

Early-Onset Rupture and Cardiac Embolization of an Implantable Venous Port Catheter: A Case Report of Pinch-Off Syndrome

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Abstract:

Implantable venous access devices are indispensable for long-term treatment management in oncology patients; however, they may lead to rare but serious mechanical complications. While "Pinch-off syndrome" is typically associated with chronic catheter wear occurring over several months, we present the case of a 46-year-old female patient who developed complete rupture and cardiac embolization only 12 days after implantation. The catheter ruptured during the first chemotherapy session, 7 days after placement, and became lodged between the right ventricle and the subclavian vein. The embolized distal fragment was successfully retrieved via the right brachial vein using a snare catheter.

Keywords: Pinch-Off Syndrome, Catheter Rupture, Cardiac Embolization, Snare Catheter Retrieval, Costoclavicular Forceps

Catheter migration or fracture in port catheter systems is a rare complication observed in approximately 1% of patients. Despite its low incidence, intravascular embolization can be fatal if left untreated [1]. Costoclavicular compression or Pinch-off syndrome (POS) is the mechanical entrapment of the catheter within the narrow anatomical space between the clavicle and the first rib [2-4]. Although it is generally defined in the literature as a late-stage complication, early-onset ruptures pose both diagnostic challenges and require urgent intervention. Early diagnosis and management are vital; as stated by Sauro *et al.* [5], even a short delay after diagnosis can lead to further distal migration of the fragment toward the pulmonary artery.

CASE PRESENTATION

A 46-year-old female patient, scheduled for adjuvant chemotherapy one month after primary surgery, underwent successful port catheter placement via the right subclavian vein (Figure 1. a). The procedure was performed under ultrasound guidance using a supraclavicular approach near the jugular bifurcation, without the initial use of fluoroscopy. Seven days after placement, during the third hour of the first chemotherapy cycle, the patient developed sudden, sharp pain in the port area followed by localized swelling. Induration and an inflammatory response were observed in the region over the following 48 hours. Due to severe pain during a second treatment

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attempt on the 12th day, a radiological evaluation was initiated (Figure 1. b, c). Chest X-ray and computed tomography (CT) confirmed that the catheter had completely detached from the reservoir and a complete mechanical transection of the catheter within the costoclavicular space (between the clavicle and the first rib) (Figure 1. d, e). A short proximal remnant remained attached to the reservoir, while the distal segment had embolized into the right atrium and ventricle. An emergency endovascular procedure was performed via the right brachial vein. In the angiography unit, the fragment was captured using a snare catheter and successfully removed (Figure 1. f). Five days following the extraction, a new port catheter

was successfully placed at a new site adjacent to the previous location. The patient continues her oncological treatment and remains complication-free.

DISCUSSION

Pinch-off syndrome is characterized by mechanical stress within the costoclavicular space [6]. Hinke *et al.* [2] demonstrated that most POS cases (72%) show radiological signs within the first 3 weeks after placement. In our case, a rupture in the form of complete separation was detected only 12 days after implantation. In a review of 109 cases by Mirza *et al.*

