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A Missing Guide Wire After Placement of Peripherally Inserted Central Venous Catheter

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Conflict of interest: None declared

Patient: Male, 50
Final Diagnosis: Retained guidewire removal by interventional radiology
Symptoms: Swelling
Medication: —
Clinical Procedure: Fluoroscopic retrieval of the guidewire
Specialty: Critical Care Medicine

Objective: Unusual setting of medical care

Background: Central venous catheterization is a common tool used in critically ill patients to monitor central venous pressure and administer fluids and medications such as vasopressors. Here we present a case of a missing guide wire after placement of peripherally inserted central catheter (PICC), which was incidentally picked up by bedside ultrasound in the intensive care unit.

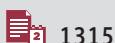
Case Report: A 50-year-old Hispanic male was admitted to the intensive care unit for alcohol intoxication. He was managed for septic shock and required placement of a peripherally inserted central line in his left upper extremity for antibiotics and vasopressor administration. A bedside ultrasound performed by the intensivist to evaluate upper extremity swelling revealed a foreign body in the left arm. Percutaneous procedure by Interventional radiologist was required for retrieval of the guidewire.

Conclusions: Guide wire related complications are rarely reported, but are significantly associated with mortality and morbidity. The use of ultrasound guidance placement of PICC lines decreases the risk of complications, provides better optimal vein selection, and enhances success.

MeSH Keywords: Catheterization, Central Venous • Foreign Bodies • Radiography, Interventional • Ultrasonography

Abbreviations: PICC – peripherally inserted central catheter; PICCS – peripherally inserted central catheters

Full-text PDF: <http://www.amjcaserep.com/abstract/index/idArt/901046>



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Background

Peripherally inserted central catheters (PICCs) provide immediate venous access to inpatient and outpatient adult and pediatric patients. Approximately three million PICCs are placed annually in the United States [1]. Most PICCs are placed by appropriately trained nurses under ultrasound guidance. PICC-related complications include bleeding, phlebitis, cellulitis, thrombus, pain during infusion, air embolism, and catheter tip migration. A rarely reported PICC-related complication is a missing guide wire, which can result in arrhythmias, intravascular entrapment of wires, embolization of wire fragments, and vessel perforation. Use of ultrasound before and after placement of PICCs helps prevent this complication [2]. We present a case of a retained guide wire that was incidentally found with bedside ultrasound.

Case Report

A 50-year-old Hispanic male was admitted to the intensive care unit for alcohol intoxication. Upon admission, the patient was confused and unable to provide any meaningful details. His previous records showed that he had comorbidities including benign essential hypertension, paroxysmal atrial fibrillation, non-ischemic cardiomyopathy, and multiple hospitalizations for delirium tremens. He had a 15-year history of alcohol misuse and failed multiple detox attempts. He had never smoked tobacco and did not have any other toxic habits. He had no reported allergies. His medications included thiamine, folate, aspirin, metoprolol, iron, and multivitamin supplements. He lived alone and lacked strong social support.

Upon presentation, physical examination revealed a confused, middle-aged man. Vitals showed a fever of 99°F (37.2°C), pulse rate of 112 beats per minute, respiratory rate of 20 breaths per minute, and blood pressure 110/60 mm Hg. Oxygen saturation was 95% in ambient air. He had conjunctival pallor, mild jaundice, and was tremulous. Abdominal examination revealed no hepatosplenomegaly or ascites. There was bilateral air entry on auscultation of lungs with no adventitious sounds. Precordial examination revealed normal heart sounds with holosystolic apical grade III/VI murmur. His neurological examination showed no focal neurological deficits with a Glasgow Coma Scale score of 13. On initial presentation, his labs were significant for neutrophilic leukocytosis, macrocytic anemia, chronic thrombocytopenia, abnormal liver function tests, and hyponatremia. His chest radiography showed right lower lobe infiltrate. He was managed for alcohol intoxication, electrolyte imbalances, rhabdomyolysis, and aspiration pneumonia. The next day, the patient developed hypoxic respiratory failure requiring mechanical ventilator support. He was managed for septic shock due to methicillin-sensitive



Figure 1. Transverse image depicting guide wire within the lumen of the left basilic vein.

