

Ultrasound to the Rescue: Management of Looped Guidewire during Hemodialysis Catheter Insertion in the Left Internal Jugular Vein

Jhanvi Bajaj^{1*}, Mohammed Saif Khan²

¹Department of Anesthesiology, KEM Hospital, Mumbai, Maharashtra, India, ²Department of Critical Care Medicine, Trauma Centre and Central Emergency, Rajendra Institute of Medical Sciences Ranchi, Jharkhand, India

Abstract

Hemodialysis catheters are commonly placed in the major central vein for the purpose of dialysis. Coiling or looping of guidewire is a rare but reported complication of a central vascular catheter insertion. We report a case in which we encountered a rare complication of looping of the guidewire used for dialysis catheter placement and how we correctly diagnosed and repositioned it under ultrasound guidance. A 68-year-old man diagnosed with Carcinoma of Piriform Fossa admitted in our ICU had Acute Renal Failure. An attempt to insertion of hemodialysis catheter in left internal jugular vein was made. Following successful puncture, the guide wire was threaded through needle. After five centimeter length of guide wire was threaded, resistance was felt and a loop of guidewire was visualized which was abutting the posterior wall of vein in out-of-plane view, creating a dual-point echogenicity. Under ultrasound guidance, we slowly pulled out the guidewire till the loop disappeared. The catheter was then inserted without repeat puncture of the vessel, thus preventing chance of thrombosis by repeated attempts. Real time USG guidance not only improves the success rates but also decreases the number of attempts and complications related to hemodialysis catheterization. Moreover, it benefits the patients by reducing the risks and discomforts of the procedure by reducing the duration of cannulation. The intelligent use of real-time ultrasound guidance in each step of the central venous catheterization is absolutely the need of the hour to prevent catastrophic yet preventable complications.

Keywords: Central venous catheterization, guidewire, hemodialysis, rescue, ultrasound

INTRODUCTION

Hemodialysis catheters are commonly placed in the major central vein for the purpose of dialysis. Coiling or looping of guidewire is a rare but reported complication of central vascular catheter insertion. Anatomically, the left internal jugular vein (IJV) catheterization is more difficult than the right due to its tortuous course.^[1] Incorrect placement of guidewires used during the Seldinger technique of venous cannulation has been reported to cause arrhythmias, cardiac perforation, and tamponade.^[2] Here, we report a case in which we encountered a rare complication of looping of the guidewire used for dialysis catheter placement and how we correctly diagnosed and repositioned it under ultrasound guidance without puncturing the vessel again.

CASE REPORT

A 68-year-old man diagnosed with carcinoma of piriform fossa, with no comorbidities was admitted to our intensive care unit (ICU) with hypoxemic respiratory failure and septic shock. The trachea was intubated and fluid resuscitation and vasopressor support were started. A 7 Fr sized triple lumen central venous catheter (CVC) was inserted in the right IJV under ultrasound guidance and in the first attempt successfully without any complication. Over a few hours, the patient was observed to have life-threatening complications of acute renal failure (anuria, metabolic acidosis with HCO_3^- of 12 mEq/L, and hyperkalemia with K^+ of 6.8 mEq/L). Therefore, urgent

Address for correspondence: Dr. Jhanvi Bajaj,
Department of Anesthesiology, KEM Hospital, Mumbai, Maharashtra, India.
E-mail: jhanvi.s.bajaj@gmail.com

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hemodialysis was planned for the patient, and consent for the same was taken from the patient's relatives. The left IJV was chosen for dialysis catheter insertion for two reasons; first, the right IJV was already catheterized with CVC, and second, the femoral vein cannulation is associated with higher risks of catheter-related infection, thrombosis, and occlusion as compared to IJV cannulation.

The patient was positioned with the head slightly lower than the rest of the body and the left side of the neck was cleaned with 2% w/v chlorhexidine gluconate and draped. We planned to follow the Seldinger technique under ultrasound guidance. Local anesthesia was given at the puncture site with 4 ml of 2% lignocaine. After locating the IJV using ultrasound (linear probe, 5 MHz frequency, Sonosite Edge II), the vein was punctured at 45° angle with the introducer needle and free aspiration of blood was confirmed. Following a successful puncture, the guidewire was threaded through the needle. After 5 cm length of guidewire was threaded, resistance was felt. Further attempt to thread the guidewire was stopped and a guidewire was removed. The syringe was connected to needle hub and free blood aspiration was done to confirm the presence of the needle in vein. On reattempting the guidewire insertion through the needle, we felt the resistance after 5 cm length of guidewire was inserted. We confirmed bilateral normal breath sounds, a normal respiratory rate, and oxygen saturation of 98% with no evidence of subcutaneous emphysema or hematoma, venous congestion, or limb ischemia. At this point of time, the senior ICU registrar was called for help.

