CASE REPORT

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Massive Hemothorax Post Central Venous Line Removal: A Case Report

Ahmad Nasrat Al-juboori,[1, 2, 3, *] Amira Al Hail,[1, 2, 3] Hesham Ismail,[2, 3, 4] Adel Ganaw,[4] Harith Al-Gburi,[1] and Abdullah Ahmed[1]

[1] *Department of Otorhinolaryngology, Head and Neck Surgery, Al Wakra Hospital, Hamad Medical Corporation, Doha, Qatar.*
[2] *Weill Cornell Medical College-Q, WC University, Ar-Rayyan, Qatar.*
[3] *College of Medicine, Qatar University, Doha, Qatar.*
[4] *Department of Anaesthesia and Perioperative Medicine, Al Wakra Hospital, Hamad Medical Corporation, Doha, Qatar.*

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ABSTRACT

Hemothorax is uncommon complication of central venous catheterization. Although it often develops immediately after the procedure, it is very rare after removal of the central catheter. A 33-year-old female patient is scheduled for septoplasty under general anesthesia. Before the start of surgery, she developed hypotension (70/50 mmHg) and desaturation (PO2 down to 85%). The provisional diagnosis was anaphylaxis. A central venous catheter (CVC) was inserted into the right internal jugular vein (IJV) by the Seldinger technique with ultrasound guidance. The patient improved after hemodynamic correction for 24 hours. A few minutes after removal of the catheter in the intensive care unit, the patient developed acute chest pain and dyspnea. Chest X-ray and computed tomography revealed a massive right-sided hemothorax requiring urgent chest tube insertion with evacuation of two liters of blood. The patient improved clinically, the chest tube was removed after 3 days, and she was discharged in stable condition. Although massive hemothorax is very rarely reported after CVC removal, all cases with IJV catheter removal should be carefully monitored for an appropriate period.

Keywords: Massive hemothorax; Central venous line removal; Internal jugular vein; Case report.

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INTRODUCTION

Central venous catheterization is frequently used in the intensive care unit (ICU) for hemodynamic monitoring, extracorporeal treatments, fluid replacement, and parenteral nutrition [1]. It is an invasive procedure in critically ill and anesthetized patients; however, it may be associated with various complications, with vascular injury being the most common. While hemothorax often develops immediately after the procedure, it is infrequent after catheter removal. Despite its clinical utility, central venous catheter (CVC) insertion and removal carry risks of complications, most commonly vascular injuries. Risk factors include insertion site, technical errors, repeated puncture attempts, vascular fragility, and anticoagulation [2]. Clinically hemothorax presents with acute chest pain, dyspnea, hypoxemia, and hemodynamic instability. Diagnosis is typically made by chest radiography or computed tomography (CT). Management involves immediate resuscitation, chest tube drainage, blood transfusion, and surgical intervention in severe cases. Differential diagnoses include pneumothorax, pulmonary embolism, and cardiac tamponade [3]. Extrathoracic vascular injuries (e.g., carotid artery) can be easily discovered and managed with manual compression. In contrast, intrathoracic vascular injuries may be challenging to identify due to invisibility and the impossibility of external compression, which can lead to serious and potentially lethal results [4]. Hemothorax, when acute, can be a fatal complication

* Corresponding author: E-mail: aaljuboori@hamad.qa

of subclavian vein catheterization [5]. However, it is rarely seen late after catheter insertion, usually explained by long-term venous wall damage [6]. We present a patient of massive hemothorax following removal of a right internal jugular vein (IJV) catheter inserted under ultrasound guidance, highlighting the importance of close observation post-removal.

CASE PRESENTATION

A 33-years-old single Nepalese female, with no comorbidities or bleeding tendency, was scheduled for septoplasty and submucosal diathermy of inferior turbinates under general anesthesia. She had no history of surgery or anesthesia exposure. After induction and intubation, five minutes into the procedure, she developed severe hypotension (70/50 mmHg) and desaturation (PO2 down to 85%). She was resuscitated successfully, with improvement of blood pressure and oxygenation. The provisional diagnosis was anaphylaxis.