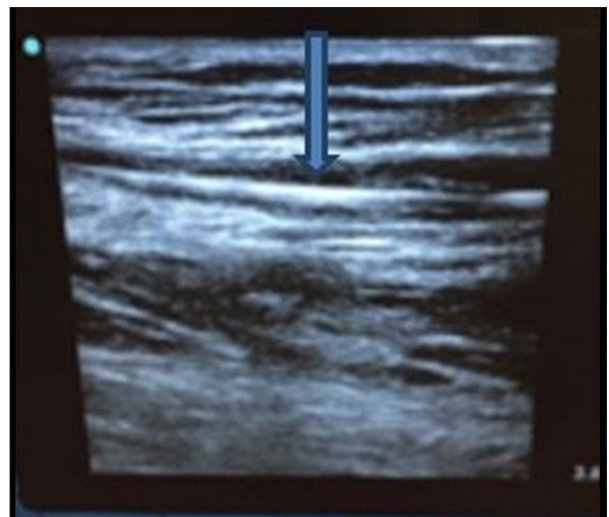


Figure 2. Longitudinal image depicting guide wire within the lumen of the left basilic vein.

staphylococcal pneumonia and required placement of a peripherally inserted central line in his left upper extremity for antibiotics and vasopressor administration. After resolution of septic shock, the peripherally inserted central line was removed. On day 14 of hospitalization, a routine physical examination revealed left upper extremity swelling that was out of proportion to the rest of the extremities. Immediate bedside ultrasound performed by the intensivist revealed a foreign body in the left arm (Figures 1, 2). It was determined to be the retained guidewire from the previously inserted central line. A chest radiograph confirmed this finding (Figure 3). Interventional radiology was consulted and the guidewire was retrieved under fluoroscopic guidance through a percutaneous procedure that used a snaring coaxial system (Figure 4). The remainder of his hospitalization was uneventful and the

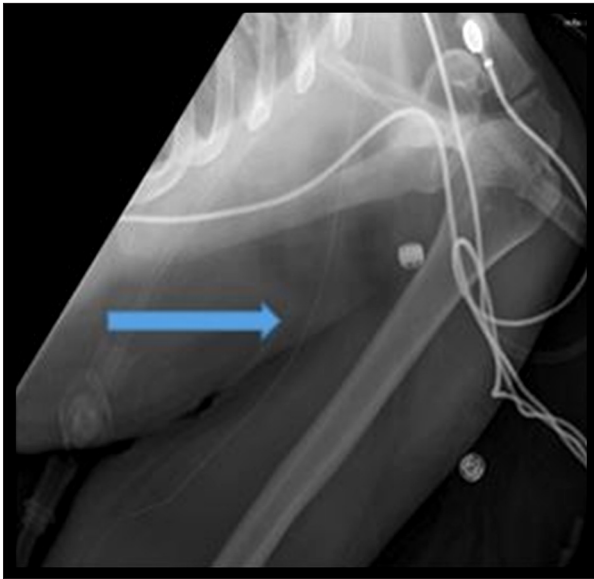


Figure 3. Chest radiograph A/P view showing retained foreign body.



Figure 4. Image of the guide wire after successful retrieval by interventional radiology.

patient was subsequently discharged to a rehabilitation facility. The patient was followed up in the rehabilitation facility and required frequent hospitalization for atrial fibrillation with rapid ventricular rate and acute exacerbation of congestive heart failure in the last six months.

