

Guidewire Loss during Central Venous Catheterization in a Patient without Symptoms: A Case Report

Hyo Gyun Choi^{1*}, Myoung Hun Kim²

¹Department of Anesthesia and Pain Medicine, Inje University Busan Paik Hospital, 75 Bokji-ro, Busanjin-gu, Busan, South Korea

²Department of Anesthesia and Pain Medicine, Inje University Busan Paik Hospital, 75 Bokji-ro, Busanjin-gu, Busan, South Korea

DOI: [10.36347/sjmcr.2023.v11i07.021](https://doi.org/10.36347/sjmcr.2023.v11i07.021)

| Received: 21.06.2023 | Accepted: 25.07.2023 | Published: 29.07.2023

*Corresponding author: Hyo Gyun Choi

Department of Anesthesia and Pain Medicine, Inje University Busan Paik Hospital, 75 Bokji-ro, Busanjin-gu, Busan, South Korea

Abstract

Case Report

Central venous catheterization is routinely performed in operating rooms, emergency departments, and intensive care units. The Seldinger technique, a comparatively safe method, is frequently utilized in such procedure. Nonetheless, this method has inherent risks; hence, it should be cautiously applied. Although complications related to guidewire utilization are rare, they can have important side effects. Herein, we describe a case of guidewire loss during central venous catheterization in a patient without symptom. Further, the causes of guidewire non-removal during central venous catheterization and preventive strategies were investigated.

Keywords: Catheterization, central venous catheter, complications, guidewire.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Central venous catheterization is among the important techniques for ensuring safety among patients receiving anesthesia before undergoing high-risk surgeries. It facilitates the monitoring of hemodynamic parameters by measuring central venous pressure, and it is used for the administration of fluids and drugs and emergency blood transfusions. However, this procedure is associated with some risks and complications. The acute complications may include arterial puncture, pneumothorax, and hemothorax. Meanwhile, the guidewire-induced complications can involve cardiac dysrhythmias, cardiac conduction abnormalities, vessel or cardiac chamber perforation, wire kinking, looping, or knotting, entanglement with existing intravascular devices, distal tip breakage with subsequent embolization, and complete guidewire loss within the vascular system [1]. The incidence of these mechanical complications attributed to the guidewire ranges from 5% to 19% [2, 3]. The prognosis associated with central

venous catheterization can be multifaceted, contingent on the early detection and management of these complications. Herein, we present a case involving guidewire loss during central venous catheterization via the right internal jugular vein.

CASE REPORT

A 62-year-old female patient who required lumbar joint fixation due to persistent back pain lasting for the last 5 years was admitted to the emergency department. The patient had been maintaining pharmacological treatment for dyslipidemia, and she had a previous history of microdiscectomy, but not central venous catheterization. Based on the pre-anesthetic evaluation, the patient was fully conscious. Her vital signs were as follows: blood pressure, 110/70 mmHg; pulse rate, 90 beats per minute; and body temperature, 36.5°C. Further, no specific abnormalities were on observed chest radiography, as shown Fig 1.

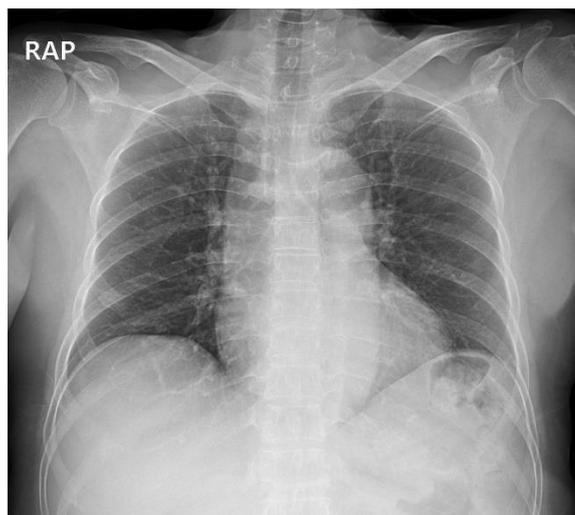


Figure 1: Normal chest radiography before surgery

The patient's American Society of Anesthesiologists physical status score was II, and anesthesia induction was achieved with 50 mg lidocaine, 120 mg propofol, 50 mcg remifentanyl, and 50 mg rocuronium. Tracheal intubation was performed using a 7.0-mm internal diameter tube, and the Cormack–Lehane grade was I. For anesthesia maintenance, desflurane and remifentanyl at a rate of 100 mcg/h were administered. After anesthesia induction, right internal jugular venous catheterization was performed using the ultrasound-guided Seldinger technique with a 7.0-Fr double-lumen catheter (central venous catheter kit, Merit Medical Singapore Pte., Ltd.) for hemodynamic monitoring and fluid management.