A right IJV CVC was inserted using the Seldinger technique under ultrasound guidance. Chest X-ray confirmed the catheter tip at the junction of the superior vena cava and right atrium, with no complications noted (Figure 1).

Surgery was cancelled, and the patient was transferred to the ICU for observation and investigation. After 24 hours, she had recovered with stable vitals and was fully conscious after hemodynamic correction and anti-anaphylaxis management. The CVC was removed. Within minutes, she developed right-sided chest pain, dyspnea, abdominal pain, hypotension, tachycardia, and tachypnea.

An immediate chest X-ray showed complete opacification of the right hemithorax with contralateral mediastinal shift, primarily due to a large amount of fluid (Figure 2).

Urgent computerized tomography (CT) with contrast study (patient vitals still tolerating contrast study) to rule out vascular leak. CT showed the same findings as the chest X-ray (Figure 3 A and B).

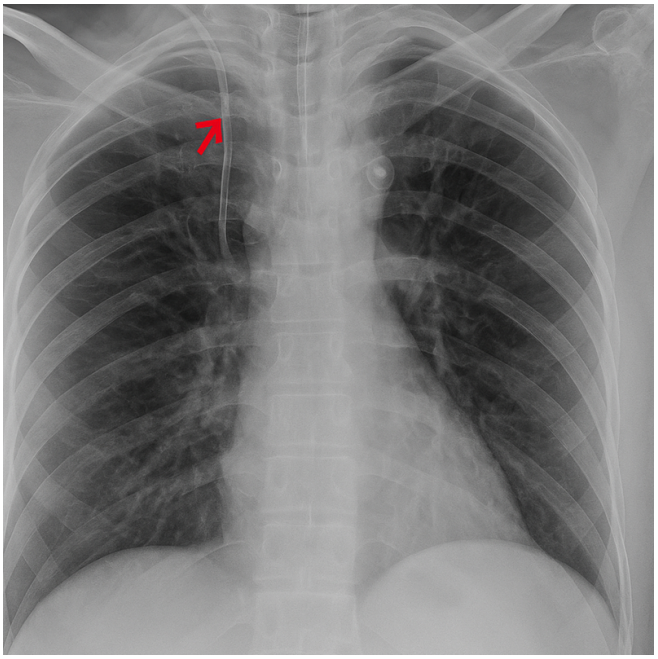

Figure 1. Posterior-anterior view chest X-ray after central venous catheter insertion (red arrow).

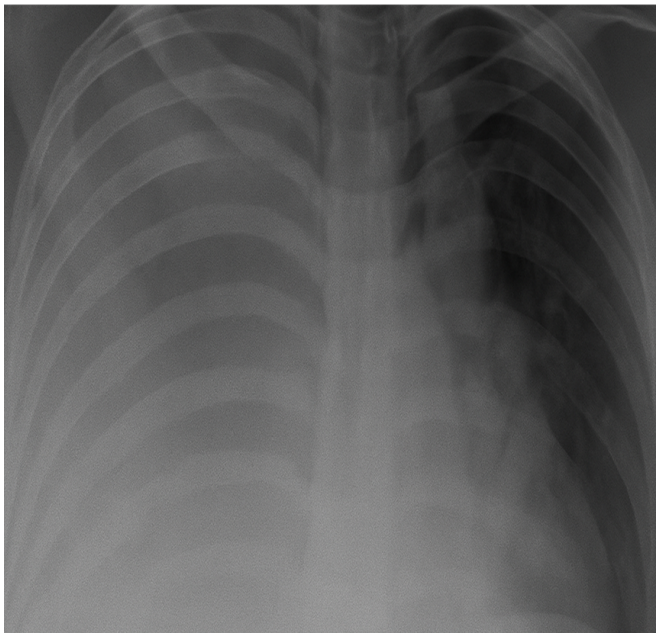

Figure 2. Posterior-anterior view chest X-ray showed complete opacification of the right hemothorax with contralateral mediastinal shift with possible underlying lung collapse from the pressure effect.

The density [Hounsfield unit (HU)] of the fluid confirms it is blood. The Thoracic team consulted, and an immediate chest tube was inserted (Figure 4).

