

Postural Ventricular Tachycardia from Peripherally Inserted Central Catheter Line Placed Using Tip Confirmation System

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Abstract:

We report a striking and florid case and immediate emergency management of 'postural' ventricular tachycardia likely caused by the mis-confirmed tip of a peripherally inserted central cannula (PICC) placed via a Tip Confirmation System (TCS).

Cardiac arrhythmia is a known complication of PICC insertion, however the literature does not include a case of arrhythmia where a TCS was utilized for insertion to our knowledge.

This case highlights the importance of a thorough history and clinical exam in allowing for prompt diagnosis and treatment of arrhythmias caused by PICCs – despite reassuring radiographic and TCS confirmation of tip placement.

Key words: arrhythmia; picc line; ventricular tachycardia; peripheral inserted central cannula; tip confirmation system

Introduction

Peripherally inserted central cannulas (PICCs) are widely used venous access devices in clinical practice and are largely regarded as safe and effective. [1]

There is a wide range of use for PICCs such as: measuring circulatory or heart function, providing long-term access route for infusions and blood tests, delivering drugs that require rapid dilution (e.g., chemotherapy), and delivering contrast medium for cardiac imaging (amongst others).

A PICC is inserted via a cephalic or basilic vein of the upper arm under ultra-sonographic guidance, and the catheter tip is positioned at the superior vena cava (SVC) through the subclavian and brachio-cephalic veins [6].

The merits of PICC are the low incidence of catheter-related infection and the avoidance of serious complications, such as pneumothorax and hemothorax in comparison to central venous cannulation [7].

A rare complication of PICCs is cardiac arrhythmias, including positional ventricular tachycardia (VT) [2,3,4]. Literature review of this complication reveals reliance upon chest radiograph, fluoroscopy or Tip Confirmation Systems (TCS) such as the Sherlock 3CG® for confirmation of correct placement and avoidance of arrhythmia.

A TCS allows for magnetic tracking of the PICC tip during insertion and confirmation of placement with electrocardiogram (ECG), meaning most

patients will not require a chest radiograph or fluoroscopy. Use of this magnetic system mandates that only the Power PICC catheter may be inserted with use of the Sherlock 3CG® system, as this is the only compatible catheter with the system [5].

Ideally, a TPS allows for more efficient bedside insertion of a PICC and faster use of the PICC for the patient's needs. With the TCS and safe insertion of a PICC relying on the patient remaining still and in one position during insertion, we hypothesize it is possible that a positional arrhythmia may still occur after the patient moves out of position.

The Sherlock 3CG® TCS enables advancement of the catheter tip under the magnetic sensor's guidance system, which graphically shows the position of the catheter tip on a bedside monitor. When the catheter tip is located near the cavo atrial junction (CAJ), which is the preferred placement of a PICC tip, the p-waves of the ECG gradually become higher, reaching a maximum at the CAJ. With these two guidance systems, the catheter tip can be advanced to the CAJ without using fluoroscopy [6].

Despite their use there have been case reports of misplaced catheter tips when using the Sherlock 3CG® system when tip position is further confirmed with ultrasound or chest radiograph [7]. Though the authors of these findings did not specifically mention the complication of cardiac arrhythmia as a result of the misplaced catheter.

The aim of this article is to highlight the importance of a thorough clinical history and exam, and that despite use of a TCS and reassuring radiographic evidence of correct PICC tip placement, positional arrhythmias from a PICC are still possible.

Case Presentation

A 31-year-old female presented to Sunshine Coast University Hospital (SCUH) Emergency Department complaining of position provoked palpitations for the past two days. SCUH is a tertiary hospital in Queensland, Australia with a well-established PICC insertion and vascular access team.

The patient had non-Hodgkin's Lymphoma (NHL) for which she was receiving intra-venous chemotherapy. A PICC line had been inserted into her right arm two days prior to presentation by the hospital's vascular access team in accordance with hospital protocol and utility of the Sherlock 3CG® TCS. Which meant that no chest radiograph was necessary post insertion before the PICC was going to be able to be used. At time of insertion there were no complications reported and the TCS indicated satisfactory position of the PICC tip.

Only a couple of hours after insertion of the PICC line with tip placement verified using a TCS she began having intense thoracic palpitations with feelings of "pounding" in her chest and became presyncopal. These symptoms were only noticed by the patient when positioned: leaning forward, lying on right or left lateral decubitus or prone positions. Notably, the palpitations resolved immediately once the above positions were abandoned, and the patient was supine, which is the position she was in during PICC insertion.

