When roads collide. Successful retrieval of a floating piece of a tunneled catheter with the collaboration of a vascular surgery and an interventional radiology team

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Abstract:

Purpose: We present a case of successful retrieval of a tearaway trocar that was accidentally lost during insertion through the right jugular vein and was trapped in the right atrium of the heart of a patient.

Case report / technique: Computed Tomography Venography (CTV) was first performed to identify the position of the lost tearaway trocar. The patient was transferred to the angiographic suite and the trocar was brought up under fluoroscopic guidance and was temporarily parked near the point of insertion. Transfer to the operating room followed, and open removal was achieved. Successful removal was performed uneventfully, and patient was discharged the next day.

Conclusion: The collaboration of a vascular surgery and an interventional radiology team helped our patient to avoid a major cardiovascular procedure. This is an example of the results that can be achieved when we cross the boundaries and different specialists work together for the benefit of the patient.

INTRODUCTION

It is estimated that the prevalence of chronic kidney disease is rising, leading recently to an increase in the number of patients requiring dialysis. The most common form of dialysis is hemodialysis (HD), with a worldwide prevalence of 89%, followed by peritoneal dialysis that is the preferred method of dialysis of the remaining 11%[1].

Hemodialysis (HD) requires access to the vascular system, and the form of vascular access is a shared patient-doctor decision. The preferred method is usually arteriovenous fistulas (AVFs) because of the lower complications rates and superior long-term durability[2]. Alternative means of vascular access for HD, which include arteriovenous grafts (AVGs) and central venous catheters (CVCs), are chosen mainly for cases with many comorbidities and shorter life expectancy. There are two types of CVCs, *nontunneled* CVCs that are used in critically ill patients and are designed for short-term dialysis, and *tunneled* CVCs that can be used for long-term HD.

We present a case of successful retrieval of a floating piece of a tunneled HD catheter that was trapped accidentally in the venous system of our patient at the time of catheter insertion.

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CASE REPORT / TECHNIQUE

Our patient, a 77-year-old female with history of diabetes mellitus, hypertension and obesity, started HD on 9/1/23 with the use of a non-tunneled jugular catheter. The dialysis team decided to exchange over the wire the non-tunneled with a tunneled catheter, and on 23/1/23, while advancing the catheter through the sheath, a segment of the introducer sheath approximately 10 cm long was detached and remained floating in the venous system. Over the same wire that was used for the exchange, the dialysis team inserted again a non-tunneled catheter to regain access to the vascular system of the patient. As a result of that action, the tip of the non-tunneled catheter was embedded in the proximal end of the floating introducer sheath (Figure 1). Urgent transfer to the Vascular Surgery department of our hospital followed for further treatment.

At admission, the patient was transferred to the radiology department and a computed tomography scan of the region was performed to establish the exact position of the floating piece. The floating piece was visualized trapped partly in the superior vena cava and, to a greater extent, within the right atrium (Figure 2). The patient was transferred to the angiographic suite, and under fluoroscopy an attempt was made to remove the floating piece of the introducer sheath. From the intravascular solutions available, including loop-snare, helical basket and grasping forceps, our interventional radiologist was more familiar with the use of the loop-snare technique. With access through the non-tunneled catheter that had been inserted in the right jugular vein after the accidental loss, a 20mm ONE Snare® Endovascular Snare System (*Merit Medical Systems, Inc.*) was used. The proximal end of the floating in-

troducer sheath that was fixed around the tip of the non-tunneled catheter was liberated after pulling the catheter back, and that free end was firmly grasped with the snare system (Figure 3). Retraction and temporary parking of the floating piece at the level of its insertion in the right jugular vein followed (Figure 4). Transfer of the patient to the operating room and open removal of the lost introducer sheath was finally achieved (Figure 5). The remaining course of treatment of our patient was uneventful, and she was discharged from our hospital the next day.

