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Case Report

Knot formation of a guidewire during subclavian venous catheterization: A case report [☆]

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ABSTRACT

Central venous catheters are used for a variety of purposes, including emergency care, parenteral nutrition, and chemotherapy, but their insertion can cause mechanical complications such as malposition, arterial puncture, and pneumothorax. Here, we describe a rare case of guidewire knot formation during subclavian vein catheterization. A 70-year-old woman presented to our facility for central venous port placement for chemotherapy after surgical resection of a retroperitoneal liposarcoma. The left subclavian vein was selected and punctured under ultrasound guidance, and a guidewire was introduced. However, strong resistance prevented both advancement and withdrawal of the guidewire. Radiograph revealed a knot like shadow near the tip of the guidewire. After placement of a central venous port in the opposite site, the knotted guidewire was surgically removed. Intraoperatively, the guidewire was found to penetrate the vein and form a knot on the outside of the posterior wall. Although the guidewire was able to be removed, a postoperative chest x-ray revealed a left pneumothorax, which required 10 days of treatment. If a knot forms in a guidewire during catheterization, surgical removal is recommended because forcible pulling can damage the vessel. In conclusion, guidewire knot formation is a very rare complication, but physicians performing central venous catheterization should be aware of it, and this report describes how to prevent and manage it.

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Introduction

Implantable central venous port systems are useful for cancer patients who require intermittent administration of anti-cancer drugs, parenteral nutrition, and blood tests. These devices improve patient satisfaction without restricting the patient's daily routine. A central venous port consists of a reser-

voir implanted subcutaneously and a catheter inserted into a central vein. Various complications are known to occur during insertion and maintenance period, and well known complications include infection, thrombosis, malposition, arterial injury, and pneumothorax [1]. However, guidewire knot formation during insertion is uncommon [4,5].

In our case, the guidewire penetrated the subclavian vein and formed a knot on the outside of the posterior wall.

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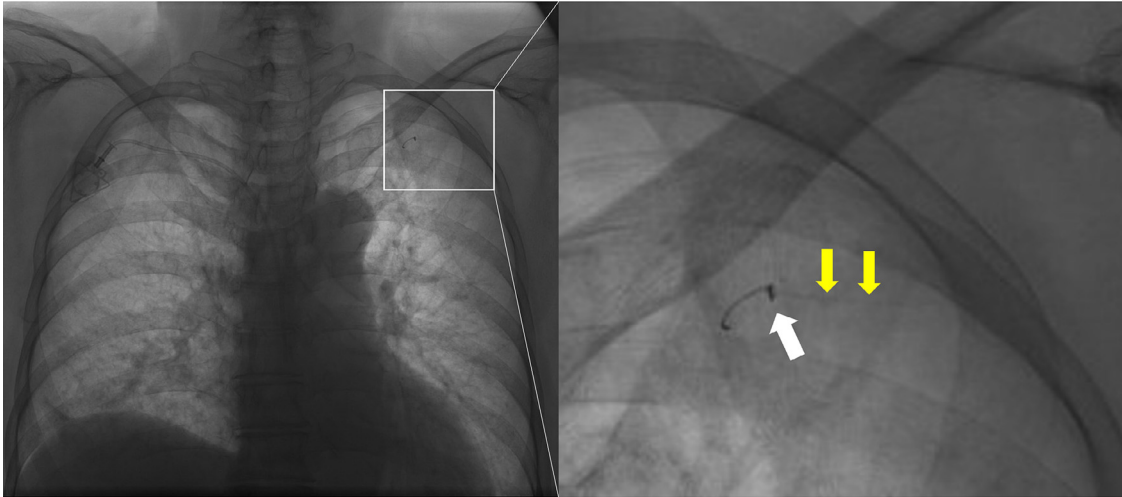


Fig. 1 – A chest X-ray after placement of a central venous port. A knot like shadow was shown near the tip of the guidewire (white arrow). The outer cover coil of the guidewire was stretched out (yellow arrows).