Examination & Investigations

In the resuscitation bay of the emergency department, she was anxious but haemodynamically stable. Her PICC site was satisfactory; heart sounds and jugular venous pressure were normal, as was the respiratory exam. Her 12-lead ECG and bedside cardiac telemetry was consistently in normal sinus rhythm in the supine position. But when asked to move to the left lateral decubitus position immediately her heart rhythm switched to a VT pattern.

(Figure 1; A, B) This was accompanied by the patient's identical symptoms of palpitations and pre syncope, as she previously described. The arrhythmia and symptoms resolved upon moving from the lateral decubitus position to the supine position.

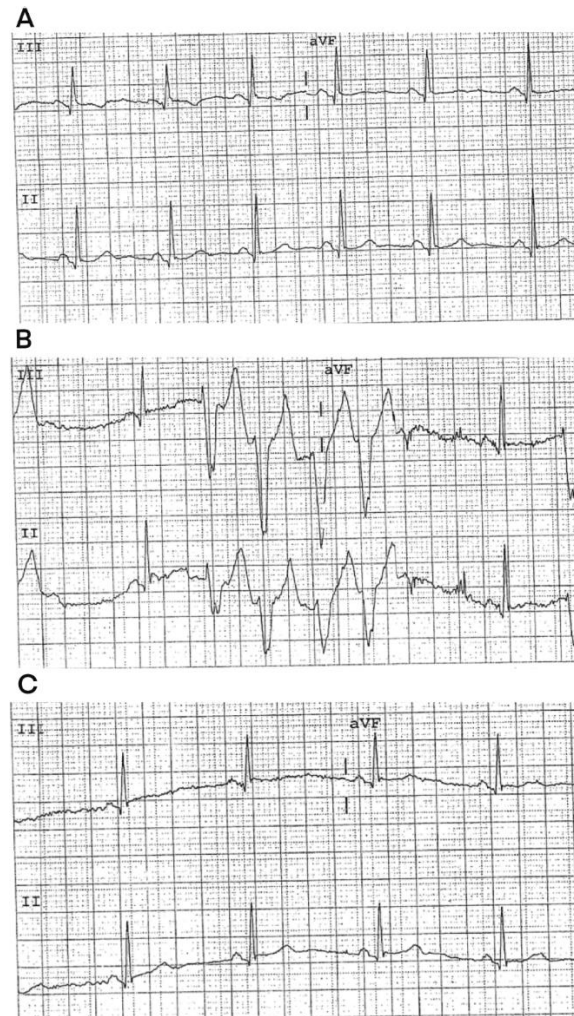


Figure 1: Electrocardiogram traces based on the patient's position two days post PICC insertion via a TPS

A: Baseline, supine position, normal rhythm

B: VT in lateral decubitus position

C: In lateral decubitus position after re-positioning tip of PICC; now showing a normal sinus rhythm

An erect chest radiograph, taken while asymptomatic, showed the tip of the PICC to be appropriately projected over the junction of the superior vena cava and right atrium, in the CAJ.[4] Laboratory investigations including full blood count, renal function, liver function test, and venous blood gas were unremarkable.

After discussing with the vascular access team and PICC-insertion service they confirmed that the PICC had been satisfactorily inserted without issue using the Sherlock 3CG® Tip Confirmation System [5].

Discussion

Our initial thoughts were the PICC tip was migrating during movement and causing the arrhythmia and associated symptoms. Unfortunately given the severity of the patient's symptoms we were unable to obtain a chest radiograph in the offending positions to verify if this was the case.

Previous research had found that of eighteen cases of mispositioned catheter tips using the Sherlock 3CG® tip confirmation system, four had adequate position within the CAJ on chest radiograph [6]. However, in this case both the Sherlock 3CG ® and chest radiograph confirmed appropriate placement.

After wide consultation with the PICC insertion nurses, cardiology, radiology, and emergency teams, it was agreed upon to attempt to reposition the PICC by withdrawing the PICC 1.5cm; this was achieved without complication under sterile technique.

After reposition of the PICC the patient was asked to assume the triggering positions again (right and left lateral decubitus, and prone). The palpitations did not occur, and the ECG remained in normal sinus rhythm (See Figure 1 C). The patient was discharged home for routine oncology and vascular access service follow up, with the PICC remaining in situ as well as no restrictions on the use of the PICC.

Conclusion

In summary, we present to our knowledge the first position-dependent VT following PICC insertion with the utilisation of a TCS, and appropriately positioned PICC on chest radiograph. Careful history taking, with appropriate exams, investigations and vigilant clinical suspicion, can lead to effective and timely treatment. A seemingly simple, readily available, and cheap intervention of catheter tip reposition was an immediately successful treatment, without reinsertion or removal of the entire PICC.

Conflict of Interest

None to declare

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Nil

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