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Case report
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Massive haemothorax from inadvertent subclavian vein injury during tunnelled dialysis catheter insertion requiring surgical repair

Shahir Asraf bin **Abdul Rahim**, **Kok** Chu Chian, Nurul Syuhada binti **Suhaimi**

Department of Anaesthesiology and Intensive Care, Kulliyyah of Medicine, Sultan Ahmad Shah SASMEC @ IIUM, Kuantan, Malaysia

Abstract

Massive haemothorax is a rare but life-threatening complication of internal jugular vein catheterisation. We report a 55-year-old male with end-stage renal failure and limited intravascular access who required a tunnelled dialysis catheter after fistula failure and missed haemodialysis. Multiple ultrasound-guided insertion attempts resulted in an inadvertent massive left haemothorax. The patient developed immediate postprocedural respiratory distress, requiring intensive care unit (ICU) admission, mechanical ventilation, and vasopressor support. Computed tomography of the thorax confirmed left sided haemothorax, and an ultrasound-guided chest tube was inserted. It drained 700 mL of blood. He received transfusion of 4 units each of packed red blood cells, fresh frozen plasma, cryoprecipitate, and platelets. After stabilisation, he was transferred urgently to a tertiary hospital for cardiothoracic surgery. Thoracotomy revealed subclavian vein injury, which was repaired with an estimated intraoperative blood loss of 1.8 L. Postoperatively, he was successfully weaned from mechanical ventilation over 4 days in ICU. Early recognition of this rare complication and timely definitive intervention is essential to improving outcomes and ensuring patient safety.

Correspondence: Correspondence: Shahir Asraf bin Abdul Rahim, Master of Medicine (Anaesthesiology), Department of Anaesthesiology and Intensive Care, Kulliyyah of Medicine, Sultan Ahmad Shah SASMEC @ IIUM, Bandar Indera Mahkota 25200 Kuantan Pahang, Malaysia.
E-mail: drshahirasraf@iium.edu.my

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Introduction

Central venous catheter (CVC) placement is essential for anaesthetists in operating theatres and intensive care units (ICU) for various purposes such as venous access, medication delivery, renal replacement therapy, and monitoring. Understanding and mitigating the risks of complications, particularly mechanical ones, is crucial. These complications can occur during or after placement. This case report presents a potentially fatal complication of CVC placement and discusses vascular injury to the central venous anatomy as a mechanical complication following CVC insertion as well as its management.

Case presentation

An average built 55-year-old man with a history of end-stage renal failure and exhausted intravascular access was admitted to the hospital due to complications from failed fistulas and missed haemodialysis sessions. The patient's regular medications did not include any anticoagulants or antiplatelets. The nephrology team had attempted to place a tunnelled dialysis catheter in the left internal jugular vein (IJV) as his right IJV was thrombosed. The procedure required multiple attempts despite ultrasound guidance. During the final attempt, the catheter was advanced over a guidewire, but there was no inflow or outflow from both lumens of the catheter. When the proceduralist removed the catheter, the patient suddenly reported left chest pain and shortness of breath. Immediate vital signs revealed hypotension, with blood pressure 70/40 mmHg and S_pO_2 88%. Saturation improved to 100% after the patient was placed on a high-flow mask. Blood pressure improved to 108/76 mmHg with administration of 500 mL crystalloid.

Physical examination showed reduced movement of the left chest and dullness on percussion. A bedside ultrasound revealed left pleural effusion, and a portable chest X-ray was urgently performed (Fig. 1). The chest X-ray post procedure showed complete opacification of the left chest consistent with haemothorax. The patient was immediately transferred to the intensive care unit (ICU) and intubated due to impending respiratory arrest. Large-bore intravenous (IV) branulas and femoral CVC were inserted for resuscitation. The haemodynamic was supported with 0.08–0.1 mcg/kg/min norepinephrine to maintain a mean arterial pressure of 65 mmHg for

