

Available online at www.sciencedirect.com

ScienceDirect

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

Case Report

A modified loop snare technique for the retrieval of a dislodged central venous catheter ☆,☆☆

Makoto Haga, MD, PhD*, Shunya Shindo, MD, PhD

Department of Cardiovascular Surgery, Tokyo Medical University Hachioji Medical Center, 1163 Tatemachi-chou, Tokyo, 193-0998, Japan

ARTICLE INFO

Article history:

Received 14 September 2020

Revised 5 October 2020

Accepted 6 October 2020

Keywords:

Dislodged central venous catheter

Loop snare technique

Endovascular treatment

ABSTRACT

A dislodged central venous port catheter is typically retrieved using an endovascular approach; however, the retrieval procedure poses a challenge for vascular specialists. The desired outcomes can be successfully achieved with the loop snare technique, an endovascular treatment method for the retrieval of a dislodged central venous port catheter. Herein, we present a case wherein the modified loop snare technique was used for successfully retrieving a dislodged central venous port catheter by reversing the tip of the guidewire inside the right ventricle and advancing it back into the snare.

© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Dislodging of a central venous port catheter (CVPC) is a rare complication, and the dislodged catheter is typically retrieved through the standard method, the endovascular approach. Despite advancements in the techniques, vascular specialists, and clinicians face challenges in the retrieval of a dislodged CVPC. The currently available endovascular treatments for a dislodged CVPC include the use of a loop snare, basket retriever, balloon catheter, and grasping forceps [1,2]. High success rates have been reported for the loop snare method, a standard method of endovascular treatment for the retrieval of a dislodged CVPC [1,2]. We describe the use of the modified loop snare method for the retrieval of a dislodged CVPC in a

70-year-old man. Informed consent was obtained from the patient to publish this case report and the images.

Case report

A 70-year-old man was diagnosed with advanced colon cancer and lung metastasis in November 2015. A subclavian CVPC had been surgically placed, and he had been receiving chemotherapy since December 2015. As a complete response was achieved with chemotherapy, the subclavian CVPC was last used in August 2019, and no signs suggestive of a dislodged catheter were noted in the chest radiograph obtained at that time. In February 2020, a chest radiograph revealed

☆ Acknowledgments: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

☆☆ Competing Interests: None.

* Corresponding author.

E-mail address: makoto420@hotmail.com (M. Haga).

<https://doi.org/10.1016/j.radcr.2020.10.013>

1930-0433/© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

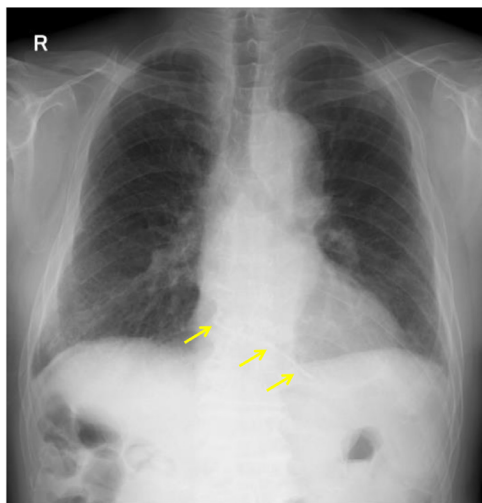


Fig. 1 – Chest radiograph showed a dislodged catheter in the heart (arrow).

that this CVPC had dislodged and was displaced in the heart (Fig. 1). Further examination with computed tomography revealed that the distal and proximal ends of the dislodged catheter were located in the right ventricle and right atrium, respectively (Figs. 2A-C). The patient was admitted to our hospital for endovascular retrieval of the dislodged CVPC.