Two liters of blood were drained through the chest tube. Two units of packed red blood cells were transfused, and the patient improved clinically. The chest tube was removed after three days, and she was discharged in stable condition (Table 1). Informed consent for publication was obtained from the patient, and institutional ethical approval was obtained from the Medical Research Center.

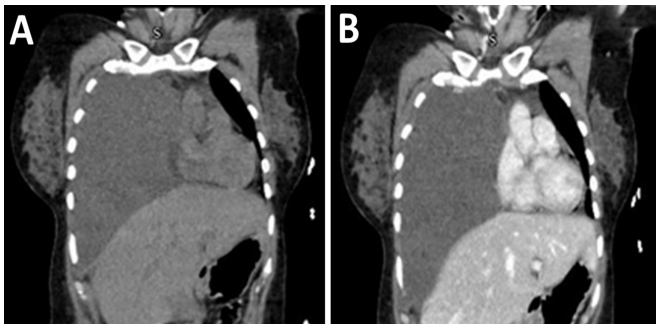

Figure 3. Coronal sections of computed tomography for the chest and upper abdomen showed right-sided hemothorax after withdrawal of the right central venous line. (A) non-contrast image (B) after contrast administration, extravasation of blood

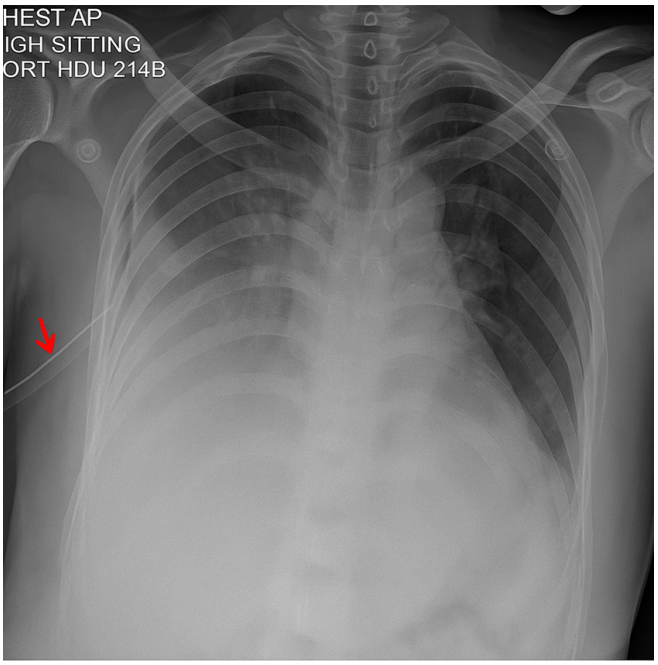

Figure 4. Posterior-anterior view chest X-ray showed partial re-inflation of the collapsed lung with still obliteration of the right costophrenic angle after chest tube insertion (red arrow).

Table 1. A chronological summary of events in the patient developed right-sided hemothorax after withdrawal of CVC*.

Date/Time	Event	Outcome
Day 0 - Intraoperative	Anaphylaxis (hypotension, desaturation) during nasal surgery	Resuscitated, CVC inserted under ultrasound guidance
Day 0 - Post-op	Transferred to the ICU for observation	Hemodynamically stable
Day 1 - Catheter removal	Sudden chest pain, dyspnea, hypotension	Chest X-ray/CT: massive right hemothorax
Day 1 - Emergency management	Chest tube inserted, 2 liters drained, blood transfusion given	Stabilized, improved clinically
Day 4	Chest tube removed	Discharged in stable condition

* CVC (central venous catheter), ICU (Intensive care unit), CT (computed tomography).