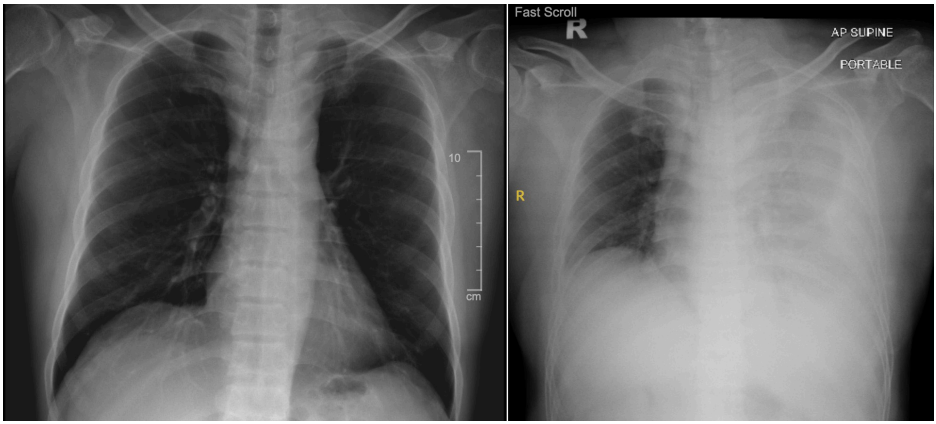

Fig. 1. (Left) Pre-procedure and *(right)* post-procedure chest X-ray.

Fig. 2. Computed tomography of the thorax showing left pleural effusion, likely haemothorax.

adequate organ perfusion.

An urgent computed tomography of the thorax, as shown in Figure 2, reaffirmed left sided haemothorax. A pigtail size 12F was placed under ultrasound guidance by the radiologist, which drained 700 mL of frank blood. The patient's haemoglobin dropped from 8.9 g/dL to 5 g/dL in the span of 3 hours. Continuous resuscitation with blood products included transfusion of 4 units of packed red blood cells

followed by 4 units of fresh frozen plasma, cryoprecipitates, and platelets, respectively. Concurrent with resuscitation efforts, he was referred to the surgical team. The decision was made to clamp the chest tube and to transfer the patient to a tertiary hospital with cardiothoracic services. During the emergency thoracotomy, the surgeon detected a direct puncture wound inferior to the left subclavian vein at the left innominate junction with active bleeding. Total estimated blood loss during the surgery was recorded at 1.8 L. Following surgery, the patient was weaned from mechanical ventilation in the ICU over 4 days and later transferred to the general ward.

Discussion

The IJV is a major vein responsible for draining blood from the brain, face, and neck. It originates at the jugular foramen, receiving blood from the sigmoid sinus and inferior petrosal sinus, and descends in the neck alongside the common carotid artery. Medially, it is related to the carotid arteries and the vagus nerve, while laterally it is bordered by the sternocleidomastoid muscle. The IJV collects blood from several tributaries including the facial, lingual, pharyngeal, and thyroid veins and terminates by merging with the subclavian vein to form the brachiocephalic vein. The right and left brachiocephalic veins form the superior vena cava.[1]

In patients with end-stage renal failure, repeated vascular access procedures such as CVC insertions and arteriovenous fistulas can distort normal vascular anatomy through scarring, thrombosis, or stenosis of central veins. These anatomical changes increase the technical difficulty of subsequent catheter placements, even when performed under ultrasound guidance. In this case, multiple prior CVC insertions likely contributed to the challenging cannulation, with limited options after the right IJV thrombosed. Possible causes for right IJV thrombosis include repeated catheter-related endothelial trauma, venous stasis, and a prothrombotic state associated with uraemia.[2] Despite real-time ultrasound, complications can still occur when vessels are small, scarred, or anatomically distorted, leading to misdirection of dilators or guidewires into adjacent structures.[3] Mechanical complications of CVC placement often occur during the Seldinger or modified Seldinger technique, which involves needle cannulation of the central vein, guidewire insertion, dilatation of the skin at the vessel entry site, and catheter advancement over the guidewire.[4] Most complications are detected immediately or soon after insertion. While the types of complications for larger CVCs are similar, they may be more severe due to the catheter size. Direct vascular injury, *e.g.*, laceration, through-and-through injury, or dissection can occur following insertion of CVC. Risk factors include malposition of the needle or

guidewire within the central lumen of vessel, difficult dilator advancement over the guidewire, and larger calibre catheter.

The presentation of vascular injury can vary significantly, ranging from asymptomatic cases to immediate or delayed complications such as haematomas, pleural or pericardial effusion, and cardiovascular collapse. It is essential to maintain a high level of suspicion for unexpected bloody pleural or pericardial effusion as well as an unanticipated drop in haematocrit or episode of hypotension. In this case, the patient developed acute chest pain, dyspnoea, hypoxia, and hypotension almost immediately after CVC placement. The rapid onset of respiratory compromise, coupled with unilateral decreased chest movement and ultrasound evidence of pleural effusion, raised a high suspicion of vascular injury.

