

# To See is to Believe? A Misplaced Central Venous Catheter in Normal Position on Chest Radiograph

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## ARTICLE INFO

**Received:** 📅 April 01, 2022

**Published:** 📅 April 08, 2022

**Citation:** Yu-Fu Lee, Yao-Chuan Hsiao. To See is to Believe? A Misplaced Central Venous Catheter in Normal Position on Chest Radiograph. Biomed J Sci & Tech Res 43(2)-2022. BJSTR. MS.ID.006860.

## ABSTRACT

Central venous access is a common procedure in clinical practices. To place the Central Venous Catheter (CVC) into proper position is crucial. For jugular venous catheters and subclavian venous catheters, the tip of the catheters should be in the supra vena cava; therefore, the clinician might rely on chest radiograph to know the place of the catheters. Here, we report an case with misplacement of a CVC which was placed between right jugular vein and right carotid artery with its tip in the right paratracheal region. However, the position of the CVC was normal on chest radiograph. The care team placed a chest tube for pleural effusion drainage and observe the fluid color because there were potential risks of mediastinum soft tissue trauma and vascular injury causing consequential hemothorax. In conclusion, chest radiographs are not totally reliable to check central lines position. We suggested chest tube placement in cases with pleural injuries for observation and prevention of fatal hemothorax and pneumothorax.

## Introduction

Central venous access is a common procedure performed in many clinical settings, especially in critically-ill patient for a variety of indications. Over 5 million Central Venous Catheters (CVC) are inserted every year in the United States alone, accounting for 15 million central venous catheter days [1,2]. A total of 5% of medical center inpatients had a CVC inserted during hospitalization in Taiwan [3]. While central lines are prevailing in clinical settings, all kinds of complications associated with central line placement are rising. Here, we present a case with misplacement of a CVC into an unusual space.

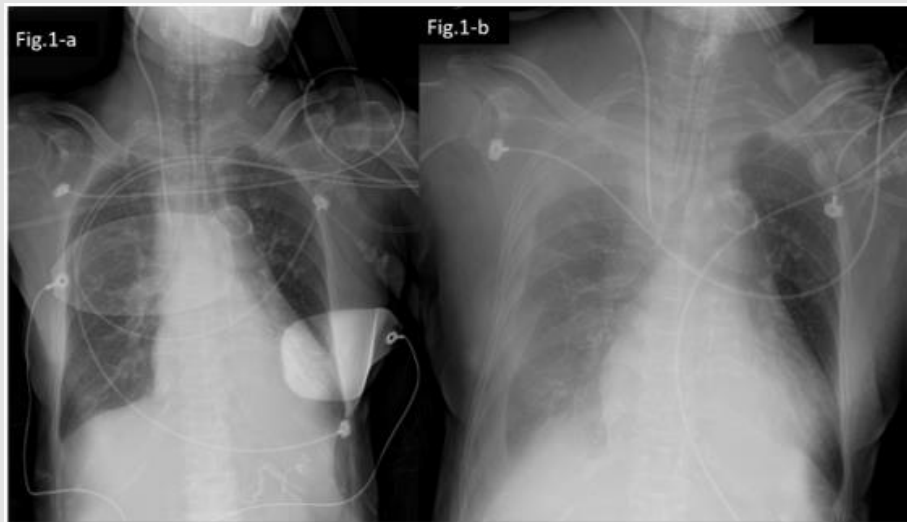
## Case Report

This 84-year-old Taiwanese woman, a homemaker with history of essential hypertension and type 2 diabetes mellitus under regular control who was admitted because of acute decompensated heart failure with preserved left ventricular ejection fraction

complicating acute pulmonary edema and respiratory failure. A CVC was placed at right neck using a landmark technique to monitor central venous pressure and administer medications. The whole procedure was done by an experienced internal physician. At first, a bevel-down introducer needle was inserted into right jugular vein. With positive blood withdrawal, a guidewire was sent into the jugular vein. However, a slight resistance to guidewire approaching was met at a depth of 10cm; therefore, the operator tested and confirmed the needle position with positive blood withdrawal again. Then, the guidewire was sent further to 25cm. A CVC was inserted through the guidewire by Seldinger technique smoothly. The patient took a chest radiograph for checking the CVC position, and it was in normal position (Figure 1a). Despite no blood withdrawal through the CVC, the catheter was used for drug administration. 7 hours later, the patient developed tachypnea even under ventilator support, and the second chest radiograph