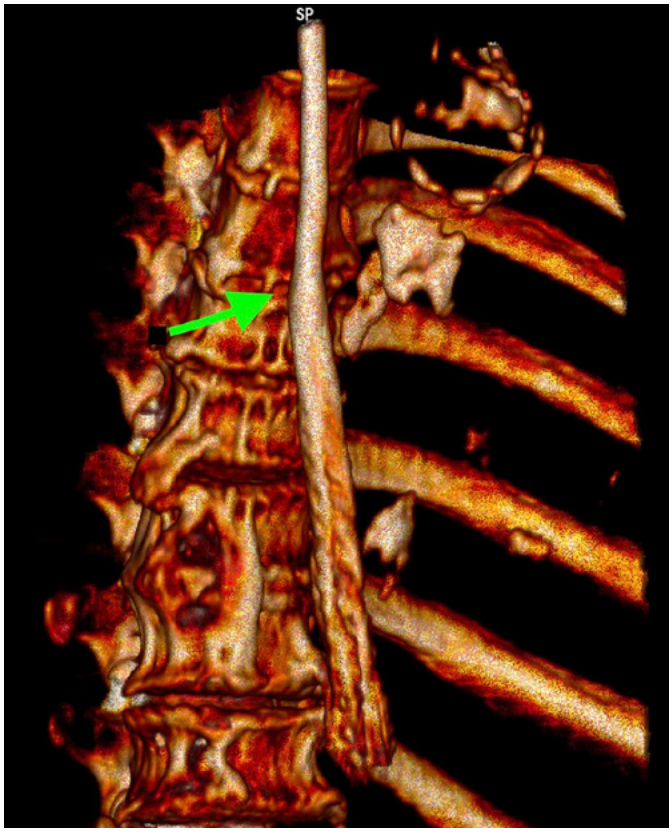

Figure 1. Tip of the non-tunneled CVC embedded in the lost introducer sheath (green arrow)

Figure 2. Computed Tomography image at admission showing the hemodialysis catheter route

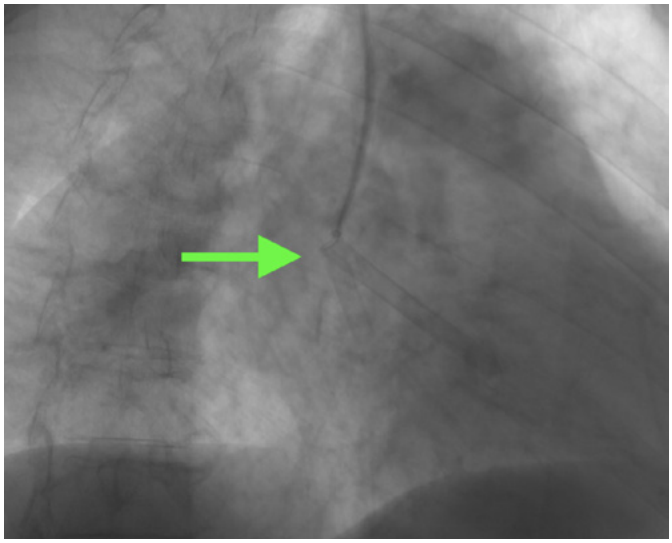

Figure 3. Floating introducer sheath grasped with the loop-snare (green arrow)

Figure 4. Floating introducer sheath brought up near the point of central vein catheter insertion (green arrow)