The management of haemothorax requires a systematic approach to ensure rapid stabilisation and effective treatment. The first step is recognition and assessment, which involves quickly identifying signs of respiratory distress and hemodynamic instability through vital signs and physical examination. Haemodynamic stabilisation follows, with intravenous access established for fluid resuscitation and blood transfusion as needed while maintaining a mean arterial pressure of 60–65 mmHg to ensure organ perfusion without exacerbating bleeding.

It is very important to be vigilant in CVC insertion, especially in patients with limited vascular access. Symptoms such as chest pain, dyspnoea, or hypoxia should prompt immediate imaging to rule out iatrogenic injuries like haemothorax. Several factors likely increased the chance of mechanical complications in this patient: difficult anatomy from previous cannulations, thrombosis of the right IJV, and multiple attempts at cannulation on the left side despite ultrasound guidance. Each repeated attempt increases the risk of inadvertent vessel injury. Immediate management in our hospital included rapid recognition of haemothorax, securing the airway through endotracheal intubation, insertion of femoral venous access for resuscitation, initiation of vasopressor support, and placement of an ultrasound-guided chest drain that evacuated 700 mL of blood.

According to Advanced Trauma Life Support guidelines, massive haemothorax is defined by the need for thoracotomy and the indications are blood loss > 1,500 mL or one-third of blood volume or blood loss > 200 ml/h (3 ml/kg/h) over 2–4 hours, or continued need for blood transfusion. In this case, the immediate drainage of 700 ml of blood raised concern for the development of massive haemothorax.

Massive haemothorax compresses the lung and mediastinum, reducing venous return and impairing cardiac output. Blood loss leads to hypovolemia, decreasing preload and systemic perfusion. Combined, these effects cause hypotension,

tachycardia, and shock. Respiratory compromise further worsens oxygen delivery, exacerbating tissue hypoxia and haemodynamic instability.[4] In this case, the patient's abrupt onset of hypotension, hypoxia, and respiratory distress following catheter insertion together with immediate drainage of 700 mL of blood, fulfilled the clinical criteria of a massive haemothorax. From a safety perspective, doctors must maintain a high index of suspicion for complications when patients deteriorate after CVC placement.

A chest tube should be inserted to drain the haemothorax, relieve lung compression, and restore respiratory function.[5] Ultrasound guidance is advised for precise chest tube placement.[6] In unstable patients requiring thoracotomy, a chest tube of 24–28 French is recommended,[7,8] although smaller tubes may be effective in selected cases.[9] If there is rapid blood accumulation (>20 ml/kg), surgery may be necessary.[10] Urgent imaging (chest X-ray or computed tomography of the thorax) is necessary to confirm the diagnosis and identify the source of bleeding.[10] Finally, in cases of severe injury, referral and transfer to a specialised surgical team or tertiary care centre should be arranged for optimal management. The urgency of referral to a tertiary centre in this case was underscored by the ongoing haemodynamic instability and significant blood loss despite initial drainage and resuscitation. Massive haemothorax with evidence of central vascular injury exceeds the capacity of a general hospital and mandates transfer for cardiothoracic surgical repair.

The learning points from this case in terms of the perspective of CVC placement are strict adherence to ultrasound-guided technique during CVC insertion and avoiding multiple attempts at cannulation, particularly in anatomically challenging patients. It is also important to use appropriately sized catheters to ensure smooth passage of dilators and thereby reduce vessel trauma.[11] As a reminder, when resistance is met, advancement must not be forced and guidewire position must be reassessed.[12,13]

This case raises several learning points regarding detection and management of complication of CVC placement. Frequent clinical assessments should be performed post-procedure, including measurements of heart rate, blood pressure, and oxygenation as well as physical examination (*e.g.*, percussion, auscultation). Early chest imaging (ultrasound or X-ray) post-CVC insertion in high-risk or symptomatic cases should be performed.[14,15] Serial haematocrit levels may help to detect occult bleeding.[16] Coordination and multidisciplinary team management between anaesthesiology, ICU, and surgical teams should not be delayed when clinical deterioration is observed, especially when patients require transportation to a different hospital for escalation of management.[17]

Conclusion

This case highlights the importance of prompt recognition of a rare complication of CVC placements. Appropriate and timely intervention, and well-coordinated multidisciplinary management of rare complications can significantly improve patient outcome.

