

Retrieval of fractured dialysis catheter through phlebotomy of internal jugular vein: a case report

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Huizhen Wu^{1*}, Tapas Ranjan Behera^{2,*},
Doaa Attia², Xiaoling Yu¹ and
Quanquan Shen³ 

Abstract

A central venous catheter is the most common access for initiating hemodialysis. Prolonged access through a central venous catheter increases the risk of infection and dysfunction of the catheter with potential development of catheter-induced thrombosis and embolism. However, fracture and dislodgement of the catheter with subsequent embolization is an unexpected complication. Endovascular treatment is a promising method to remove intravascular foreign bodies. We herein report a case of a 58-year-old woman undergoing prolonged hemodialysis who required central venous catheter removal because of mechanical fracture of the tunneled cuffed catheter and its migration in the internal jugular vein. An urgent chest X-ray showed that the two free ends of the fractured tunneled cuffed catheter were located in the right atrium and right internal jugular vein. Phlebotomy of the internal jugular vein was successfully performed to retrieve the fractured tunneled cuffed catheter and the associated thrombi. In this case, phlebotomy for retrieval of the embolized catheter fragment extending into the right atrium was a safe alternative to an endovascular technique of catheter fragment retrieval. Phlebotomy preserved the integrity of the catheter fragment and its associated thrombus and was both cost-effective and safe.

¹Department of Nephrology, Chun'an First People's Hospital, Hangzhou, Zhejiang, China

²Taussig Cancer Institute, Cleveland Clinic, Cleveland, Ohio, USA

³Department of Nephrology, Zhejiang Provincial People's Hospital, People's Hospital of Hangzhou Medical College, Hangzhou, Zhejiang, China

*These authors contributed equally to this work as co-first authors.

Corresponding author:

Quanquan Shen, Department of Nephrology, Zhejiang Provincial People's Hospital, People's Hospital of Hangzhou Medical College, No. 158 Shangtang Road, Hangzhou, Zhejiang 310014, P. R. China.
Email: spring198457@sina.com



Keywords

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Introduction

Hemodialysis is the most prevalent modality of renal replacement therapy for patients with end-stage kidney disease.¹ Despite efforts in planning and establishing long-term vascular access options ahead of regular hemodialysis, the prevalence of central venous catheters (CVCs) in patients with end-stage kidney disease remains high.²

The relative ease of placing a CVC with immediate usability makes it a suitable venous access method in emergency situations. The CVC also serves as a bridging access to hemodialysis in patients requiring urgent initiation of hemodialysis when the arteriovenous fistula/graft has not yet matured for use. Despite the advantages of catheters, complications include catheter-related infection and central vein stenosis.³ However, fracture of a catheter with or without embolization is an unusual yet serious complication.^{4,5} We herein report a rare case of mechanical fracture of a tunneled cuffed catheter (TCC) that migrated during the removal process and was successfully retrieved through phlebotomy of the internal jugular vein.

Case report

A 58-year-old woman with end-stage renal disease due to chronic glomerulonephritis had undergone regular intermittent hemodialysis for nearly 8 months. An arteriovenous fistula was established, and the patient was started on hemodialysis via a temporary hemodialysis catheter through the right internal jugular vein. After 2 months of treatment, the temporary hemodialysis

catheter required replacement with a TCC (HFS 24-C 14.5F × 24CM Hemo-Flow® Double Lumen Catheter; Medical Components, Inc., Harleysville, PA, USA) because of a catheter-related infection. The patient had been undergoing intermittent hemodialysis through the TCC in the right internal jugular vein for about 6 months while awaiting maturation of the arteriovenous fistula when she was admitted to the hospital for removal of the TCC. Prior to the surgery, the TCC exit site had been maintained in an aseptic condition using povidone-iodine cleansing and nontransparent dressing while using a 5000-unit/mL heparin solution without prophylactic antibiotic lock as a TCC locking solution.

The patient's physical examination and blood tests were unremarkable except for elevated concentrations of blood urea nitrogen (16.82 mmol/L) and serum creatinine (840 μmol/L). The catheter removal was conducted under local anesthesia through a skin incision above the catheter cuff. The catheter was isolated and fastened. It was then cut near the inner side of the cuff after it had been distally clamped with forceps. During this process, the forceps accidentally became loosened and the distal catheter fragment slid into the vein. An urgent chest X-ray showed that the distal end of the fractured TCC was located in the right atrium with its proximal free end in the right internal jugular vein (Figure 1).

The patient was asymptomatic. Considering that the free end of the catheter was still in the right internal jugular vein, we decided to attempt its retrieval through right internal jugular vein phlebotomy