The options, including endovascular retrieval and thoracotomy, were discussed with the patient, and he elected to proceed with the endovascular retrieval. The right common femoral vein was catheterized, and a 10-Fr sheath was placed. A 0.035-inch guidewire, 4-Fr internal mammary artery (IMA) catheter (Cordis Europa NV, The Netherlands), and 25-mm 6-Fr single-loop snare (Amplatz gooseneck snare, Covidien, Dublin, Ireland) were used to capture the dislodged CVPC under fluoroscopic guidance. The guidewire was directed through the IMA catheter to the right atrium, crossing over the dislodged CVPC. We, then, reversed the tip of the guidewire inside the right ventricle and advanced it back into the snare

(Figs. 3A and B). The snare was closed at the leading end of the guidewire and withdrawn from the entrance of the atrium into the sheath (Fig. 4A-C). The sheath and CVPC were removed as a unit from the right femoral vein. The patient was discharged the next day, with no complications.

Discussion

The average port lifespan is reported to be 1075 days (range, 269-2657 days) [3], and the average time from CVPC implantation to dislodgment ranges from 46 to 1281 days (mean duration of stay, 451.6 ± 325.4 days) [1]. In the current case, the catheter had dislodged approximately 4 years after implantation, indicating that the duration of use had exceeded the average port life span, and that CVPC replacement was necessary to avoid dislodgment.

The estimated prevalence of a dislodged CVPC has been reported to be 0%-4.1% [1,4,5]. Previous studies have reported complications, including mortality, arrhythmia, clotting, perforation, and infections owing to a dislodged catheter [6]. Therefore, immediate endovascular retrieval is recommended, regardless of the duration for which the CVPC has been dislodged on diagnosis.

CVPC fractures can occur owing to excessive pressure within the catheter, pinch-off syndrome, catheter malpositioning, catheter fatigue, and incorrect use of the catheter [7]. The fractured catheter can migrate distally along the bloodstream and continue until it is lodged in the superior vena cava, right atrium, right ventricle, or main pulmonary artery. Surov et al. reported that the common sites of catheter embolization are the superior vena cava (15.4%), right atrium (27.6%), right ventricle (22%), and pulmonary arteries (35%) [8].

The standard surgical method for the retrieval of a dislodged catheter is thoracotomy; however, morbidity and mortality may significantly increase with this procedure. The endovascular approach is the safest method for retrieving a dislodged catheter. The current endovascular methods for the retrieval of a dislodged catheter include the use of a loop snare, basket retriever, balloon catheter, and grasping forceps [1,2].

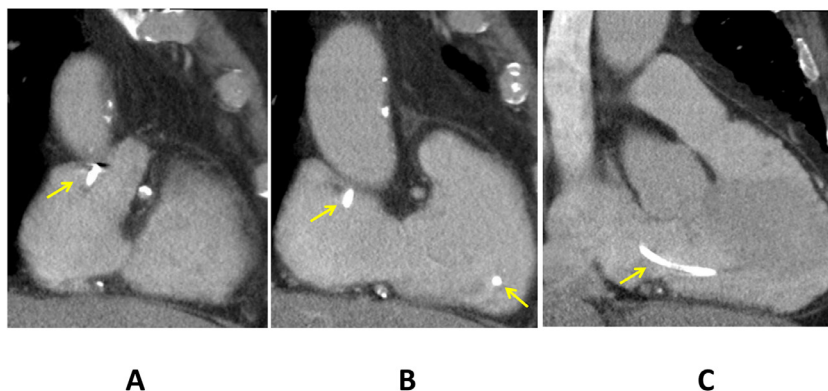


Fig. 2 – (A) Computed tomography showed a proximal end of the dislodged catheter present in the right atrium (arrow). (B) Computed tomography showed a distal end of the dislodged catheter present in the right ventricular whereas the proximal end was present in the right atrium (arrows). (C). Computed tomography showed the middle of dislodged catheter present in the tricuspid valve (arrow).

