Endovascular Removal of Entrapped Central Venous Catheter Guide Wire

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I present the case of a 24-year-old female patient with a guidewire entrapment during central venous catheter insertion. At first, open surgery was considered to remove the entrapped guidewire; however, after vascular surgery consult, it was removed by a simple endovascular procedure described below in detail.

Key Words: Central venous catheters, Endovascular procedures, Guidewire entrapment

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INTRODUCTION

Central venous catheter (CVC) placement by the modified Seldinger technique [1] is commonly performed for drug and fluid administration or central venous pressure (CVP) monitoring in intensive care units or operating rooms. Various complications may occur during catheter placement. In order to decrease the incidence of technical complications, the National Institute for Clinical Excellence recommend placement of the CVC under ultrasonographic guidance [2]. Despite the compliance with all these measures, there remains an unexpected risk of complications even after safe venous puncture. Insertion of a guidewire (GW) and a dilator or catheter requires adequate precision and skills. Cardiac arrhythmia is the most common complication that occurs during the GW passage [3]. Other complications include looping, kinking, knotting, fragmentation, embolization, and intraluminal entrapment of the GW [4]. Trapped GW is a rare complication and there is no guideline for the optimal management of its removal. Here, I present a case of CVC GW entrapment that was successfully removed by an endovascular technique.

TECHNIQUE

A 24-year-old female was admitted to the intensive care unit with a history of weakness and lethargy. An anesthesiologist tried to insert a CVC by the modified Seldinger technique. The right internal jugular vein was blindly punctured and the GW was advanced despite encountering a slight resistance. However, the catheter did not pass easily along the GW. The operator tried to remove the GW with mild to moderate hand manipulation, but failed. Chest radiography revealed severe coiling and kinking of the GW between the base of the neck and mediastinum (Fig. 1). Following this, vascular surgery consultation was requested to remove the entrapped GW. Because endovascular removal was preferred over open surgery, the patient was transferred to the catheterization laboratory and cardiac monitoring was started.
After injecting 1% lidocaine at the GW entrance site in the neck, the wire path in the neck was evaluated under fluoroscopy (Fig. 2A). It seemed that the GW passed anterior to the trachea at the base of neck, and the end loop passed at the upper portion of the mediastinum. It was observed that the shape of the wire loops and its path did not match the path of the internal jugular and brachiocephalic veins. In order to remove the catheter, it was necessary to first straighten the torsions of the wire. There was no suitable catheter similar to the length of the CVC wire available for this purpose. Therefore, I decided to shorten the Judkins Right catheter (Cordis, Warren, NJ, USA) 5 F from 150 cm to 20 cm from the tip. The catheter was then advanced over the wire up to the first kinked segment of the wire (Fig. 2B). In this step, the push and pull technique was used to straighten the kinked wire and advance the catheter over it.

**Fig. 1.** Chest radiograph shows the guidewire kinked and looped at the base of neck (arrows).

**Fig. 2.** Steps of catheter advancement over the entrapped central venous catheter wire with the push and pull technique.

**Fig. 3.** Successful removal of the guidewire without any breakage.
Trapped Central Venous Catheter Guide Wire Exclusion

After the catheter reached the end of the wire, it was removed easily from the catheter without any resistance (Fig. 2F) (Supplementary Video). Finally, the catheter was removed with no bleeding or hematoma (Fig. 3). The vital signs of the patient were normal, and she returned to the intensive care unit for continuing her treatment. I did not insert a new CVC catheter because the patient’s parents did not consent to re-insertion.

DISCUSSION

CVCs are used in patients when access to central veins is required to measure the CVP or for medication or fluid administration. The Seldinger technique is widely used for CVC placement [5]. The complications of this procedure are diverse, and it is imperative that the operator takes all the necessary measures to minimize these complications. The complications related to the GW placement are rare but potentially serious [6]. Looping, kinking, knotting, fragmentation, embolization, and intraluminal or extraluminal entrapment of the GW may occur during CVC placement [4]. Ultrasound-guided catheter insertion has been proposed to prevent such complications [7,8]. Despite the use of ultrasound for catheter insertion, the presence of resistance against GW advancement is another important issue that should be considered to prevent GW-related complications. There are only limited reports on how to remove an entrapped GW. In many cases, the wire was removed by open surgery or by pulling out the wires under the fluoroscopy guidance [3,4,9,10]. Only a few cases have reported the successful endovascular removal of an entrapped GW during CVC placement [11].

In this case, a handmade shortened angled tip catheter (Judkins Right; 5 F, 20 cm length) was used to put in the entrapped wire, in order to reduce the resistance of the coiled and kinked wire surface against the surrounding tissue.

Furthermore, a special maneuver by the catheter tip, called the push and pull movement, was applied, where the kinked segment of the wire was easily opened, the catheter was advanced over the wire, and the GW was finally removed (Fig. 2B-E). When the tip of the catheter reached the wire’s first severe kink segment, it could not move forward at all. At this point, pushing the catheter forward and pulling the wire backwards caused the catheter to pass through the kinked wire, ultimately resolving the knot.

In this technical note, I want to emphasize that any CVC catheter insertion by the Seldinger technique should be done under ultrasound guidance and by the hands of a trained operator. No forced manipulation should be applied, even in case of resistance, to pass the GW or advance the dilator or catheter. If this happens, the operator should refrain from continuing and check the wire path under fluoroscopy. If the wire is kinked, coiled, and entrapped, it can be removed carefully by applying the endovascular technique explained above, and there is no need for open surgery unless uncontrollable bleeding occurs. Therefore, I propose the endovascular removal of an entrapped CVC wire, because it is safe, needs less anesthesia, and is less time consuming as compared to open surgery. Moreover, the recovery time of the patient is much shorter.

CONCLUSION

In conclusion, for removing the entrapped CVC wire the mentioned endovascular procedure is safe, needs less anesthesia, and is less time consuming with much shorter recovery time of the patient as compared to open surgery.

SUPPLEMENTARY MATERIAL

Supplementary data can be found via https://doi.org/10.5758/vsi.2020.36.1.45.

CONFLICTS OF INTEREST

The author has nothing to disclose.

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