DISCUSSION

The central venous line has a vital role in ICU and general anesthesia, and can be inserted via the IJV, femoral, and subclavian veins. There have been several reports and articles about the advantages and disadvantages of each route [7]. During CVC, the operator can predict proper needle and catheter entry into the vein by gentle withdrawing the syringe and then the catheter, checking for aspiration of venous blood. Aspiration of blood is not completely reliable indicator of correct catheter placement. Even when the catheter is positioned correctly, certain ports may not function optimally depending on the exact location of catheter tip [4, 8, 9]. Following placement of a CVC, obtaining a chest X-ray is essential to verify the position of the catheter tip. Typically, the catheter should run parallel to the central venous walls and display a smooth curve as it lies within the superior vena cava [9]. In our case, the catheter appeared well-positioned with no immediate complications, with no evidence for injury of the superior vena cava on chest X-ray. The literature indicates that using ultrasound-guided central vein cannulation markedly lowers the failure rate (from 55% to 8%) and reduces mechanical complications (from 41% to 4%) when compared with blind Seldinger approach [8]. In the presented case, the catheterization was performed using the Seldinger technique, guided by ultrasound, in order to ensure a safe and proper insertion of the CVC. Owing to the above-mentioned reasons, the Seldinger technique might be not a direct cause of the hemothorax following removal of the CVC. Chest X-ray and ultrasonographic imaging are often used to confirm the location of the CVC tip [3, 9]. In the presenting case, there is no abnormality on chest X-ray following catheterization.

Hemothorax following removal of the CVC is seldom to be seen in clinical practice with only few reported cases in the literature [3]. Comparison with prior reports underscores both shared mechanisms and notable differences. Lee et al. (2013) reported massive hemothorax temporally associated with CVC removal following a prior subclavian cannulation; they proposed that the catheter might have tamponade an otherwise occult vessel injury, with bleeding manifesting upon withdrawal [3]. Kebede et al. (2025) similarly described immediate hemothorax after removal of a subclavian CVC and emphasized the need for standardized post-removal monitoring protocols [10]. In contrast, Costa-Pinto et al. (2020) highlighted the rarity of hemothorax following IJV CVC removal and suggested patient and procedure specific risk factors, such as a lower neck insertion site and pleural proximity [2]. Collectively, these reports align with our case in supporting a pathophysiologic model in which the catheter tip occludes a micro-perforation or erosion of the venous wall or pleura; removal eliminates the tamponed effect, precipitating rapid intrathoracic bleeding.

The azygous vein-named for being unpaired-is one of the major thoracic veins. It begins near the level of the first and second lumber vertebra, travels upward along the right side of the vertebral column, and then curves forward above the right main bronchus just beyond the tracheal bifurcation [11]. The azygous ends in the superior vena cava [12]. Accidental insertion of a CVC into the azygous vein is considered uncommon. While positioning a CVC tip in the azygous vein may be used as an alternative in patients with significant venous obstruction, this location carries a higher risk of complications [13]. Because the azygous vein has a relatively small diameter (about 6-8 mm), it is more prone to thrombus formation, stenosis and extravasation [12]. But in the presenting patient, it is unlikely to be an injury to the azygous vein, because X-ray showed a centrally located catheter, which is contrary to a lateral and posterior diversion of the catheter in azygous vein injury [11].

Accordingly, we believe that the CVC tip fits the injured hole exactly, and temporarily seals a micro-perforation (iatrogenic injury). Its removal precipitated massive bleeding despite prior stability. To our knowledge, rarely the adult patient who was stable hemodynamically and had no symptoms will suffer from severe hemothorax developed immediately af-

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ter withdrawal of the catheter and requiring chest tube insertion.

CONCLUSION

Massive hemothorax following CVC removal is rare but potentially life-threatening. Patients should be closely monitored after its removal, especially when IJVs are involved, to allow early detection and management.

ETHICAL DECLARATIONS

Acknowledgments

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Ethics Approval and Consent to Participate

The case report had been approved by the medical research center, Hamad Medical Corporation, Qatar (Reference number: MRC-04-24-565 on 21st September 2024). Informed consent from the patient had been obtained for publication of the case with its images.

Consent for Publication

Informed consent from the patient had been obtained for publication of the case with its images.

Availability of Data and Material

The data and material are available in the Cerner documentation system in Hamad Medical Corporation.

Competing Interests

The authors declare that there is no conflict of interest.

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Use of Artificial Intelligence

Artificial intelligence has been used in a limited manner for the correction of spelling, grammar, and punctuation, as well as in specific texts with editing.

Authors' Contributions

Al-juboori A: Conceptualization, Writing-original draft, Al Hail A: Project administration, Ismail H: Data curation, Ganaw A: Investigation, Al-Gburi H: Software management, Ahmed A: Writing-review and editing. All authors read and approved the final version of the manuscript.

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