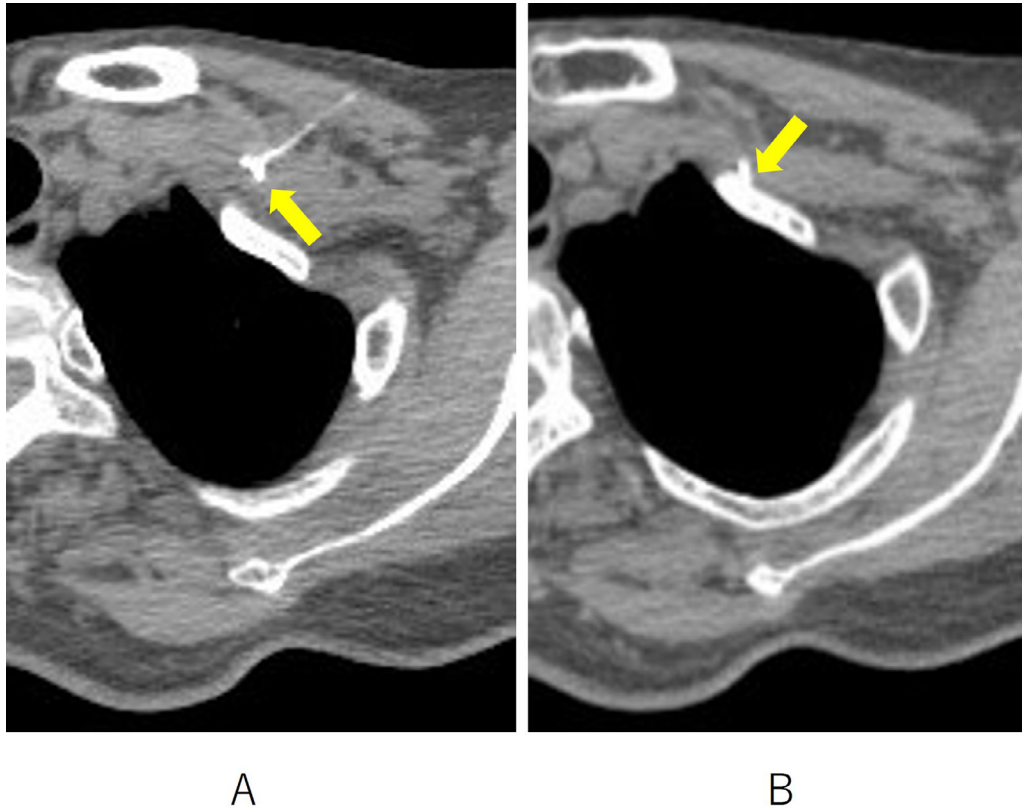


Fig. 2 – A. The CT image also revealed a knot like shadow near the tip of the guidewire (yellow arrow).
B. The CT scan revealed the guidewire penetrated the posterior wall of the vein and its tip was in contact with the left clavicle (yellow arrow).

Case report

A 70-year-old woman presented to our facility for placement of a central venous port for adjuvant chemotherapy after surgical resection of a retroperitoneal liposarcoma. In the proce-

dure room, the physician in charge decided to insert a central venous catheter into the left subclavian vein and place a reservoir in the left anterior thoracic region. After several ultrasound guided attempts to puncture the vein, he confirmed venous blood backflow and introduced a guidewire. However, there was strong resistance when the guidewire was advanced