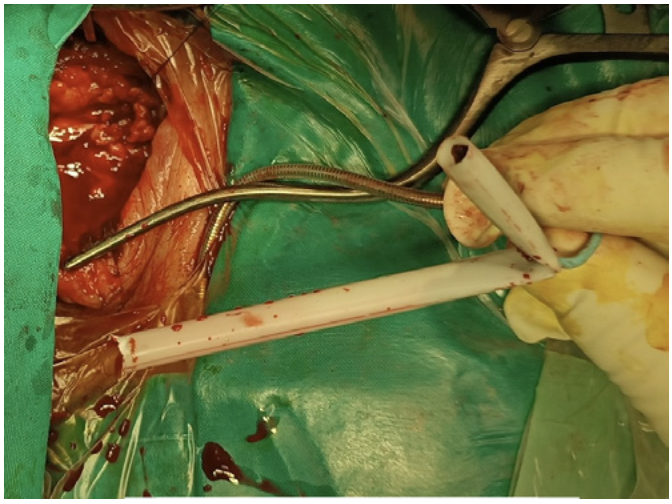

Figure 5. Open surgical removal of the detached introducer sheath

DISCUSSION

Catheter fracture and dislocation is an uncommon but life-threatening complication with an estimated rate of 0.1%[3]. Catheter fractures can occur owing to excessive pressure within the catheter, pinch-off syndrome, catheter malpositioning, catheter fatigue, and incorrect use of the catheter[4]. The site to which the fractured fragments migrate varies, with the most prevalent being the right heart chambers. According to Cheng et al., broken catheters embolize frequently to superior vena cava (23.9%), right atrium-inferior vena cava (20.6%), right atrium-hepatic vein (11.9%), and right atrium-right ventricle (10.8%)[5]. A catheter fragment in the heart can be the cause of serious complications, including mortality, arrhythmia, clotting, perforation, and infections[6].

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. There are 3 devices available for extraction of foreign body percutaneously: loop-snare, helical baskets, and grasping forceps. High success rates have been reported for the loop snare method, a standard method of endovascular treatment for the retrieval of a dislodged catheter[7]. For cases with no free end of the dislodged catheter available to grasp with the snare, modifications have been described with good results[8,9]. 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, and a transient ventricular arrhythmia has been described to develop when the guidewire or the catheter crosses the sinus node or the atrioventricular node[10].

CONCLUSION

The collaboration of a vascular surgery team and an interventional radiology team in this case, helped our patient to avoid a cardiac surgery that could lead to serious complications. This is an example of the results that can be achieved when we push boundaries and collaborate with different specialties for the benefit of the patient.

REFERENCES

1 Pecoits-Filho R, Okpechi IG, Donner JA, Harris DCH, Aljubori HM, Bello AK, et al. Capturing and monitoring global differences in untreated and treated end-stage kidney disease, kidney replacement therapy modality, and outcomes. *Kidney Int Suppl* (2011) 2020;10(1):e3-9. Epub 2020 Feb 19.

2 Murad MH, Elamin MB, Sidawy AN, Malaga G, Rizvi AZ, Flynn DN, et al. Autogenous versus prosthetic vascular access for hemodialysis: a systematic review and meta-analysis. *J Vasc Surg* 2008;48(5 Suppl):34S-47S.

3 Di Carlo I, Cordio S, La Greca G, Privitera G, Russello D, Puleo S, Latteri F. Totally implantable venous access devices implanted surgically: a retrospective study on early and late complications. Arch Surg 2001; 136:1050-3.

4 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.

5 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.

6 Van Den Akker-Berman LM, Pinzur S, Aydinalp A, Brezins M, Gellerman M, Elami A, Roguin N. Uneventful 25-year course of an intracardiac intravenous catheter fragment in the right heart. J Interv Cardiol 2002;15:421-3.

7 Tsai TN, Han CL, Lin WS, Yang SP, Tsao TP, Chu KM, et al. Transcatheter retrieval of dislodged Port-A catheter fragments: experience with 47 cases. Acta cardiol sin 2006; 22:221–8.

8 Sokwalla, N.K., Sagoo, R., Moussa, A. *et al.* A modified two-step technique for the retrieval of a chemoport catheter fragment with inaccesible ends. *CVIR Endovasc* **5**, 61 (2022). https://doi.org/10.1186/s42155-022-00342-x

9 Makoto Haga, Shunya Shindo. A modified loop snare technique for the retrieval of a dislodged central venous catheter, Radiology Case Reports, 15 (2020) 2706–2709. https://doi.org/10.1016/j.radcr.2020.10.013.

10 Denny MA, Frank LR. VT secondary to port-cath fracture and embolization. J Emerg med 2003; 24:29–34.