

# Pulseless Electrical Activity Following Subclavian Central Line Removal in a Patient with Cervical Spine Injury

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## Abstract

Protocolised removal of central venous catheter is of paramount importance, as the procedure is implicated with numerous complications which are witnessed as well as reported in literature. Unprecedented events like bradycardia, arrhythmias, cardiac arrest as a result of air embolism, carotid sinus hypersensitivity, embolisation from the vascular end of the catheter, dislodgment of an atherosclerotic plaque or thrombus in the carotid artery precipitated during central line removal have been highlighted. Following is a brief account of cardiac arrest following Subclavian central line removal in a patient with cervical spine injury. In addition to above factors is pertinent to note that patients with High Spinal Cord Injury, above fourth dorsal vertebra have a decreased sympathetic outflow, leading to parasympathetic dominance, which may have resulted in baroreceptor mediated vagal stimulation and reflex bradycardia which progressed to junctional rhythm and pulseless electrical activity. Being aware of these serious potential complications while removing the central venous catheters and prevention of the same is of vital importance. The trainees and nursing staff should be educated regarding being vigilant and monitoring these patients.

**Keywords:** Cardio-respiratory Arrest, Carotid Sinus Hypersensitivity, Subclavian Catheter

## 1. Introduction

The procedure to remove a central venous cannula in situ, is implicated with numerous complications which are witnessed as well as reported in literature. Being aware of these serious potential complications while removing the central venous catheters and prevention of the same is of vital importance. Following is a brief account of cardiac arrest following Subclavian central line removal in a patient with cervical spine injury.

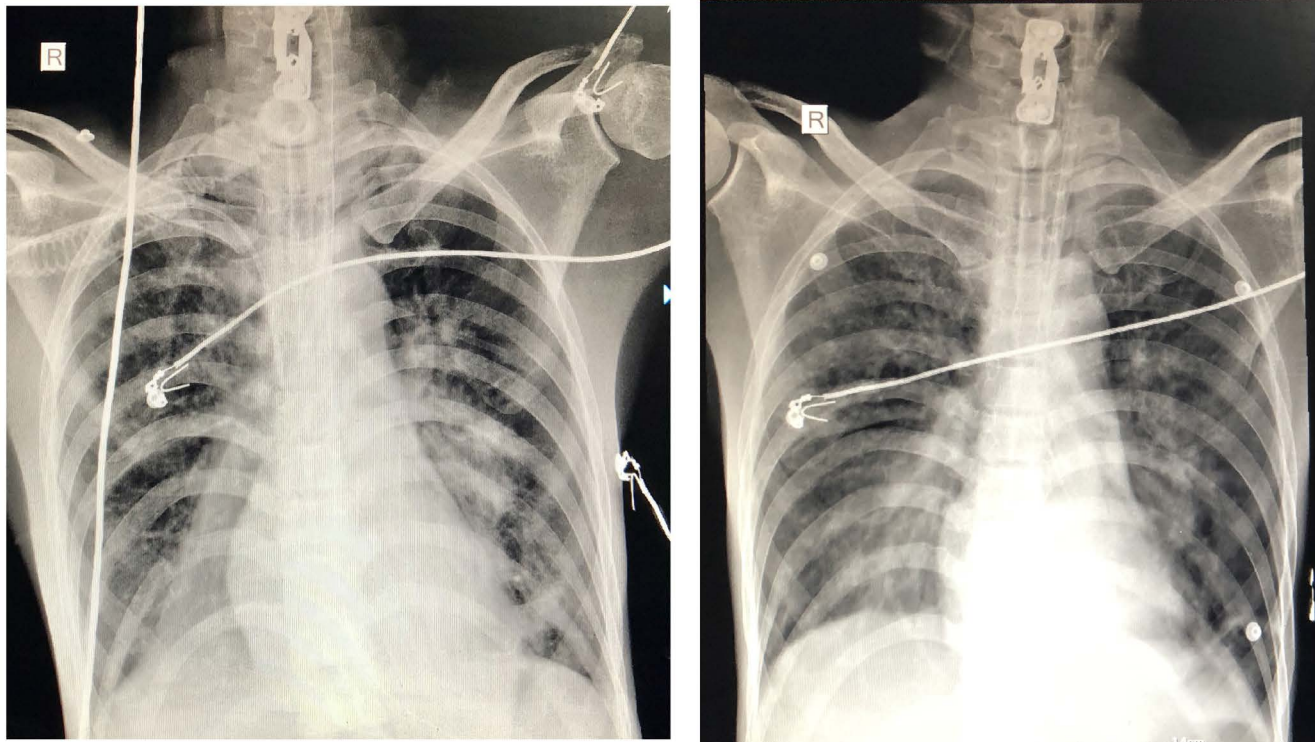
## 2. Case Report

A 36-year-old male with no co-morbidities was admitted in intensive care unit following traumatic cervical spine fracture fixation at the level of C6-C7 vertebrae, and

