the supine position. We believe that this bending occurred at the insertion site of the catheter into the left subclavian vein, and that the catheter was partially fractured at the same site (Figs. 1C, 6B). Since the vascular insertion site of a catheter is where most angles are made, it is assumed that the catheter's vascular insertion site was subjected to repeated bending force due to the patient's positional change, resulting in partial fracture. We do not consider this to be caused by POS because it is too lateral for POS to occur.

It is known that a cross-link is formed between the intravenous lining and catheter after central venous catheter placement [12]. Kinoshita et al. [13] reported that 15 of 28 (54%) TIVAP catheters implanted in the forearm with an indwelling duration of > 60 months could not be removed due to adhesions to the vessel wall and concluded that indwelling duration was an independent risk factor for failure to remove the TIVAP catheter. In this case, the TIVAP was implanted for 72 months, and we believe that a fibrin sheath had formed, causing catheter adhesion to the vessel wall, resulting in a fracture. Complications can occur if the catheter is fractured and remains in the body. While central vein and right heart system catheter fragments should be retrieved whenever possible [14], if the adhesions are strong and difficult to remove, the other option is to retain them in the body because they are less likely to cause complications [15,16]. However, this does not imply that complications do not occur. For example, a case of delayed pulmonary artery thromboembolism due to the formation of thrombi around residual intravascular foreign bodies has been reported [16]. Percutaneous retrieval, which is less invasive, less costly, and has a reported high success rate, should be attempted [5,14,16].

The use of a guidewire has been reported as a method for removing adherent catheters [17]. In the present case, we were able to pull the catheter out halfway through, but it did not lead to complete removal, and only the guidewire was removed. The Amplatz guidewire (0.035 inch) did not repass through the catheter lumen, but the Radifocus guidewire (0.025 inch) passed through easily. There may have been strong stenosis of the catheter lumen due to thick fibrin. After forming the guidewire exiting the body on both the left subclavian vein and the right femoral vein sides, we inserted the microsnare via the cobra catheter lumen near the FC using the same method as in Figures 3B and 3C, and tried to catch the FC, but because the adhesion was so strong, the FC had no free ends and we failed. Snares are often used to retrieve foreign bodies in blood vessels [4–9,16] and are simple and easy to use, with a high success rate of removal [14,18]. However, it is difficult to catch foreign bodies without a free edge [14]. In the present case, although the catheter had come out halfway through, there were no free ends on the FC. Perhaps the FC moved within the fibrin sheath formed in the vessel, and the thick fibrin moved with the FC, but the FC remained still inside of the fibrin sheath (Figs. 4A, B). We considered it essential to release adhesions in order to retrieve the FC, so we carefully inserted the peel-away sheath between the vessel wall and the FC, and repeated pushing and pulling to scrape away the cross-linked tissue bridging the vessel wall and the FC. As a result, we succeeded to release adhesions of the FC (Figs. 4C and D). Although the TIVAP catheter fractured during removal, we were able to retrieve it percutaneously without complications by utilizing the guidewire that had been inserted previously and the peel-away sheath.

If there is an adhesion between the catheter and the vessel, it is important to insert a guidewire as far as possible distally via the catheter lumen in advance. By doing so, the possibility of percutaneous retrieval can be preserved even in the case of the catheter fracture during removal. If the adhesions are too strong to catch the catheter in the vessel with a snare, another option is to use a peel-away sheath to scrape the adhesive tissue bridging the vessel wall and the catheter.

Ethical statement

JA Hokkaido Koseiren Sapporo Kosei Hospital Ethics Committee approved this study.

Patient consent

Consent to report this case was obtained from the patient himself and signed in writing.

Data availability statement

The data from this study are available upon request.

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