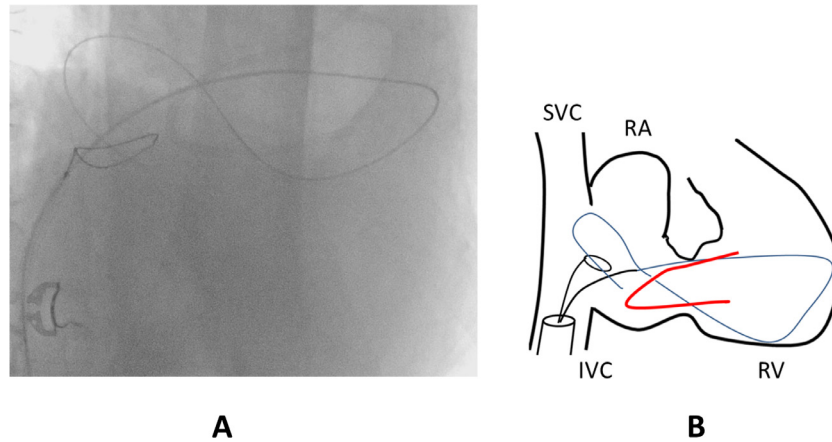


Fig. 3 – (A) Radiograph showed the tip of the guide wire was reversed at the right ventricle and advanced back into the snare. (B) Diagram showing the catheter and the guide wire at the right atrium and crossing the guide wire over the dislodged catheter. The guide wire was reversed and advanced back into the snare. IVC, inferior vena cava; SVC, superior vena cava; RA, right atrium; RV, right ventricle.

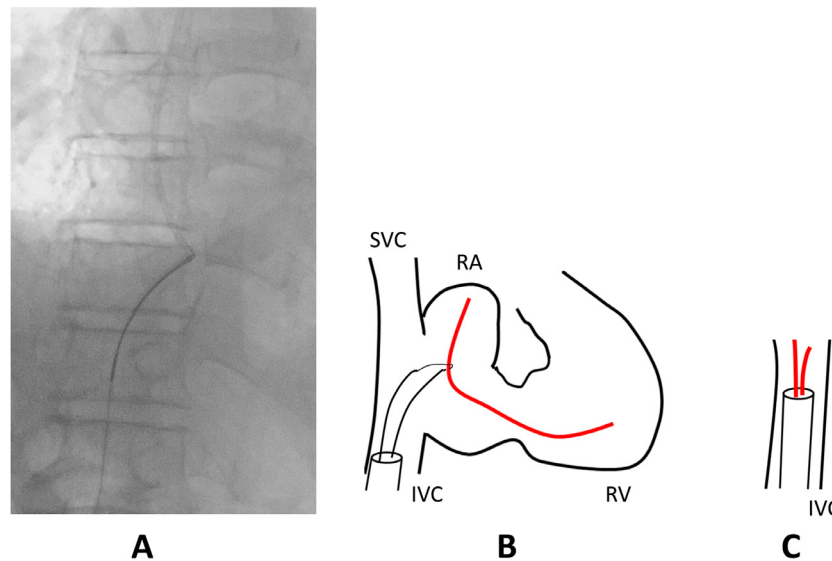


Fig. 4 – (A) Radiograph showed the snare was closed at the leading end of the guide wire and withdrawn into the sheath. (B) The snare was closed at the end of the guide wire. IVC, inferior vena cava; SVC, superior vena cava; RA, right atrium; RV, right ventricle. (C) The dislodged catheter was withdrawn into the sheath. IVC, inferior vena cava.

The loop snare method is a standard technique that shows a high success rate for the endovascular retrieval of dislodged catheters [1,2]. However, there are some disadvantages of this procedure. Based on our experience and that reported in other studies, it is sometimes difficult to relocate the end of the dislodged catheter when both free ends are in the heart, as in the current case [9]. The absence of either free end often accounts for the failure of CVPC retrieval [1,5,8,10]. When there are no free ends for retrieval, a pigtail catheter can be tugged to relocate the dislodged catheter into a position that is easily accessible [1,9,11]. However, tugging the dislodged catheter with a pigtail catheter inside the right atrium is difficult, as the stiff material makes the catheter head difficult to control, and this maneuver is associated with the risk of damage to the heart.

Once retrieval using a loop snare fails, the likelihood of success with other options is considered low [10]. We described an effective wire-loop snare technique that may improve the success rate for the retrieval of dislodged catheters. The difference between the standard loop snare method and our wire-loop snare technique is that the guidewire is reversed at the ventricle; therefore, this technique can be used even when the end of the dislodged catheter is not accessible.