Declarations

Informed consent for publication
The patient provided written informed consent for the publication of the medical data and images contained in this article

Competing interests
None to declare.

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References

1. Infant J, Russell I, Snell J, et al. Applied Anatomy for the FRCA. 2nd ed. Cambridge: Cambridge University Press; 2012.
2. Maya ID, Allon M. Vascular access: core curriculum 2008. Am J Kidney Dis. 2008;51(4):702-8. http://doi.org/10.1053/j.ajkd.2007.10.046
3. Lamperti M, Bodenham AR, Pittiruti M, et al. International evidence-based recommendations on ultrasound-guided vascular access. Intensive Care Med. 2012;38(7):1105-17. http://doi.org/10.1007/s00134-012-2597-x
4. Pumarejo Gomez L, Tran VH. Hemothorax. 2023 Aug 8 [updated 2025 Jan]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538219/
5. Zeiler J, Idell S, Norwood S, Cook A. Hemothorax: a review of the literature. Clin Pulm Med. 2020;27(1):1-12. http://doi.org/10.1097/CPM.0000000000000343

6. Taylor LA, Stenberg R, Tozer J, Vitto MJ, Joyce M, Jennings J, et al. Novel approach to ultrasound-guided thoracostomy. J Ultrasound Med. 2022;41(3):743-7. http://doi.org/10.1002/jum.15759
7. Inaba K, Lustenberger T, Recinos G, Georgiou C, Velmahos GC, Brown C, et al. Does size matter? A prospective analysis of 28–32 versus 36–40 French chest tube size in trauma. J Trauma Acute Care Surg. 2012;72(2):422-7. http://doi.org/10.1097/TA.0b013e3182452444
8. Bauman ZM, Kulvatunyou N, Joseph B, et al. Randomized clinical trial of 14-French (14F) pigtail catheters versus 28–32F chest tubes in the management of patients with traumatic hemothorax and hemopneumothorax. World J Surg. 2021;45(3):880-6. http://doi.org/10.1007/s00268-020-05852-0
9. Tanizaki S, Maeda S, Sera M, et al. Small tube thoracostomy (20–22 Fr) in emergent management of chest trauma. Injury. 2017;48(9):1884-7. http://doi.org/10.1016/j.injury.2017.06.021
10. UpToDate [Internet]. Waltham (MA): UpToDate; 2025 [cited 2025 Mar 4]. Available from: https://www.uptodate.com/contents/initial-evaluation-and-management-of-blunt-thoracic-trauma-in-adults?search=massive%20hemothorax&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1
11. American Society of Anesthesiologists Task Force on Central Venous Access. Practice guidelines for central venous access 2020: an updated report. Anesthesiology. 2020;132(1):8-43. http://doi.org/10.1097/ALN.0000000000002864
12. Singh R, Yadav G, Goudra B. Difficult internal jugular central venous cannulation using ultrasound guidance. Case Rep Anesthesiol. 2019;2019:5134575. http://doi.org/10.1155/2019/5134575
13. Katiyar S, Jain RK, Bihari V. Entrapped central venous catheter guide wire. J Anaesthesiol Clin Pharmacol. 2010;26(3):406-7. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2943714/
14. Chui J, Saeed R, Jakobson DJ, et al. Is routine chest radiography necessary after ultrasound-guided central venous catheter insertion? Chest. 2018;154(1):120-6. http://doi.org/10.1016/j.chest.2018.03.020
15. Sharma A, Bodenham A. Futility of “routine” postprocedural chest radiograph after hemodialysis catheter insertion. J Vasc Access. 2018;19(3):207-9. http://doi.org/10.1177/1129729817747622
16. Zehtabchi S, Sinert R, Goldman M, Kapitanyan R, Ballas J. Diagnostic performance of serial hematocrit measurements in identifying major injury in adult trauma patients. Injury. 2006;37(1):46-52. http://doi.org/10.1016/j.injury.2005.05.033
17. Lasek J, Jadczuk E. Thoracic trauma – principles of surgical management. Eur J Transl Clin Med. 2020;3(2):47-55. http://doi.org/10.31373/ejtcm/120124