





Extravascular Course of Central Venous Catheter: A Rare Subclavian Complication Detected via Thoracoscopy

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ABSTRACT

Central venous catheterization via the subclavian vein is commonly performed due to its advantages, including lower infection rates and greater patient comfort. However, mechanical complications such as malposition may occur. We present a rare case in which a subclavian central venous catheter traversed extravascularly through the thoracic cavity before re-entering the superior vena cava, detected incidentally during video-assisted thoracoscopic surgery. The catheter was successfully removed without complications. This case highlights the importance of verifying catheter placement, as blood aspiration from all lumens does not guarantee correct positioning. In this report, the extravascular course and management of the subclavian catheter in the thoracic cavity during thoracoscopic surgery are discussed.

Keywords: Catheter malposition, extravascular course of subclavian catheter, video-assisted thoracoscopic surgery

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Introduction

Central venous catheters (CVCs) are invasive procedures frequently used in many clinical indications such as intensive care, major surgeries, long-term intravenous treatments, and hemodynamic monitoring to provide temporary or long-term vascular access. Although the subclavian vein is frequently preferred due to its advantages such as low infection rate, high patient comfort, and ease of nursing care in central catheter placement, it also carries risks of mechanical complications.^[1]

The most common complications during CVC placement include malposition, hemothorax, pneumothorax, cardiac tamponade, vascular erosion, air embolism, and arrhythmia.^[2,3] Malposition is one of the mechanical complications that may lead to serious consequences as the catheter advances outside the vessel, into the arterial system, mediastinum, or thorax. According to the literature, 14–81% of all complications are due to malposition.^[3,4] The risk of malposition is higher, especially in the right

subclavian vein compared to the internal jugular vein (9.1% vs. 1.4%).^[5] Superior vena cava (SVC) perforation due to CVC is a rare complication (0.5%) that may result in hemothorax, pneumothorax, or pneumomediastinum. Therefore, it is important to verify the catheter position after the procedure and to recognize complications early.^[6,7] In this report, the extravascular course and management of the subclavian catheter in the thoracic cavity during thoracoscopic surgery are discussed.

Case Report

Written informed consent was obtained from the patient for the presentation. A 27-year-old, 55-kg, female patient with a history of smoking and diabetes mellitus, who was scheduled for wedge resection with video-assisted thoracoscopic surgery (VATS) due to a right lung nodule, was evaluated as ASA II. The patient had exertional dyspnea, while other physical examination findings and laboratory tests were normal. The patient was consulted to cardiology due to exertional dyspnea.

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The patient was taken to the operating room and monitored with routine anesthesia monitoring and Bispectral Index (BIS) monitoring, as well as left radial artery cannulation for continuous blood pressure monitoring. The patient's basal blood pressure was 120/70 mmHg, pulse rate was 75/min, and peripheral oxygen saturation was 98%. After 3 min of preoxygenation with 100% O₂, routine anesthesia induction was performed, and after sufficient muscle paralysis was achieved, the patient was intubated with a 35 Fr double-lumen left endobronchial tube. After the endobronchial tube location was confirmed by auscultation and bronchoscopy, the tube distance was determined. Anesthesia maintenance was provided with 2% sevoflurane in 50/50 O₂/air and 0.05 mcg/kg/min remifentanyl infusion at BIS 40–60. After intubation, a triple-lumen CVC was placed in the right subclavian vein in a single attempt by an experienced anesthesia assistant without any problems. Blood flow from all lumens was confirmed by aspiration, the lines were flushed with physiological serum, and the catheter was fixed.

The patient was placed in the left decubitus position and prepared for VATS. During thoracoscopic access, the surgeon noticed that the catheter had exited the subclavian vein, advanced into the thoracic cavity, and reached the SVC extravascularly (Fig. 1). The course of the catheter in the thorax and its entry into the SVC were directly observed. Open surgery was performed. After wedge resection, the catheter was removed in a controlled manner by the cardiovascular surgeon by suturing around the catheter (Fig. 2). After bleeding and leakage control, a thoracic tube was placed. At the end of the three-hour operation, the patient was extubated without any problems and taken to intensive care. She was transferred to the ward the next day without any complications.

