



Suspected Short Peripheral Venous Catheter Intravascular Embolization: Identification and Management

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Abstract

Embolization of a standard short peripheral venous catheters (S-PVC) related to catheter fracture is an extremely rare complication. Early identification and management is essential to avoid potential complications (i.e. central embolization, arrhythmias, cardiorespiratory failure, etc.). In this report, we describe a case of suspected short-PVC fracture in a pediatric patient. The goal is to review available literature and provide insight on what to do in the setting of suspected PVC fracture.

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INTRODUCTION

Intravascular embolization of a fractured short peripheral venous catheters (S-PVC) is an extremely rare complication. Most reported cases of embolization related to fracture occur in the setting of central venous catheter or totally implanted port devices (0.2% to 4.2% occurrence) [1, 2]. In this report, we describe a case of suspected short-PVC fracture in a pediatric patient that eventually led to litigation. The goal is to provide insight on what to do if this complication is suspected.

CASE REPORT

A 9-month-old baby girl presents to the Emergency Department (ED) with respiratory distress, cough, and fever. After a complete workup, the patient was admitted by her pediatrician with a working diagnosis of severe bronchiolitis for intravenous (IV) hydration, antibiotics, and aggressive respiratory therapy. A standard 24F Jelco IV catheter was placed at a dorsal vein (basilic side) of the left hand at this time and secured with tape/sterile dressings (i.e. standard polyurethane dressing, SPU) and soft immobilization at

the wrist. Three days later her mother notifies the day nurse that the IV access bandage was wet. On inspection, the nurse found that only the catheter hub was present, but the intravascular catheter was missing. An extensive search at bedside failed to locate the catheter. She immediately notified the admitting pediatrician about the situation and an x-ray of the left wrist and hand was ordered. The radiology report described a linear foreign body on the dorsal aspect of the wrist at the access site. Soft immobilization of the hand and wrist with a soft splint wrapped in bandage upon notification of the latter finding. That same night the mother notified progressive swelling and discomfort of the hand and the on-call nurse loosened the temporary dressing to provide relief.

The next morning a surgeon was consulted and a local exploration for urgent removal of the foreign body was recommended. Intraoperatively, an incision was made at the previous catheter site but after exploration, the foreign body was not found. Multiple x-ray views of the left arm, shoulder and chest were taken and did not

find/locate central migration. A computed tomography (CT) scan of the chest was done the next day but no foreign body was found at any thoracic structure (i.e. pulmonary artery or distally in the lung vasculature). Despite that the patient was completely asymptomatic and the latter studies were negative, the parents continued to have significant concerns about the possible complications of migration of the foreign body. At 6 months, the patient remained asymptomatic but the parents eventually sought and won litigation for the event.

DISCUSSION

Placement of a simple S-PVC is the most commonly performed procedure, as it is estimated that nearly 200 million peripheral intravenous catheters are placed yearly in the US alone [3]. Phlebitis, infiltration, occlusion, accidental dislodgment, and/or bacteremia represent the vast majority of complications of catheter failure in the setting of S-PVC [4, 5]. Intravascular migration of a fractured S-PVC to the thoracic vasculature is an extremely rare event, and to our knowledge, has only been described in one case report involving an adult [2]. For the latter, the complication resulted in clinical symptoms consistent with pulmonary embolization, which required an open thoracic intervention to remove the catheter. Moreover, once located it was found that the catheter was fractured, and the authors postulated that this mechanism of fragmentation was likely due to damage related to the insertion technique. This differed from our case which found that the entire intravascular catheter (i.e. proximal fracture) had dislodged from the hub. Therefore, fragmentation related to insertion technique was not considered to be the mechanism in this case. Instead, we postulate that weakness of the hub/catheter junction caused proximal fracturing, which may have been related to catheter damage due to excessive manipulation either at implantation or over the course of three days prior to the incident. In their report, Marsh et al suggest that more advanced securement techniques (i.e. bordered polyurethane dressings, BPU) with or without a device (i.e. sutureless securement) had reduced failure rates when compared to standard polyurethane dressing (i.e. SPU) [6].

Most reports of catheter embolization are in the setting of central venous catheters (CVC). In the largest review to date, proximal or distal catheter fracturing (i.e., away from the port chamber/hub and catheter interface) was found in 11.6% of all reported cases [1]. Thus, catheter fracture represents a relatively less common cause of migration, and one case study suggested that material fatigue may play a key role for this mechanism [7]. Moreover, guidewire/catheter kinking related to difficult angles to cannulate the subclavian vein (i.e. "pinch off" sign) and catheter damage during explantation or exchange represented the vast majority of cases that led to catheter fracture [1, 8]. Interestingly,

a meta-analysis of all cases (n = 215) of CVC migration up to 2009, found that the cause of catheter embolization was not reported or could not be identified in 19% of the cases [1].

Due to lack of data and rarity of PVC embolization, best points of care in the setting of catheter fracture can be extrapolated from cases related to CVC. Rapid identification and management is important because historical data shows that up to 75% of cases will manifest local and/or systemic signs/symptoms related to embolization and up to 1.8% rate of mortality [1]. Moreover, up to 25% of cases of catheter embolization will be asymptomatic [1]. In a review of exclusively pediatric patients with catheter embolization, the most common sites of migration included the pulmonary artery, superior vena cava, hepatic vein, and the innominate vein [9]. Thus, the first step if PVC fracture is suspected should be imaging of the access site, as well as, cross sectional imaging to evaluate for central thoracic migration. A CT with or without contrast should be considered to better delineate migration to thoracic vasculature. Treatment is primarily determined by location of migration, as a peripheral location can be removed locally by open technique and central migration is generally best treated by endovascular removal. Regardless, urgency of the procedure is critical because potential clinical complications include arrhythmias, septic emboli, pulmonary symptoms, and death [9].

In closing, we report a very rare case of suspected short-PVC proximal fracture. Although our case remained asymptomatic, extrapolated data from CVC fractures suggests that central embolization often is associated with complications. Good physician-patient communication is mainstay in this type of situation because this is associated with improved patient care outcomes and family satisfaction, particularly in the setting of an infant with an uncommon complication.

Conflicts of Interest

The authors have no conflicts of interest relevant to this article to disclose

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