



## CENTRAL VENOUS CATHETER MALPOSITION AS AN IMMEDIATE COMPLICATION AFTER INSERTION

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### ABSTRACT

**Introduction:** the use of central venous catheterization (CVC) is a common practice in intensive care, emergencies and anesthesiology and is not free of complications. Among these is the malposition of the catheter. The **purpose** of describing a case where CVC malposition was diagnosed as an immediate complication after its insertion. **Case presentation:** a case is presented in which catheterization was performed in a 76-year-old female patient, via the left posterior jugular route, identifying in the control radiography the bad position of the catheter, which took an anomalous route towards the left subclavian vein. The catheter was immediately withdrawn and the procedure was performed again through the contralateral subclavian vein and its correct position was subsequently verified. **Conclusions:** CVC malposition is a frequent complication associated with CVC insertion. In the present case it was immediately diagnosed by control radiography and the anomalous CVC was removed and correctly replaced in a second attempt without further complications

**Keywords:** central venous catheter; mechanical complications, ultrasonography.



## INTRODUCTION

The use of central venous catheterization represents a common practice in intensive care, emergency and anesthesiology. The known history of venous catheter insertion began in 1929 when Forssman inserted himself a rubber catheter to the right heart.<sup>1</sup> From that time until today this invasive procedure has gained ground, has been updated and has ceased to be an isolated exercise to become a means of continued use, especially for the facilities it provides, among which we find hemodynamic monitoring, administration of blood products and drugs, parenteral nutrition, fluid therapy and renal replacement therapies.<sup>1-3</sup>

Central venous cannulation is the most frequently performed invasive procedure in Intensive Care Units; in the United States alone, more than 5 million deep venous insertions are performed each year.<sup>1</sup>

This statement establishes that the insertion of a CVC depends fundamentally on the expertise and training of the clinician and is not free of complications.

In Cuba there are no published records on this subject and the existing literature is limited to theoretical details on the procedure. For this reason, this article was written with the purpose of describing a case where CVC malposition was diagnosed as an immediate complication after its insertion.

## CASE PRESENTATION

76-year-old female, with a personal pathological history of arterial hypertension, with occasional treatment.

She was admitted to the ICU after presenting a sudden loss of consciousness, which corresponded to the finding in the CT scan of left temporo-parietal ischemic stroke, with involvement of the middle cerebral artery.

On admission, arterial hypotension (90/60 mmHg) and clinical symptoms corresponding to an intracranial hypertension syndrome were observed. This reason demanded the implantation of a CVC for continuous infusion of vasoactive drugs. A Certofix<sup>®</sup> Mono S 430 CVC was used for the procedure (Annex Figure 1).

The procedure was performed using the Seldinger method and the anatomical route of the left posterior jugular vein was used. The technique was performed without difficulty, the vein was cannulated on the first attempt and there were no immediate complications during the procedure. However, upon radiographic verification, the malposition of the CVC was evidenced, which took a route towards the left subclavian vein (Annex Figure 2).

Immediately it was decided to remove the CVC and perform the procedure again, this time a more experienced specialist was called to perform it and the



procedure was performed through the right subclavian route and by Seldinger's method. Once again there were no complications during the procedure.

Subsequent radiographic verification showed the correct placement of the CVC in projection to the right atrium and to the edge of the atrial wall (Annex Figure 3).

## **DISCUSSION**

CVC malposition is one of the mechanical complications related to its insertion. Among them are: inadvertent arterial puncture, pneumothorax, hemothorax, pneumomediastinum, hematoma formation, air embolism, nerve injury, cardiac arrhythmias, and myocardial perforation.<sup>3-5</sup> Most are iatrogenic, are directly related to the experience of the physician performing the procedure, occur in 5 to 19% of all catheterizations performed and remain a significant cause of morbidity and mortality and prolonged hospitalization.<sup>4,5</sup>

Its basic definition is when the catheter is in the venous system but the catheter tip is not in the right atrium, superior or inferior vena cava, when the catheter is outside the venous system, bent or when the distal third of the catheter is not parallel to the vein wall.<sup>6</sup> The incidence is 5 % for jugular access to 9 % for subclavian access.<sup>7</sup> In the study by Hernández-Castañeda B and collaborators<sup>5</sup> the fundamental complication described was catheter malposition, which represented 51 % (95 % CI 3.42 - 26.61; OR: 9.5; n= 177) among catheterizations performed by anatomical reference. In another investigation carried out by Hernández-Franco EH and Martínez-Ordaza JL<sup>8</sup> this complication was present in only 1,71 % of patients (95 % CI: 1,68 - 1,72; n= 5).

Among the factors that increase the risk of presenting an insertion complication are: little experience on the part of the inserter, the number of punctures, body mass index greater than 30 or less than 20, severe hypovolemia and dehydration. The history of failed placement is the most important predictor for the development of complications, occurring in up to 20% of cases.<sup>8</sup> However, none of these elements were present in this case.