Discussion

Central venous catheter application is an invasive procedure that is common in modern medicine but can cause serious complications.^[8] Catheter malposition, one of the most common complications of CVC application, can sometimes be asymptomatic.^[9] While passage to the internal jugular vein is particularly common in subclavian catheterizations, progression to the thoracic cavity is less common.^[10,11] If the catheter does not work and blood cannot be aspirated or infused quickly enough, this may indicate catheter malposition.^[12] Hohlrieder et al.^[13] reported that aspiration of blood from central catheter lumens does not rule out catheter malposition. In our case, the catheter was placed in a single attempt, and although venous blood return was observed from all lumens, the extravascular course of the catheter was

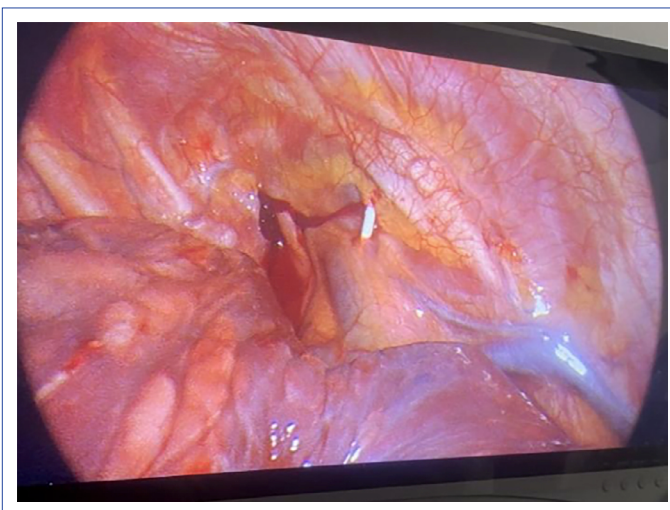


Figure 1. Thoracoscopic view of the CVC.

CVC: Central venous catheter.

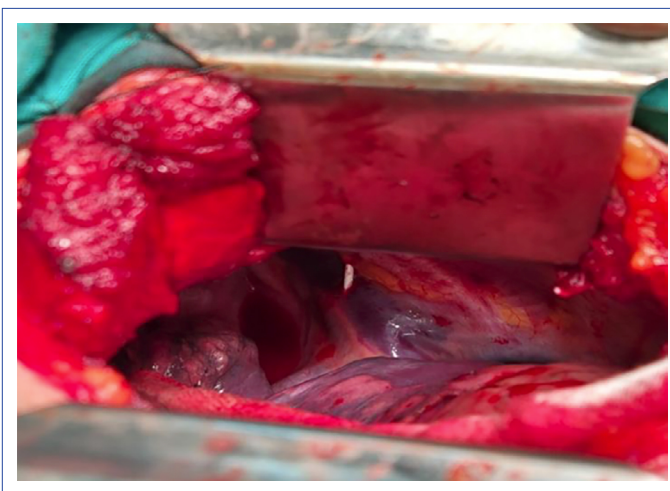


Figure 2. Appearance of the CVC after conversion to open surgery.

detected during thoracoscopy. The asymptomatic course of the malposition suggests a controlled perforation in the low-pressure venous system. In addition, the short distance advancement of the catheter in the thorax may have prevented serious tissue damage.

Complication rates for CVC placement are 5–19%; therefore, post-procedural radiological confirmation is recommended.^[14] However, in some studies, routine radiography was found to be unnecessary in experienced hands and under certain conditions.^[14,15] This case shows that a CVC placed with classical techniques can rarely exit the vessel and re-enter the venous structure. In our case, intraoperative observation provided direct diagnosis, no additional imaging was required, and the complication was resolved surgically. This approach can be considered one of the rare clinical situations where the position of the catheter can be directly monitored during the procedure.

Our case suggests that chest radiography may be insufficient in the diagnosis of malposition in central catheters placed outside of thoracic and cardiovascular surgery. Specifically, in this case, the extravascular course of the catheter was so short that it could have been missed on the chest film. It also reminded us that complications may arise not only during catheter insertion but also during removal.

Conclusion

Although blood flow from all lumens during CVC placement suggests that the catheter is in the correct position, this is not always a reliable finding and may delay diagnosis. Therefore, careful technique, operator experience, and the use of additional verification methods when necessary are critical in CVC placement. This case highlights the importance of multidisciplinary coordination and vigilant intraoperative monitoring to optimize outcomes.

Disclosures

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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