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Case report

Delayed diagnosis of a retained guidewire after bedside femoral venous catheter insertion: A preventable complication [☆]

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ABSTRACT

Central venous catheter (CVC) insertion is a commonly performed procedure that is used for continuous invasive hemodynamic monitoring, fluid resuscitation, drug therapy, and hemodialysis. CVC placement can be associated with serious complications that are mostly preventable. One of these complications is the loss of the guidewire within the intravascular space, which carries a high morbidity and mortality. Here, we describe a 44-year old patient who presented with acute kidney injury and metabolic derangements that necessitated bedside right femoral dialysis catheter to initiate emergent renal replacement therapy. A day after the catheter insertion, the guidewire was noted on a routine chest X-ray extending into the base of the skull. The clinical course was complicated with cerebral infarction. Subsequently, the retained guidewire was removed a few days after the CVC insertion. In summary, the retained guidewire within the circulation is associated with potentially life-threatening and hazardous outcomes. Continuing education, vigilant supervision, and implementing certain protocols are likely to prevent such undesirable events.

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Introduction

Percutaneous placement of central venous catheter (CVC) is a routine procedure that is used extensively in intensive care units and emergency departments to closely monitor intravascular hemodynamics, fluid and medications

administration, and emergent dialysis [1]. The insertion of CVC requires advanced operator surgical skills, supervision, and attention to details to prevent adverse effects [2]. Guidewires are usually employed using the Seldinger technique to insert these catheters. The CVC placement procedure carries several risks and is associated with mostly iatrogenic complications [2,3]. The loss of the guidewire within the

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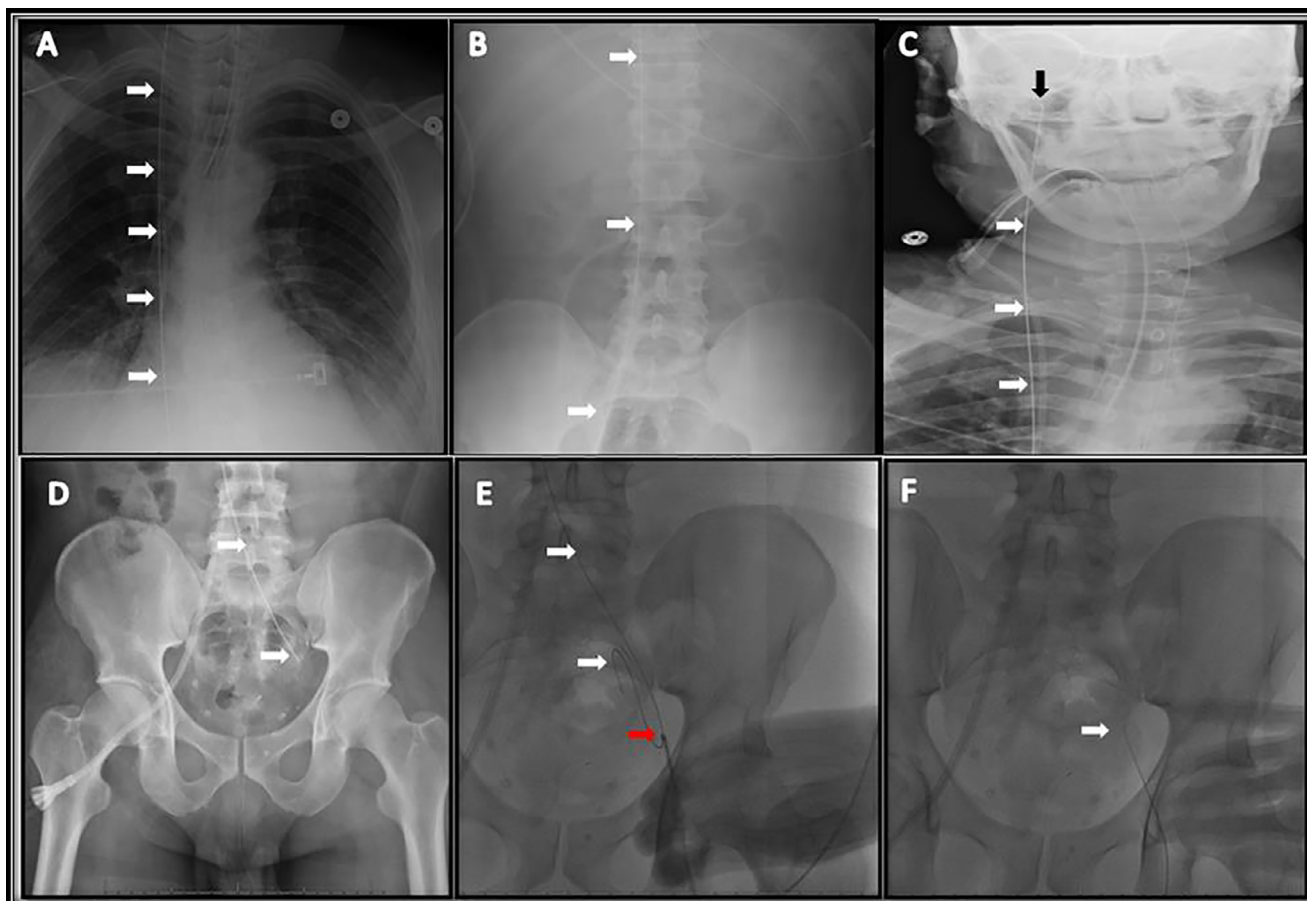


