

# Malposition of a Tunneled Cuffed Hemodialysis Catheter: Where Did the Catheter Go?

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## Abstract

The first site of insertion of central venous catheters for hemodialysis is usually the right jugular vein, and in some cases we find it necessary to insert catheters into the left jugular vein. In our case, we describe the case of a patient aged 80 years, which required the placement of a tunneled catheter for hemodialysis at the level of the left jugular vein which was complicated by a malposition of the catheter at the level of the mediastinum causing a breach at the level of the left brachiocephalic venous trunk, requiring withdrawal of the catheter without incident. In order to avoid this type of complication, we recommend a chest X-ray after the insertion to verify the correct position of the catheter.

**Keywords:** Hemodialysis; Central venous catheter; Vessel injury; Jugular vein; Mediastinum

## Introduction

Hemodialysis (HD) is the most common treatment for patients with end stage kidney disease (ESKD). It requires reliable vascular access: arteriovenous fistula (AVF), arteriovenous grafts (AVG) and central venous catheters (CVC).

KDOQI guidelines strongly recommend AVF and discourage CVC (1). Nevertheless, cuffed tunneled HD catheter placement represents a safe and effective alternative unless peripheral access cannot be established.

The ideal site for placing CVC is the internal jugular veins, the right then the left [1].

Complications may occur particularly in elderly patients such as wrong cannulation (0.94%) [2]. Vessel injury during catheter insertion can lead to malpositioning with HD into the mediastinum. Here we report a rare case of CVC displacement in the mediastinum and we describe difficulties associated with this placement.

## Case Description

This is a female patient aged 80 years with ESKD and has been on HD since 2007 *via* distal left AVF, which lasted 11 years.

Over the years, the patient could no longer tolerate the HD sessions due to peridialytic hypotension which caused thrombosis of the AVF.

Another AVF was created on the right side but did not work immediately after the procedure.

Due to the lack of peripheral vascular access confirmed by doppler ultrasound showing thrombosis of the right venous network (internal jugular and subclavian veins), we decided to insert a cuffed-tunneled left internal jugular catheter.

After obtaining the patient's consent, she was placed in the supine position with the head tilted to the right side to clear the tracking triangle.

After an ultrasound tracking of the left internal jugular vein, we identified the ideal puncture site.

Subcutaneous 1% lidocaine was used to anesthetize the area locally with a 6 ml syringe.

The puncture point was between the medial and lateral head of the sternocleidomastoid muscle, the syringe was introduced carefully with suction until dark red blood was aspirated.

We took the same puncture point with a 17 G needle and we introduced a 0.0038 inch guidewire into the vein, but resistance was encountered; however, after asking the patient to straighten her head to the left the guide passed without incident.

A #11 scalpel blade was used to create a 5 mm incision in the skin for the entry point of the catheter. We connected the catheter with the dilator trocar in order to create the subcutaneous tunnel with an exit port 5-10mm from the vein puncture port.

Then, we proceeded to the dilation of the vein by a dilator (10 Fr 15

cm) followed by a second dilator (12 Fr 15 cm). The next step was to dilate the vein with a valved peelable introducer.

We pulled out the guidewire and tore off the sheath core and we immediately blocked the tear off sheath with finger tips with no blood return.

We placed the long term catheter along the avulsion free cavity while tearing the tear off sheath on both sides.

Blood flow was checked without difficulties. We sutured and fixed the catheter with an infusion of 1.9 cc of heparin in into each catheter.

An X-ray of the thorax was performed in order to confirm the correct placement of the catheter and this examination revealed a malposition of the catheter tip into the chest (Figure 1).

In order to be sure of the path taken by the catheter, we completed a thoracic angioscanner with 3D reconstruction (Figures 2 and 3) showing a branch at the level of the left brachiocephalic venous trunk with a catheter located in the mediastinum adjacent to the pericardium.

We removed this catheter without incident and placed a femoral catheter.

## Discussion

Complications secondary to HD catheter placement include infection, thrombosis, hemorrhage, cardiac arrhythmia and malposition, of which some of these complications can be fatal [2-5].

Catheter malposition is a relatively rare complication (4%) and in some studies even a lower incidence (0.94%) [2].

These complications may be related to vascular variations, thrombosis, punctures or vascular lesions that may lead to the death of patients in certain cases [6].