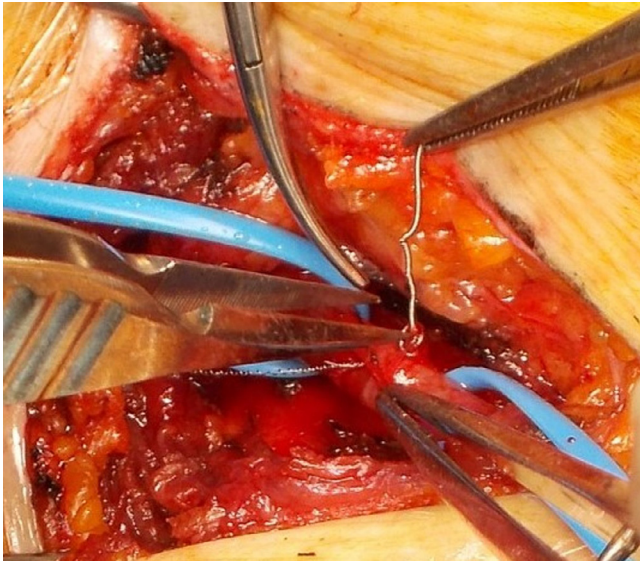


Fig. 3 – Intraoperatively, the guidewire penetrated both anterior and posterior walls of the vein and was knotted outside the posterior wall.

approximately 20 cm. He suspected the guidewire was not inserted properly and withdrew it but could not remove it. The outer cover coil of the guidewire had been stretched out because it was pulled with considerable force. After that, Radiograph revealed a knot like shadow near the tip of the guidewire (Fig. 1). Cannulation of the left subclavian vein was ceased, leaving the guidewire in situ. The puncture site was changed to the right subclavian vein. This time, cannulation was successful, and a reservoir was placed in the right anterior thoracic region. Then, computed tomography (CT) was performed to survey how the guidewire was in the body. The CT image revealed a knot like shadow near the tip of the guidewire, as in the X-ray image (Fig. 2A). It also revealed that the guidewire penetrated the posterior wall of the vein and its tip was in contact with the left clavicle (Fig. 2B). After consultation with the orthopedic surgeon, we determined that surgical removal of the guidewire under general anesthesia would be appropriate because forcible pulling could break the guidewire or damage the vein. Intraoperatively, the guidewire was found to penetrate the anterior and posterior walls of the vein, forming a knot outside the posterior wall (Fig. 3). The knotted guidewire was carefully untied and removed from the left subclavian vein. Unfortunately, a postoperative chest x-ray revealed a left pneumothorax, and the patient was discharged after 10 days of hospitalization for treatment of the pneumothorax.

Discussion

Implantable central venous port systems are widely used for cancer patients who require intermittent intravenous administration of chemotherapy, parenteral nutrition, and blood exam. These devices are completely implanted subcutaneously and do not restrict daily activities of living, thus im-

proving patient satisfaction. A central venous port consists of a reservoir implanted subcutaneously and a catheter inserted into a central vein. The catheter is usually cannulated using the modified Seldinger method, and as with regular central venous catheters, complications such as malposition, arterial injury, and pneumothorax can occur during insertion [1]. However, guidewire knot formation during insertion is very rare [4,5]. In previous cases, there was strong resistance during guidewire advancement and withdrawal, and a knot was subsequently discovered by radiography. Both intravascular and extravascular cases of knot formation have been reported [2,3,4,6].

If resistance is felt when inserting a guidewire, it should not be advanced any further, but inexperienced operators may not be able to recognize resistance. In addition, since proper insertion cannot be confirmed in the blind, there is a risk of complications such as intravascular or extravascular malposition. Inserting the guidewire under fluoroscopic guidance and confirming its position with an ultrasound device are effective ways to minimize such complications [5].

In our case, the guidewire penetrated the subclavian vein and formed a knot outside the posterior wall. This indicates that the guidewire was inserted via a needle whose bevel was in contact with or penetrated the posterior wall of the vein, and the tip of the guidewire reached the outside of the posterior wall. Since the guidewire tip is flexible, excessive force in the tissue can cause it to kink or loop and even form a knot [6].

If a knot forms in a guidewire during insertion, surgical removal is recommended, as forcible pulling can damage blood vessels or break the guidewire and leave remnants in the body. If knot formation of the guidewire is intravascular, vascular surgeons should be consulted [4].

In conclusion, guidewire knot formation is a very rare complication, but physicians performing central venous catheterization should be aware of it. We suggest that guidewire insertion under fluoroscopic guidance with no resistance and confirmation of position by ultrasound imaging can minimize this undesirable event.

Patient consent

Written informed consent was obtained from the patient for publication of this case.

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