Fig. 1 – Panel A: Chest X-ray showing guidewire [white arrows] extending across the inferior vena cava (IVC), right atrium and into the superior vena cava (SVC). Panel B: Abdominal flat plat X-ray showing guide wire [white arrows] extending across the inferior vena cava (IVC) from right common iliac vein. Panel C: Frontal X-ray of the head and neck showed a guidewire projecting over the right neck with a J-shaped tip projecting over the skull base (black arrow). Panel D: Caudal end of the guide wire migrated towards the left common iliac vein (white arrows). Panel E: Retained guide wire being removed using a snare catheter (Red arrow). Panel F: White arrow showing J shaped guide wire tip being retrieved.

circulation during the procedure is a rare complication that could be associated with significant morbidity and mortality. This complication is mostly preventable by following standard procedural protocol, adhering to correct safety measurements, and documenting the removal of guide wire after the procedure [3,4].

In this report we describe a 44-year-old patient who developed acute kidney injury complicated with multiple metabolic derangements and required emergent dialysis for which he underwent bedside right femoral CVC under ultrasound guidance. The catheter insertion was complicated by the loss of the guidewire, which was noticed a day later at the neck level then migrated to the left common iliac vein after dialysis initiation. Interestingly, the retained wire was inadvertently missed on abdominal plain X-ray and subsequently was complicated with acute stroke.

Case report

A 44-year-old healthy male with no significant past medical history presented to our facility with fulminant hepatic failure, acute kidney failure, severe hyperkalemia, and metabolic acidosis secondary to acetaminophen toxicity. An ultrasound-guided right femoral temporary hemodialysis vascular catheter was inserted at bedside to emergently start continuous renal replacement therapy. Twenty-four hours later, a routine chest X-ray was performed and detected a guidewire extending from the inferior vena cava, right atrium, and into the superior vena cava (Fig. 1, panel A). Interestingly, the retained guidewire had been inadvertently missed on an abdominal flat X-ray that was done 20 hours after insertion (Fig. 1, panel B). A frontal X-ray of the head and neck showed

the guidewire extending over the right neck with a J-shaped tip projecting over the skull base (Fig. 1, panel C). After continuous renal replacement therapy initiation, the caudal end of the guidewire migrated to the left common iliac vein (Fig. 1, panel D) presumably due to blood flow turbulence associated with the right femoral CVC. Few days later, the patient suffered a right sided caudate nucleus cerebral infarction that was noted on brain imaging. The retained guidewire was successfully removed using a snare catheter (Fig. 1, panel E) in interventional radiology suite under fluoroscopic guidance (Fig. 1, panel F). The patient died of cardiac arrest and fulminant hepatic failure related complications 9 days later.

Discussion

Central vascular catheters (CVC) are routinely used in the emergency department and intensive care units for critical patients, including those who require urgent dialysis [1,2]. Several veins can be used to insert CVC such as jugular, subclavian, and femoral veins. The CVC kit includes guidewires to facilitate the line placement. While the complication rate of inserting CVC catheters is approximately 15%, the intravascular loss of the guidewire during CVC placement is a rare but serious complication [5]. Since the guidewire does not completely occlude the catheter lumen, the blood can be aspirated from the CVC ports, which confirms the intravascular placement of the CVC. Moreover, upon flushing the CVC after placement, the guidewire can be further pushed into the circulation and becomes remote [6,8]. The lost guidewire is usually found incidentally on a routine X-rays or computed tomography images after the procedure.

Retained guidewires increase morbidity and mortality, particularly when used in the vascular system. Several complications are reported with retained guidewires related to CVC placement including arrhythmia, thrombosis, cardiac and aortic perforation, pneumothorax, and cardiac tamponade [5–7].

In the case presented here, the guidewire was lost during bedside right femoral hemodialysis catheter insertion and was not recognized by the operator. Further, this complication was also missed on the abdominal flat X-ray film performed 20 hours after CVC catheter insertion. It is reasonable to speculate that human error combined with recognition shortcomings on subsequent imaging resulted in the overlooking of the retained guidewire in our case. Further, the failure to adhere to good procedural practices likely resulted in this complication. We strongly feel that this complication is preventable by following standard procedural protocol and by documenting the removal of guide wire after CVC insertion [5].

In general, several predisposing factors are proposed for retained guidewires after CVC placement including inattention, inexperienced operator, inadequate supervision of trainees, lack of communication, and overtired staff [5,6].

In order to reduce the rate of this complication, many facilities have a competency-based training process to prevent guidewire loss such as holding the guidewire and stopping the advancement of the guidewire upon encountering resistance [5]. The use of standardized checklists during CVC in-

sertion that includes the guidewire removal can further lower this complication. Some evidence suggests that simulation models using forced error with validation of competency provides a mechanism to decrease the rate of this complication and improve patient safety [9]. Lastly, post CVC insertion imaging is always a good practice to avoid such complication.

Once discovered, the retained guidewires are usually retrieved in the radiology suites under fluoroscopy guidance. The basic retrievers for removing intravascular foreign bodies include loop snare catheters, hook tip guide wires or catheters, basket retrievers, and grasping forceps or catheters [10,11].

In summary, retained guidewires after CVC insertion is a rare serious complication that is associated with significant morbidity. Several measures can be taken to minimize this potentially preventable lethal complication.

Patient consent

Written informed consent was obtained from the patient for all procedures and publication of this case and accompanying images.

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