The procedure progressed uneventfully, and immediate post-insertion blood flow confirmation via the catheter was achieved. Moreover, no complications were noted. Intraoperative central venous pressure was maintained at 13–19 mmHg. The surgical procedure comprised spinal disk incision, intervertebral disk excision, and bone harvesting, performed in the left lateral decubitus position, along with decompression and joint fixation in the prone position. The surgery was performed without any evident incidents. Postoperative chest radiography was performed to assess potential lung complications. Postoperative chest radiography showed that the guidewire remained, which was not noticed by the medical staff at that time, as shown in Fig 2.



Figure 2: Retained guidewire from the central venous catheter extending from the right iliac vein and crossing the diaphragm to the inferior vena cava

Nevertheless, the wound healed well, and the patient was discharged 15 days post-surgery.

Thirteen days after discharge, during a routine follow-up radiography, the guidewire was identified in

the inferior vena cava and right iliac vein. The patient did not report any leg pain or cardiovascular anomalies. Guidewire removal was successfully performed via the right femoral vein using a gooseneck snare at the interventional radiology center, as shown in Fig 3.

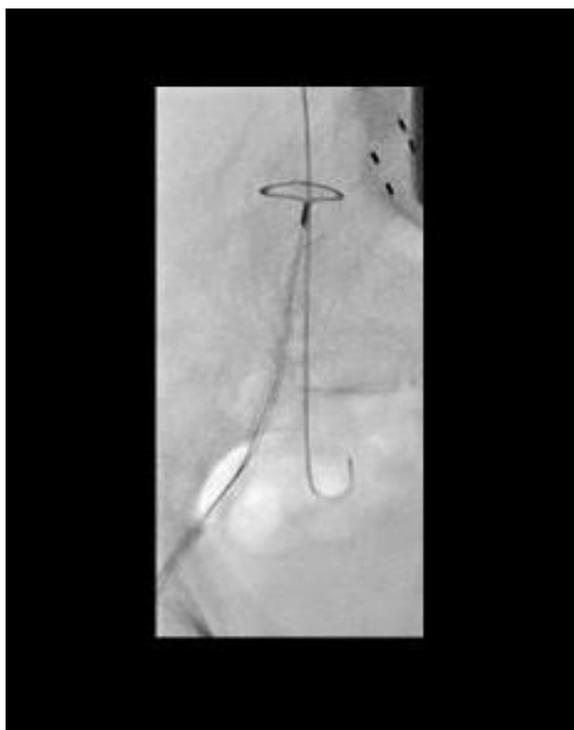


Figure 3: Using a snare via the right femoral vein, the guidewire in the intervention center was removed

During the interventional procedure for guide wire removal, the patient's vital signs remained stable, and there were no significant changes in her condition.

The procedure was smoothly completed without any other complications, as shown in Figs 4 and 5.



Figure 4: Post-procedural appearance with the successful removal of the guidewire from the femoral region

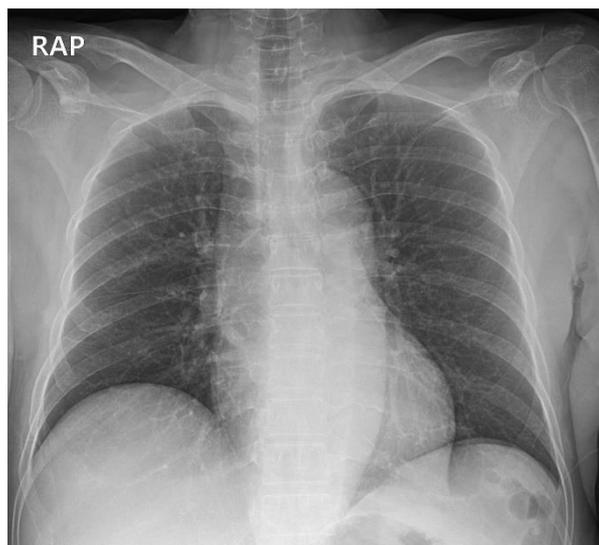


Figure 5: Post-procedural appearance with the successful removal of the guidewire from the chest

DISCUSSION

During central venous catheterization with the Seldinger technique, the introducer needle is initially inserted into the vein. Thereafter, the guidewire is guided via the needle, and the needle is then removed. The catheter is then introduced over the guidewire, which is subsequently removed after catheter insertion [4]. Although extremely rare, potential complications may arise due to this process. In conditions where the guidewire is not successfully removed, complications within the vasculature and adverse events such as arrhythmia, vascular trauma, thromboembolism, infection, perforation, and cardiac tamponade may occur [4, 5]. However, in this case, the patient did not experience any symptoms related to the remained guidewire within 28 days after it was left inside the body [4].