mechanically ventilated. After a prolonged ICU stay of 28 days, we were successful in weaning him off the ventilator and just prior to discharge from ICU, it was decided to remove the subclavian Central Venous Catheter (CVC) as it was no longer indicated. Prior to the procedure, patient was fully conscious and oriented to time, place and person, with baseline heart rate of 64/min, regular rhythm, blood pressure of 100/64 mmHg, afebrile, saturation of 100% on O<sub>2</sub> at 5L/min, with serum electrolyte within normal limits, no acid base disturbances noted on arterial blood gas, a recent transthoracic echocardiogram revealing optimal baseline cardiac functioning and volume status and normal central venous pressure.

As per protocol, patient was explained the procedure and trendelenberg position was given. Under strict asepsis, sutures were cut and pressure bandage was kept

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Right Subclavian CVC in situ

Post CVC removal

**Figure 1.** Chest X-ray (AP view) showing the position of central line (left) and post central line removal (right).

accessible. Patient being tracheostomised, was instructed to hold breath in expiration transiently and catheter was smoothly withdrawn in slow constant motion. As the catheter was being withdrawn, patient developed bradycardia (heart rate 35/min) followed by pulseless electrical activity. The exit site of the central line was sealed with gloved tip of finger and concealed with sterile and airtight plaster dressing and immediately, the cardio-pulmonary resuscitation was administered as per American heart association 2020 guidelines; chest compressions, intravenous adrenaline administration and ventilation with 100% oxygen with Bain's circuit via tracheostomy tube were initiated. 500ml crystalloid was infused, normal blood glucose levels were confirmed. Within 30 seconds of chest compression, Return of Spontaneous Circulation (ROSC) was achieved and consciousness was regained. Patient was electively ventilated for 24-hours before any further attempts to discontinue mechanical ventilation. Airtight pressure bandage was fixed over CVC cannulation site for 48-hours. Urgent chest radiograph and echocardiography which were evaluated were unremarkable. Haemodynamic

parameters were stabilised soon after ROSC. No further adverse events were witnessed in due course of hospital stay (Figure 1).

### 3. Discussion

Unprecedented events like bradycardia, arrhythmias, cardiac arrest at the time of CVC removal have been reported in literature. Kim *et al.*<sup>1</sup> had reported complications including paresis, respiratory failure, shock, and a case of mortality secondary to pulmonary sepsis following central venous cannula removal, site of which was right Internal Jugular vein in majority of the cases, followed by right Subclavian. Reasons for adversities after removal of central venous cannula include air embolism<sup>2</sup>, carotid sinus hypersensitivity<sup>3</sup>, embolism from the distal end of the catheter, disruption and dislodgment of plaque or thrombus into the carotid artery. Carotid Sinus Hypersensitivity (CSH) has been postulated to result from surplus pressure on the neck during the performance of central line removal<sup>4</sup>. Air embolism after catheter removal is exaggerated by

circumstances that decrease central venous pressure, such as deep inspiration, hypovolemia and propped position during removal<sup>5</sup>. Boer and Hene<sup>6</sup> advised some points to prevent venous air embolism following catheter removal such as placing the patient in the head-low position, thus keeping the exit site below the level of the right atrium, avoidance of coughing, talking, or deep inhalation during the procedure. Prompt closure of exit site of CVC with an airtight seal has been suggested for about 12-hours, keeping the patient in supine position for 30 minutes post-procedure, avoiding undue pressure over the carotid sinus. Despite precautions, without pressure on carotid sinus, our patient developed haemodynamic instability which could be due to mechanical irritation of the SA node by the central line which can also result in profound sinus deceleration, sinus arrest and asystole. Patients with High Spinal Cord Injury, above fourth dorsal vertebra have an intact parasympathetic flow but a decreased sympathetic out flow, leading to dominance of the parasympathetic system; which may trigger several cardiac arrhythmias<sup>7</sup>. This may have resulted in baroreceptor mediated vagal stimulation and reflex bradycardia which progressed to junctional rhythm and pulseless electrical activity.

## 4. Conclusion

The significance of being vary of likely adversities, and adherence to protocol for the procedure of central line removal is highlighted in the above case. The trainees and nursing staff should be educated regarding being vigilant and monitoring these patients.

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