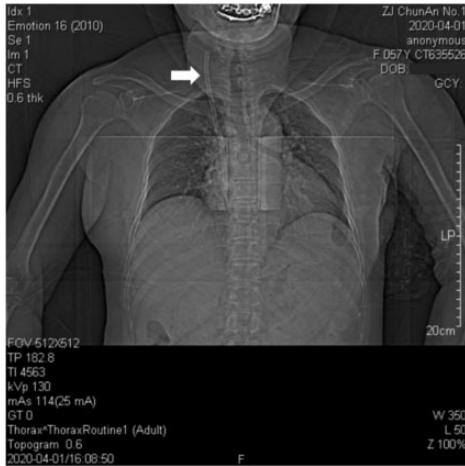


Figure 1. Chest X-ray showing the fractured catheter (arrow) in the right atrium traversing through right internal jugular vein

under general anesthesia. After 10 hours, we had dissected the right neck skin, carefully separated the sternocleidomastoid and scalene muscles, and exposed the right internal jugular vein, where we could trace one end of the fractured TCC inside the vein. An incision was made in the vein, which exposed thrombi covering the fractured TCC. The thrombi were removed from the vein and the TCC was successfully retrieved (Figure 2). The removed catheter segment was about 15 cm long (Figure 3). We then sutured the venous incision using a simple continuous suture with 5-0 polypropylene suture material (Prolene; Ethicon, Cincinnati, OH, USA). No complications occurred during the procedure. The postoperative period was uneventful. The patency of the patient's right internal jugular vein was ensured after the procedure and at 6 months postoperatively by ultrasonographic examination.

Discussion

A CVC remains the most common access in patients initiating hemodialysis. The United

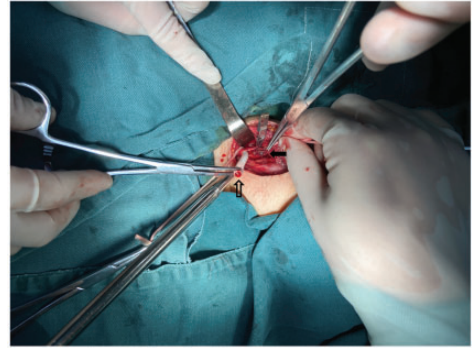


Figure 2. Thrombi (arrow) were taken out, and the fractured catheter (hollow arrow) was successfully retrieved



Figure 3. The retrieved catheter fragment (hollow arrow) and thrombi (arrow)

States Renal Data System reported that a CVC was used at hemodialysis initiation in 80% of patients in 2017.² This preference for a CVC is associated with its relative ease of placement at multiple sites, immediate usability, absence of pain, and easy connection to the dialysis unit. A CVC is used in the management of acute renal failure and in chronic renal failure as a bridge until maturation of the arteriovenous fistula/graft; it is also used when options for arteriovenous access are lacking or arteriovenous access has failed. Although an arteriovenous fistula was established in our

patient, it was not mature enough for use at the time of dialysis requirement. Therefore, dialysis was started through a temporary hemodialysis catheter that was changed to a TCC for dialysis access while waiting for maturation of the arteriovenous fistula.

Regardless of the catheter type and material, serious complications associated with CVCs have been recognized. Various long-term complications of CVCs include central vein thrombosis, catheter-related infection, catheter dysfunction from intramural and extramural thrombosis, and mechanical complications such as kinking, accidental bleeding, catheter adhesion, perforation, and even air embolism.⁶ Catheter-related complications from catheter fracture and embolization are being increasingly recognized. During removal of the CVC, the catheter tip can fracture and migrate to distal vessels and the heart. Embolization of fractured catheters may be asymptomatic, but they can also induce symptoms such as chest discomfort and hyperventilation with potential thrombus formation, perforation, arrhythmia, and infection.⁷

The intravascular catheter fragments should be removed as soon as possible to prevent their migration and resultant complications. The method of choice for management of such cases is either interventional radiological catheter retrieval or surgery.⁸ The percutaneous snare technique under fluoroscopic guidance is effective in most cases of fractured catheter fragment removal; however, the size of the fractured TCC in our case was larger (14F) than that in a previous report, in which an 18F sheathed catheter was adopted to transport the snare through the right femoral vein.⁹ In that report, blood vessel anastomosis and surgical closure by manual suturing was needed to close the incision in the right femoral vein after removal of the 18F sheathed catheter. In our case, because the fragment of the TCC was

within the internal jugular vein, major surgery such as thoracotomy or cardiac surgery could be averted. An alternative approach could have been to perform a percutaneous intervention; however, given the tendency of a fractured catheter to form a thrombus, which is associated with complications such as pulmonary embolism and stroke during percutaneous intervention,¹⁰ locating the fractured catheter within the internal jugular vein made phlebotomy the preferred choice. Because of the propensity for thrombus formation induced by endothelial damage from a fractured catheter, a percutaneous intervention should be avoided to prevent dislodging of the associated thrombus. When the fragment is accessible through the internal jugular vein, phlebotomy has the added advantage of being an inexpensive and safer option than percutaneous intervention.

It is important to ensure use of the correct procedure during surgical removal of a TCC by ensuring that the catheter is intact upon removal. Care must be taken to avoid pulling the catheter out against resistance. Instead, the catheter should first be withdrawn from the vein using a slow, consistent motion, and it should then be cut below the cuff or secured proximally (heart side) with two forceps. When part of a TCC fragment is still in the internal jugular vein, phlebotomy for removal of the catheter fragment is safe and effective. Careful surgical management with direct access to the fragment, when possible, decreases the complications of embolization by protecting the integrity of the catheter fragment and any associated thrombus while being less expensive and safer than endovascular techniques of catheter fragment retrieval.

Ethics statement

Publication of this study was approved by the local ethics committee of the Chun'an

First People's Hospital (approval number 0020200910). The patient provided written informed consent for publication.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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ORCID iD

Quanquan Shen  <https://orcid.org/0000-0001-6704-6247>

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