The guidewire retained within the blood vessel can be attributed to various factors. First, the end of the guidewire is straight, thereby increasing the possibility of complete entry into the vessel. Second, to decrease the risk of contamination during the procedure, guidewires can be inserted deeper than necessary, inadvertently increasing the possibility of its retention. Third, there may be factors related to human error, which include insufficient skill, fatigue, and lack of concentration among the medical staff [3]. In this case, the complications were attributed to the operator's lack of experience and skills, insufficient concentration, and the absence of supervision during catheterization. The procedure was performed by a first-year resident alone. Further, since the procedure was performed late in the afternoon, the operator could have experienced a high level of fatigue, leading to lack of concentration. The inadvertent loss of guidewire within the blood vessels can cause life-threatening outcomes; thus, the medical team must focus to prevent its occurrence. Throughout the procedure, the guidewire's end should be monitored while ensuring that it remains in-hand during the

procedure [6]. Incorporating the use of a long guidewire with an attached marker to its terminus can further decrease the risk of guidewire loss within the vasculature.

After the procedure, it is important to inspect the removed guidewire and check smooth fluid injection and appropriate backflow via the central venous catheter [7]. If the guidewire is suspected of remaining in the vessel, radiographic examination after catheter insertion should be performed. In this case, despite the guidewire's presence in the post-catheterization radiograph, a lack of concentration led to its initial non-recognition by the medical staff. Therefore, surgeons, anesthesiologists, and radiologists should collectively review post-procedure or post-surgery radiographic images to prevent missing any complications that may be detected [7]. After this case, we have implemented changes based on scholarly recommendations. These changes include discontinuing the independent performance of central venous catheterization procedures by first-year residents and ensuring that procedures are performed under the appropriate supervision of experienced staff members. Furthermore, it is now mandatory for physicians and nurse to collaborate in validating the position of the guidewire during and after the central venous catheterization procedure. These modifications are in accordance with the current academic literature and best practices to enhance patient safety and minimize the risk of iatrogenic complications.

Upon confirming guidewire retention within the blood vessel, guidewire removal must be performed. The gooseneck snare is the preferred device in this procedure. The alternative methods include the two-wire technique, endovascular forceps, and Dormia basket. In exceptional circumstances, venotomy or median sternotomy can be conducted. The

administration of an anticoagulant, commonly heparin, is conventionally required prior to guidewire removal.

All things considered, caution must be taken during central venous catheterization to ensure patient safety and prevent guidewire retention within the blood vessel. Procedural complications should be anticipated, and different safety measures must be employed. During the procedure, it is essential to monitor the patient's symptoms to identify potential complications. Furthermore, physicians and nurses should check the guidewire together during and after the procedure. Thereafter, radiologists, surgeons, and anesthesiologists should cautiously review the radiographic images to identify any possible complications. To minimize complications related to the guidewire, such a process should be routinely conducted.

CONCLUSION

Herein, we aim to emphasize prophylactic measures against iatrogenic complications by focusing on the whole central venous catheterization procedure. We recommend early detection methods via comprehensive monitoring and routine check-ups, which can be performed by the medical team, even on patients who are asymptomatic after treatment, to reduce the risk of severe adverse outcomes.

REFERENCE

1. Khasawneh, F. A., & Smalligan, R. D. (2011). Guidewire-related complications during central venous catheter placement: a case report and review of the literature. *Case reports in critical care*, 2011, 287261. doi:10.1155/2011/287261
2. Mansfield, P. F., Hohn, D. C., Fornage, B. D., Gregurich, M. A., & Ota, D. M. (1994). Complications and failures of subclavian-vein catheterization. *New England journal of medicine*, 331(26), 1735-1738.
3. McGee, D. C., & Gould, M. K. (2003). Preventing complications of central venous catheterization. *New England journal of medicine*, 348(12), 1123-1133.
4. Amit, A., Jyotsna, S., & Kasyap, V. K. (2016). Retention of guidewire: a rare but avoidable complication of central venous catheterization. *Journal of Comprehensive Pediatrics*, 7(1), e33238. doi:10.17795/compreped-33238.
5. Eskandarian, R., Abdollahpour, A., Aghaamoo, S., Amini, N., Zangian, H., & Ghods, K. (2022). A Case Report: Surgical Removal of Missing Guide Wire, Is it the Best Intervention?. *Bulletin of Emergency & Trauma*, 10(3), 138.
6. Khasawneh, F. A., & Smalligan, R. D. (2011). Guidewire-related complications during central venous catheter placement: a case report and review of the literature. *Case reports in critical care*, 2011. doi:10.1155/2011/287261.
7. Van Doninck, J., Maleux, G., Coppens, S., & Moke, L. (2015). Case report of a guide wire loss and migration after central venous access. *Journal of Clinical Anesthesia*, 27(5), 406-410. doi:10.1016/j.jclinane.2015.04.005.