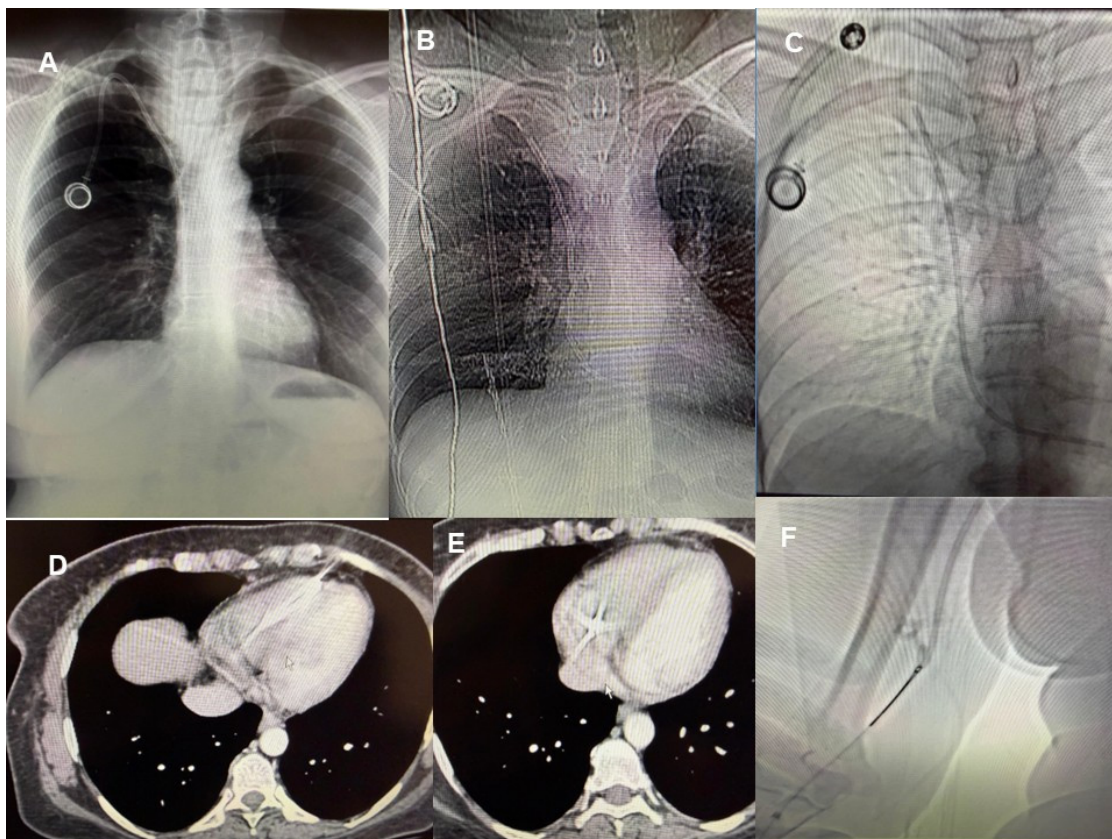


FIGURE 1. Radiological progression of an implantable port catheter showing implantation, acute rupture, and endovascular retrieval. A) Early Post-operative Control: The port catheter system, placed via the right subclavian vein, is shown with normal anatomical positioning and intact reservoir connection immediately following implantation. B) Computed Tomography (CT) – Disconnection View: Complete transection of the catheter is observed within the costoclavicular space (between the clavicle and the first rib), showing the proximal end disconnected from the reservoir. C) Posteroanterior Chest X-ray – Catheter Migration: The ruptured distal catheter fragment is seen migrating along the vascular track toward the cardiac chambers (right atrium and ventricle). D) CT Axial Section – Right Atrium: The embolized radiopaque catheter fragment is clearly visible within the right atrium. E) CT Axial Section – Right Ventricle: The distal tip of the catheter is shown extending into the right ventricle, passing through the tricuspid valve plane. F) Fluoroscopic Image – Endovascular Extraction: The retrieval process is depicted as a "snare" catheter, advanced via the right brachial vein, captures and extracts the embolized fragment.

[3], it was found that POS occurs on average 5.3 months after placement. The timeframe in our case represents a rare example falling into the "immediate post-placement" category. Such an accelerated timeline suggests that specific anatomical and procedural risk factors—such as a particularly narrow costoclavicular space, a highly medial insertion angle, and the immediate mechanical fatigue from upper extremity mobility—likely exacerbated the stress on the catheter.

Staniscia *et al.* [6] and Andris *et al.* [7] stated that sudden pain and swelling during infusion are the most fundamental clinical indicators of impaired mechanical integrity. Misinterpreting these symptoms as an allergic reaction can delay diagnosis [8]. While the rupture of a port unused for 6 years, as reported by Funaki [9], demonstrates the variability of the process, the acute presentation in our case proves the aggressiveness of the mechanism. Percutaneous snare retrieval of embolized fragments has been reported as the gold standard [1, 9]. To prevent recurrence, it is recommended to place newly implanted catheters more laterally [6]. Due to the dynamic nature of the compression, the importance of multidisciplinary follow-up protocols in such procedures is emphasized [10].

CONCLUSION

The POS mechanism can cause catheter rupture much earlier than expected in the literature. Clinicians must remain mindful that sudden pain or localized swelling during early infusion may indicate a loss of mechanical integrity due to POS. In such instances, immediate cessation of the infusion and urgent radiological evaluation are mandatory to prevent further and must intervene without delay to prevent distal embolization.

Ethics Approval and Consent to Participate

As this study is a single case report, formal ethics committee approval was not required. However, the study design and data collection were conducted in strict accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient for the publication of this case report

and any accompanying clinical details and images.

Data Availability

All data generated or analyzed during this study are included in this published article. The data that support the findings of this study are available on request from the corresponding author, upon reasonable request.

Authors' Contribution

Study Conception: MA; Study Design: MA; Supervision: MA, USS, CK; Funding: MA, USS; Materials: MA, USS, CK; Data Collection and/or Processing: MA, USS; Statistical Analysis and/or Data Interpretation: MA, USS, CK; Literature Review: MA; Manuscript Preparation: MA; and Critical Review: MA, USS, CK.

Conflict of Interest

The author(s) disclosed no conflict of interest during the preparation or publication of this manuscript.

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The author(s) declare that no artificial intelligence-based tools or applications were used during the preparation process of this manuscript. Google translate was used for spelling and orthography checking purposes. The all content of the study was produced by the author(s) in accordance with scientific research methods and academic ethical principles.

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