Without removing guidewire, needle and guidewire were scanned to check the position of a guidewire in relation to the vein. Guidewire with the needle was found to be inside the vein; however, a loop of guidewire was visualized which was abutting the posterior wall of the vein in out-of-plane (axial) view, creating a dual-point echogenicity [Figure 1]. We retracted back the introducer needle a bit making sure that the guidewire was still in its place. Under real-time ultrasound guidance, we slowly pulled out the guidewire till the loop (dual-point echogenicity)

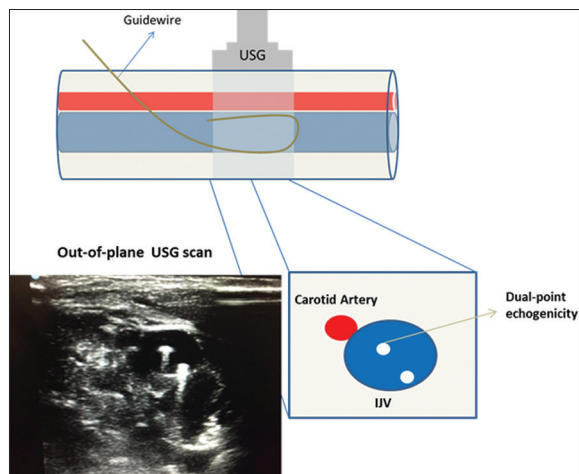


Figure 1: Out-of-plane (axial) ultrasonography scan of the neck showing loop of the guidewire in the internal jugular vein

disappeared; making sure that the guidewire was visible in the vessel lumen all the time. Again, the guidewire was advanced caudally in the vein, which could be threaded further without any resistance. Following dilatation, the dialysis catheter was railroaded over the guidewire, and a guidewire was removed. Correct intraluminal placement of dialysis catheter in the left IJV was conformed using ultrasonography (USG) [Figure 2]. Blood was aspirated in both ports and free flow was confirmed. A bedside chest X-ray was performed to ensure the correct placement of the hemodialysis catheter.

DISCUSSION

The main complications associated with hemodialysis catheter insertion procedure are cannulation failure, arterial puncture, hematoma formation, infection, and thrombosis of the veins.^[3,4] Repeated attempts at catheterization, especially in patients requiring chemotherapy or hemodialysis is an important risk factor for the formation of thrombus.^[5] The placement of a hemodialysis catheter can also be complicated due to kinking or looping of the guidewire. Kinking of the guidewire can potentially misdirect the tissue dilator and lead to off-tracking of the guidewire outside the vein.^[6] These complications are more common with inexperienced operators, increasing number of attempts, severe dehydration (reduced diameter of the vein), and morbid obesity.

In a study by Wang and Sweeney,^[7] they postulated that looping of the guidewire in the vein is due to the guidewire perforating the wall of the vein and becoming lodged in the surrounding soft tissues. There are many possible causes of vessel wall perforation. Some of them include using a straight, sharp tip guidewire instead of a “J” tip guidewire, using a solid core guidewire instead of a “spring” flexible tip guidewire, and a history of the previous catheterization in the vein causing irregularities in the vessel wall. However, in our case, the guidewire looped inside the lumen of the left IJV.

Real-time USG guidance not only improves the success rates but also decreases the number of attempts and complications

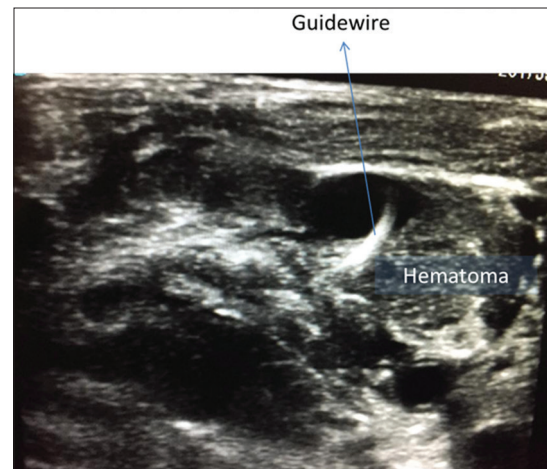


Figure 2: Loop of guidewire corrected under ultrasound guidance

related to hemodialysis catheterization. Moreover, it benefits the patients by reducing the risks and discomforts of the procedure by reducing the duration of cannulation. Considering all above advantages, USG guidance should become the standard of care in clinical practice.^[8]

A study by Forauer *et al.*, even highlighted the significance of preprocedural ultrasound scanning in patients undergoing temporary hemodialysis patients and found that 35% presented with significant findings such as stenosis, anatomic variation, nonocclusive thrombus, and total occlusion.^[9]

Hemodialysis catheters are often placed by resident in-training. Thus, it is important that excessive force should never be used to pull out a guidewire which is stuck in the vein when unexpected resistance is encountered, as this may result in fracture or migration of the broken wire. Furthermore, closer supervision by senior doctors is required to help identify and prevent similar complications as we did in the described case. The intelligent use of real-time ultrasound guidance in each step of the CVC ization from preprocedural scanning to the insertion of guidewire and confirmation of catheter placement is absolutely the need of the hour to prevent catastrophic yet preventable complications.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts

will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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