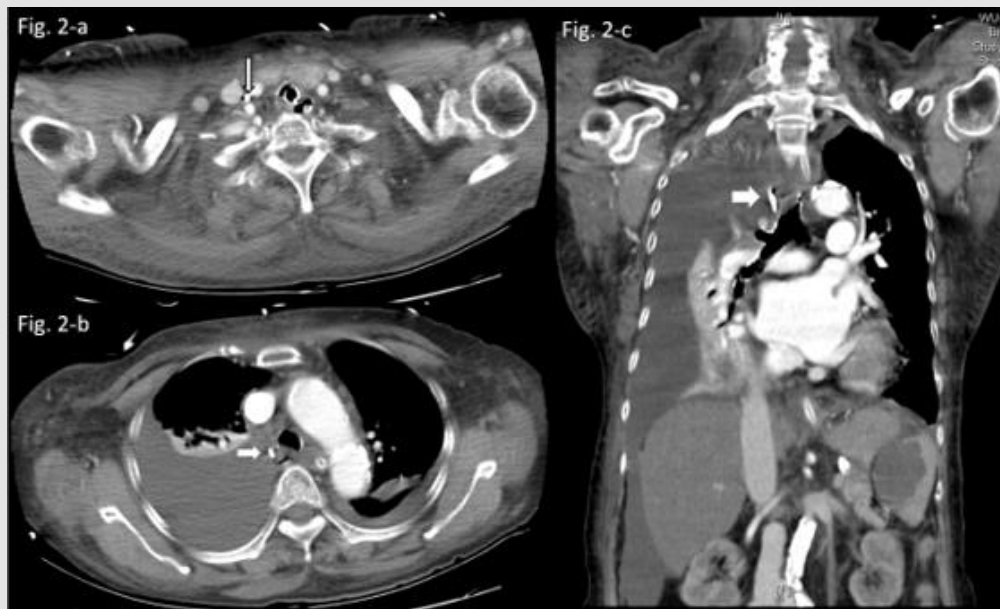
revealed right pleural effusion (Figure 1b). Under the impression of CVC misplacement into pleural cavity, the care team performed chest computed tomography which discovered the catheter was placed between right jugular vein and right carotid artery with its tip in the right paratracheal region (Figure 2). After consulting a radiologist and a cardiovascular surgeon, the care team placed

a chest tube for pleural effusion drainage and observe the fluid color because there were potential risks of mediastinum soft tissue trauma and vascular injury causing consequential hemothorax. After removing the CVC, the pleural effusion remained serous, and the chest tube was removed 10 days later after the daily drainage amount was less than 100ml.



**Figure 1:**

- A right neck CVC in normal position on chest radiograph. A thousand milliliter of Lactated Ringer's solution was given through the CVC for fluid resuscitation.
- The follow up chest radiograph (7 hours after the CVC insertion) revealed right pleural effusion.



**Figure 2:** The CVC was placed between right jugular vein and right carotid artery (the white arrow in figure 2-a) with its tip in the right paratracheal region (the white arrow in figure 2-b and 2-c).

## Discussion

The central lines associated complications can be immediate or delayed in nature. Immediate complications occur at the time of catheter insertion and include vascular, cardiac, pulmonary, and placement complications. Delayed complications include device dysfunction and infection [4]. Malpositioned central catheters have been reported placing intra-cava in carotid artery, azygos vein, persistent left-sided Supra Vena Cava (SVC), internal mammary vein, vertebral vein, other small veins and extra-cava in spinal epidural space, pericardium, pleural space, mediastinum and thoracic duct [5,6]. The CVC in our case was placed in the tract through internal jugular vein, interspace of carotid artery and internal jugular vein, paratracheal region (just next to the SVC) and pleural space; therefore, it looked perfectly normal on chest radiograph. In a word, chest radiographs may not be so reliable in checking central line position every time. As for the positive blood withdrawal during guidewire approaching, we assumed that a bevel-down introducer needle approaching might tear the posterior vascular wall and cause an exit for the guidewire. In addition, while the tip of the needle broke through the vascular wall, a part of the bevel was still in the vascular lumen. This may explain why there was positive blood withdrawal during the procedure. With the catheter tip in pleural space, soft tissue injuries resulting hemothorax and pneumothorax might occur; therefore, we inserted a chest tube before removing the CVC. A chest tube could be helpful both in observing the pleural effusion as treatment guidance and managing serious complications like tension hemothorax and pneumothorax. In such case, multi-specialty including cardiovascular surgeon, thoracic surgeon and interventional radiologist should stand by for such life-threatening complications.

## Conclusion

In conclusion, chest radiographs are not totally reliable to check central lines position. A bevel-down introducer needle approaching might increase the chance of CVC misplacement. We suggested chest tube placement in cases with pleural injuries for observation and prevention of fatal hemothorax and pneumothorax.

## Conflict of Interest

Nothing to declare.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2022.43.006860

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