Some risks associated with this procedure include penetrating the wall of the heart or the tricuspid valve, leading to cardiac perforation or tamponade. Another possible complication of this procedure is cardiac arrhythmia. A transient ventricular arrhythmia develops when the guidewire or the catheter crosses the sinus node or the atrioventricular node.

This is one of the most common complications of this procedure and is typically self-limiting. Cardiac arrhythmia cannot be completely avoided; however, the incidence of all these complications can be reduced by careful and gentle advancement of the guidewire and catheter. Difficulty is encountered when a thin guidewire, for instance, measuring 0.014-inch, is used for tightening the snare; therefore, we recommend a 0.035-inch guidewire for flexibility.

In the first reports on dislodged CVPC devices, a 16-Fr sheath was used for catheter retrieval; however, smaller sheaths are generally used presently. In this case, we used a 10-Fr sheath that was able to house a 4-Fr IMA catheter and a 6-Fr snare without any difficulties. In general, smaller sheaths reduce the risk of injury to the inferior vena cava or local hematomas at the puncture site.

Conclusions

We described a modified wire-loop snare technique of reversing the tip of the guidewire at the right ventricle. This technique is a feasible and convenient strategy for retrieving a dislodged CVPC when the ends of the device are not easily accessible.

REFERENCES

- [1] Cheng CC, Tsai TN, Yang CC, Han CL. Percutaneous retrieval of dislodged totally implantable central venous access system in 92 cases: experience in a single hospital. *Eur J Radiol* 2009;69:346–50.
- [2] Wang PC, Liang HL, Wu TH, Huang JS, Lin YH, Huang YL, et al. Percutaneous retrieval of dislodged central venous port catheter: experience of 25 patients in a single institute. *Acta Radiol* 2009;50:15–20.
- [3] Dillon PA, Foglia RP. Complications associated with an implantable vascular access device. *J Pediatr Surg* 2006;41:1582–7.
- [4] Charvat J, Linke Z, Horaekova M, Prausova J. Implantation of central venous ports with catheter insertion via the right internal jugular vein in oncology patients: single center experience. *Supp Care Cancer* 2006;14:1162–5.
- [5] Kock HJ, Pietsch M, Krause U, Wilke H, Eigler FW. Implantable vascular access systems: experience in 1500 patients with totally implanted central venous port systems. *World J Surg* 1998;22:12–16.
- [6] Fisher RG, Ferreyro R. Evaluation of current techniques for nonsurgical removal of intravascular iatrogenic foreign bodies. *AJR Am J Roentgenol* 1978;130:541–8.
- [7] Liu J-C, Tseng H-S, Chen C-Y, Chern M-S, Chang C-Y. Percutaneous retrieval of 20 centrally dislodged Port-A catheter fragments. *Clin Imaging* 2004;28:223–9.
- [8] Surov A, Wienke A, Carter JM, Stoevesandt D, Behrmann C, Spielmann RP, et al. Intravascular embolization of venous catheter—causes, clinical signs, and management: a systematic review. *JPEN Parenter Enteral Nutr* 2009;33:677–85.
- [9] Kawata M, Ozawa K, Matsuura T, Kuroda M, Hirayama Y, Adachi K, et al. Percutaneous interventional techniques to remove embolized silicone port catheters from heart and great vessels. *Cardiovasc Interv Ther* 2012;27:196–200.
- [10] Bessoud B, de Baere T, Kuoch V, Desruennes E, Cosset M-F, Lassau N, et al. Experience at a single institution with endovascular treatment of mechanical complications caused by implanted central venous access devices in pediatric and adult patients. *AJR Am J Roentgenol* 2003;180:527–32.
- [11] Chuang MT, Wu DK, Chang CA, Shih MC, Ou-Yang F, Chuang CH, et al. Concurrent use of pigtail and loop snare catheters for percutaneous retrieval of dislodged central venous port catheter. *Kaohsiung J Med Sci* 2011;27:514–19.