Subclavian catheters can be placed in the ipsilateral internal jugular vein or in the contralateral subclavian vein. The jugular catheters can follow the course of the subclavian and also the jugular on the opposite side,<sup>6</sup> as was the case presented in this occasion. Other alternatives that can collaborate with a bad position of the catheter tip are an anatomical variant or stenosis of the great veins.<sup>9</sup> Poor positioning of the CVC is associated with other complications, such as venous thrombosis, loss of central venous pressure measurement by remaining in narrower veins and with less flow or altering the flow and more possibilities of local damage, damage to vascular structures and greater mechanical and chemical damage to the vein due to the drugs to be infused and, therefore, greater risk of perforation.<sup>6,7</sup>

In this situation, catheters are easily recognized as misplaced and generally the advice of a specialist is not needed before their revision, use or removal.<sup>9</sup> To confirm the short location of the catheter, a chest radiograph should always be



performed and its correct position visualized. <sup>7</sup> Although chest radiography can only confirm central catheter passage, central catheter kinking or procedural complications. <sup>9</sup>

Due to these events that may occur, the Clinical Practice Guidelines for the management of central venous catheters in critically ill patients <sup>10</sup> recommend the use of real-time ultrasound as a guide in the insertion of the CVC via the femoral or subclavian route (Weak recommendation. Moderate level of evidence) and for the internal jugular vein (Strong recommendation. High level of evidence).

It is important to note that in the institution where the authors of this communication work there are no ultrasonographic means to perform this procedure with the desired frequency, so the exercise of catheterization is assumed based on the experience of the acting clinician and the anatomical variants of the patients.

## **CONCLUSIONS**

CVC malposition is a frequent complication associated with CVC insertion. In the present case it was immediately diagnosed by control radiography and the anomalous CVC was removed and correctly replaced in a second attempt without further complications.

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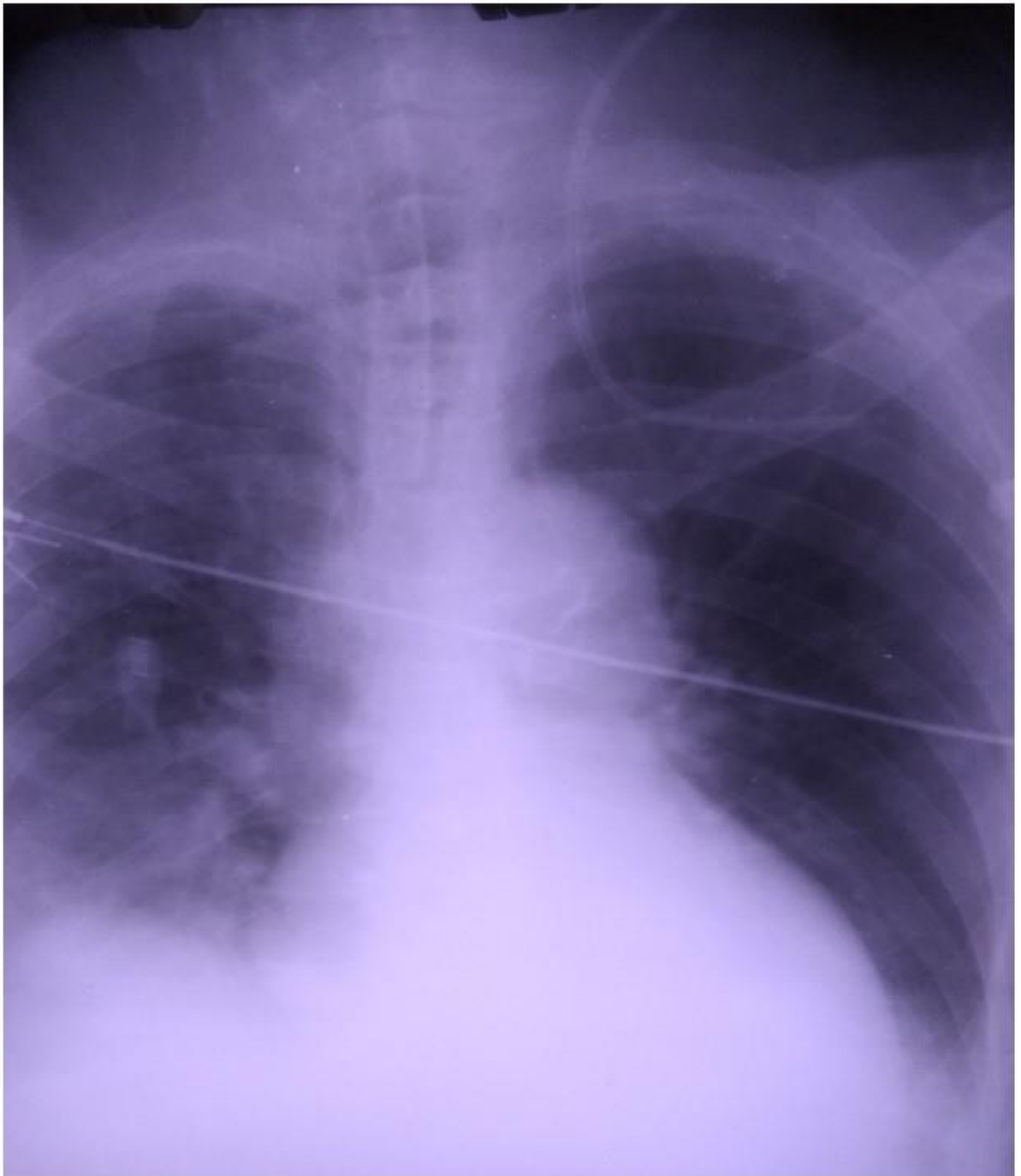
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**Annex**
  
**Figure 1. Certofix® Mono S 430 Catheter.**





**Figure 2. Radiographic evidence of CVC malposition towards the ipsilateral subclavian vein. Anteroposterior view chest radiograph. Source: authors.**





**Figure 3. Radiographic evidence of the correct position of the CVC. Chest X-ray in anterior-posterior view. Source: authors**