The catheterization of the left venous network is delicate, notably because of a rather particular anatomy.

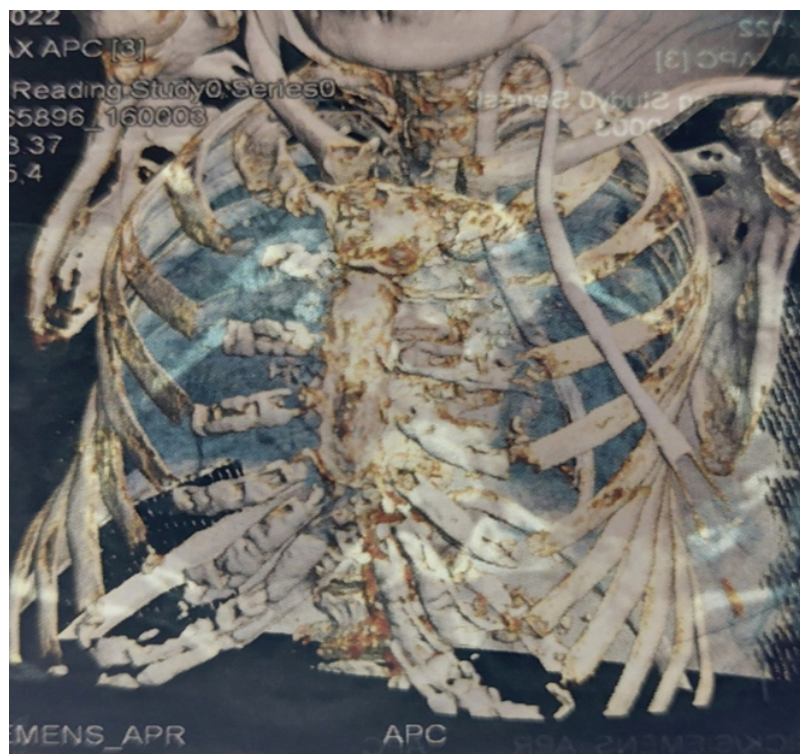
Xie P, et al. [7] described a case of dialysis catheter malposition in the mediastinum similar to our patient but which was only detected after catheter dysfunction during HD sessions.



**Figure 1:** X ray of the chest revealing malposition of the catheter.



**Figure 2:** Axial CT scan confirming the malposition.



**Figure 3:** 3D reconstruction showing misplacement.

According to the KDOQI recommendations, we obtained a chest X-ray in order to verify the correct position of the catheter before using it during HD sessions [1]. This allowed us to identify the position of the catheter in the mediastinum very quickly, thus avoiding manipulations that could have had serious consequences.

For our patient, we suspect that the introducer damaged the brachiocephalic venous trunk and the guidewire followed the path of this introducer and the catheter.

The insertion of the guidewire should be done without experiencing resistance, without producing pain to the patient or in the chest. The clinician should consider a potential venous perforation and thus a malposition of the catheter.

Kang SH, et al. [8] described in 2021 the case of two patients who had a complication of catheter malposition, one following puncture of the right jugular vein and the other following puncture of the left jugular vein, and a discussion that is related to the multiple theories explaining this complication.

As the position of the catheter cannot be assessed during the procedure, we encourage physicians to check the position of the catheter by a chest X-ray immediately after the procedure is completed and before the catheter is used to ensure that it is in the correct position.

The malposition of a catheter in the mediastinum could have serious complications such as a pneumohemo mediastinum and thus could potentially be fatal.

Our patient was stable during the procedure and even after there was no blood return which made us doubt of the diagnosis by evoking a persistent left superior vena cava but the angio CT scan confirmed the malposition in the mediastinum.

In order to avoid this complication, it may be preferable to perform an echo guided catheterization and this has been reported in the review by Tsolis N, et al. [9].

## Conclusion

In conclusion, our case illustrated a rare complication following the placement of HD catheters into the left jugular vein, which could be fatal.

In order to avoid as much as possible the complications associated with this procedure, it is preferable that the placement of the central catheter be echo-guided, with no difficulty in inserting the guidewire and chest X-ray confirmation at the end of the procedure to verify the correct position of the catheter.

## Conflict of Interest

The authors have declared that no Conflict of interest exists.

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