Discussion

In 1953, Seldinger described a simple, over a guide wire approach for catheter placement [3]. This ultrasound-guided Seldinger technique is most commonly used in the intensive care unit for placement of a central venous catheter, peripheral venous catheter, arterial catheter, or hemodialysis catheter [4,5]. The National Institute for Clinical Excellence (NICE) has published recommendations for the use of ultrasound in placing central venous catheters. Ultrasounds can reduce

complications related to venous puncture, but there could still be some complications related to the guide wire, dilator, or catheter [6].

A PICC is a form of intravenous access that can be used for long-term antibiotics, total parenteral nutrition, vasopressors, and chemotherapy. It is a catheter that enters the body through the skin (percutaneously) at a peripheral site and extends to the superior vena cava. To decrease the risk of infection, particularly a blood stream infection, those involved in the management of the PICC must adhere to strict infection control procedures [7].

There are often challenges during the initial insertion of the guide wire. If the guide wire cannot be inserted or passed easily without resistance, the procedure should be stopped immediately, and the guide wire and needle should be removed. The distal portion of the guide wire can detach and resemble a pulmonary embolism [8]. The J-tip of the guide wire can become entrapped in a vena cava filter and may cause difficulty in retrieving the guide wire [9]. Breakage of the guide wire has been reported in the literature and is not necessarily due to handling mistakes, but may also be attributed to inherent design flaws or manufacturing errors [10]. The retained guide wire in our case was likely a consequence of a fractured guide wire at the time of initial placement of the PICC.

The consequences of PICC complications can be serious and manifest as a deep vein thrombosis, pulmonary embolism, catheter-related blood stream infection, or post thrombotic syndrome. One of the most common complications after placing a PICC line is a deep vein thrombosis in an upper extremity. A comprehensive review conducted by Verso and Agnelli indicated that the incidence of symptomatic upper extremity deep vein thrombosis following the placement of a central vascular access device is between 0–3% [11]. A study conducted by Stokowski et al. demonstrated a significant reduction in thrombosis rates with the ultrasound method (1.9%) compared to the palpation method (9.3%). Moreover, successful PICC placements by nurses increased from 76.9% when using the old landmark method to 98.9% when using ultrasound guidance [12].

Factors that can lead to a missing or misplaced guide wire include inattention, inadequate supervision of trainees, and overtired staff. Operators inexperienced either in method (i.e., Seldinger technique) or actual central venous cannulation can also lead to misplaced guide wires. It is important to monitor patients for the following signs of guide wire loss: the guide wire missing post-procedure, decreased venous back flow from the lumen, resistance to injection, or a visible guide wire on ultrasound or radiograph [12].

The use of the Sherlock 3CG Tip Confirmation System provides real-time feedback on catheter tip location, orientation with the use of passive magnets, and cardiac electrical signal detection [13]. Placing a PICC with the ECG-guided method has advantages in cost effectiveness, accuracy, and feasibility in situations where x-ray images may be difficult to obtain [14].

A retained guide wire should be removed as soon as possible to prevent complications like vascular damage, arrhythmias, thrombus, or embolism [15]. Retained guide wires can be removed by interventional radiology with the help of endovascular forceps [16]. Our case is unique as there are few studies that emphasize missing guide wire after PICC line placement. Use of bedside ultrasound helps in early detection of a foreign body, leading to its retrieval.

Conclusions

Although central venous catheter placement is a common practice in critically ill patients, we want to emphasize and raise

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awareness of potential complications of the catheter. Close supervision by a senior person, use of ultrasound before and after placement of catheter, and use of a checklist may help to identify and prevent similar complications. The loss of a guide wire is a completely preventable complication, provided that one always holds onto the tip of the wire.

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M Khaja was the attending physician who made the diagnosis, took ultrasound images, supervised the treatment of the patient, and critically revised and edited the manuscript. M Kashif and H Hashmi searched the literature and wrote the paper. P Jadav was involved in patient care.

Conflict of Interests

The authors declare that they have no conflicts of interest related to this manuscript.