

# Limb Ischemia after Central Venous Cannulation: Is the Cannulation to Blame?

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## Abstract

A 65-year-old woman underwent right subclavian venous cannulation in the Intensive Care unit. Within a few hours following the cannulation, ischemic changes were noted in the right upper limb. A misplaced central venous catheter was suspected as the cause of the ischemia. However, a color Doppler study revealed right axillary artery thrombosis. She was put on antiplatelet therapy. Upper limb vascular complications can occur after central venous catheterization due to various causes. Timely investigations and management can help at such critical times.

**Key words:** Axillary artery, central venous catheterization, thrombosis

## INTRODUCTION

Central venous catheters (CVC) allow measurement of hemodynamic variables and allow delivery of medications, nutritional support that cannot be safely given through the peripheral venous catheters. Complications during central venous cannulation are quite common, and various attempts have been made to prevent them.<sup>[1]</sup> Complications during the insertion of a CVC can be attributed to inadequate landmark identification, improper needle insertion or misdirection of guidewire, inexperience of the clinician, and the number of needle attempts made. Complications of subclavian vein central venous catheterizations include pneumothorax, hematoma, arterial wall puncture, catheter misplacement, and thoracic duct laceration (on the left side). Arterial dissection, thrombosis, embolus, and unintentional arterial cannulation may cause distal ischemic damage.<sup>[2,3]</sup> Here, we report a case of the right upper limb ischemic changes noticed apparently following right subclavian central venous catheterization, which later turned out to be acute on chronic axillary artery thrombus.

## CASE REPORT

A 65-year-old woman was received into the Surgical Intensive Care Unit (SICU) following emergency exploratory laparotomy under general anesthesia for perforative

peritonitis. Patient was shifted from the operating room with the endotracheal tube *in situ* on Ambu bag ventilation as she had inadequate respiratory efforts following surgery. On arrival to the SICU, she was conscious but drowsy with a pulse rate of 120/min in both upper limb radial arteries. Noninvasive blood pressure was recorded as 160/100 mmHg on the left upper limb in supine position, SpO<sub>2</sub> was 98% on synchronized intermittent mandatory ventilation mode with FiO<sub>2</sub> 50%, tidal volume 400 ml, respiratory rate of 12/min, positive end-expiratory pressure 5 cm of H<sub>2</sub>O. Patient was a newly diagnosed hypertensive on amlodipine 5 mg once daily medication. She also had deranged renal functions. Electrocardiogram (ECG) revealed left ventricular hypertrophy. Intraoperatively, she had a reduced urine output. For fluid management, a subclavian CVC insertion was considered. Under all aseptic precautions, a 7 French double lumen catheter was inserted into the right subclavian vein by modified Seldinger's technique by a junior resident in a single attempt. Visualization of atrial ectopics on the

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ECG on insertion of the guidewire was noted. Backflow of venous blood through the catheter, nonpulsatile flow of blood was confirmed. The CVC was secured in position and fluids were administered according to the central venous pressure measurement using water manometer. A portable chest radiograph was obtained to confirm the placement of the catheter and it was found to be in place.

The following day, patient winced in pain on touching the right arm. On further examination, right upper limb pulsations were absent, peripheries were cold and color change was noticed in the right upper limb [Figure 1]. Only the right subclavian artery pulsation was palpable, other pulsations of the right upper limb were absent. CVC misplacement was suspected to be the cause of the right upper limb ischemia. An immediate emergency Doppler study of the right upper limb was performed which showed a right axillary artery acute on chronic thrombus which measured 4–5 cm with absent distal flows. She was soon started on antiplatelet medications for the same. However, the patient died due to sepsis secondary to perforative peritonitis and died 2 days after surgery.

## DISCUSSION

Adherence to well-defined indications, contraindications, and technique of central venous catheterization can help avoid unnecessary catheterizations and keep complications to a minimum. A chest radiograph is recommended as a routine procedure after any attempted central venous catheterization (whether successful or not), which helps to determine the placement of the catheter and detect any immediate complications.<sup>[4]</sup> Many modalities such as ultrasound, ECG guidance, and real time X-ray imaging can increase the successful placement of needles, guidewires, and catheters.

Subclavian artery puncture is the second most common complication, constituting 20% of all complications of all



**Figure 1:** Right upper limb showing the central venous catheter inserted into the right subclavian vein and color changes noted

subclavian central venous catheterizations.<sup>[4]</sup> The inadvertent arterial catheterization will usually be obvious from the color and pulsatile nature of the blood backflow through the catheter; this is not always true as in hemodynamically unstable patients. Artery may be damaged at the puncture site or more centrally with various consequences such as localized hematoma or false aneurysm which may cause damage to local structures such as nerves or cause airway compression. Arterial dissection, embolus, thrombus, and unintentional arterial cannulation may cause digital ischemic damage.<sup>[2,5]</sup> A case of arterial misplacement of a femoral CVC inserted in a patient with profound hemorrhagic shock and complicated with acute right external iliac arterial occlusion leading to necrosis of ipsilateral lower limb has been reported. A large bore CVC, inexperience of the inserting physician, intra-arterial administration of drugs such as sodium bicarbonate, dopamine, and calcium chloride leading to arterial vasospasm and thrombosis were the contributing factors for this case.<sup>[6]</sup> A case of postoperative axillary artery thrombosis 8 days following palliative Billroth I gastrectomy for carcinoma stomach has been reported. This patient was found to have a cervical rib on that side. Embolism due to cardiac disease, thrombosis due to carcinomatosis, and arterial damage due to pressure of cervical rib are some of the predisposing factors for axillary artery thrombosis.<sup>[7]</sup> In our patient, none of these factors were present except for old age; yet ipsilateral axillary artery thrombosis occurred.

To conclude, limb vascular complications can occur after central venous catheterization. Although arterial puncture and misplacement are a known cause, they can also occur due to other reasons like in our case. Timely investigations and management can help at such critical times to prevent permanent injury.

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## Conflicts of interest

There are no conflicts of interest.

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