CASE REPORT

Fracture of a Broviac catheter in a low-birth-weight infant

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Central venous catheters are widely used in children, particularly in very-low-birth-weight infants in whom long-term access to the venous system is required. This may be achieved by using peripherally inserted central catheters or tunnelled central venous lines (eg Broviac or Hickman lines). Previous case reports of fractured central catheters in premature neonates have involved peripherally inserted silastic catheters. Fractures and embolisation of Broviac central venous fragments have not been previously reported in preterm neonates. We describe a premature neonate with this rare complication along with the retrieval technique used.

Introduction

As more intensive and invasive treatments become available in neonatal intensive care units, the number of neonates requiring long-term central venous access has increased. This may be achieved by using in-dwelling vascular ports such as Hickman or Broviac lines, or silastic long lines inserted peripherally. Although these lines are generally safe and effective, complications caused by them include thrombus formation, infection, and fractured catheter fragments.[1] Broviac catheters are tunnelled central venous catheters and are usually surgically inserted. They may also be inserted percutaneously, requiring an introducer needle for insertion. Fractures of percutaneous intravascular central catheters (PICCs) in low-birth-weight infants have been reported.[2-4] We report here the first case of a Broviac catheter fracture and the successful percutaneous retrieval of an intracardiac catheter fragment in a low-birth-weight infant.

Case report

A 405-g female infant was delivered at 25 weeks' gestation to manage severe maternal pre-eclampsia in September 2005. She required prolonged ventilatory support for respiratory distress syndrome and chronic lung disease. Multiple PICCs and peripheral intravenous catheters were inserted for venous access and prolonged parenteral nutrition during her first 144 days of life. After multiple failed attempts to insert PICCs and peripheral catheters, a central venous catheter (Broviac 2.7-Fr single lumen CV catheter) was inserted surgically on her 145th day of life, via the right saphenous vein, to enable administration of parenteral nutrition. The catheter tip was placed in the inferior vena cava (Fig 1a). On her 175th day of life, when she had reached a weight of 2300 g, the catheter was found to be occluded. Over the next 24 hours, multiple attempts to flush it with a heparinised solution using 3-mL syringes were made. The occlusion resolved after flushing with no symptoms noted after the procedure. Two days later, a chest X-ray showed a catheter fracture in the right iliac vein (Fig 1b). The fractured catheter, measuring approximately 9 cm in length,

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Catheterization, central venous; Equipment failure; Infant, low birth weight

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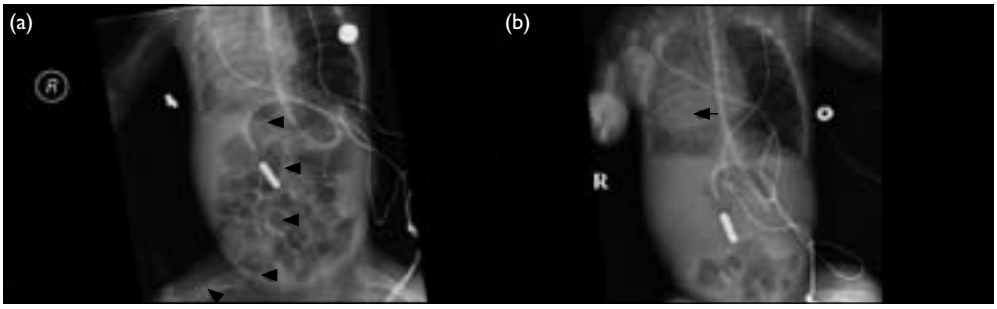

FIG 1. (a) Anterior-posterior radiogram showing an intact Broviac catheter (arrowheads) in the right femoral vein. (b) Anterior-posterior radiogram showing a Broviac catheter fragment (arrow) embolised to the right atrium and a portion of the catheter in the right internal iliac vein and inferior vena cava is not seen

一宗發生於極低體重嬰兒體內的布魯維克導管破裂

中心靜脈導管普遍用於小兒身上，尤其是在一些需要長期接駁至靜脈系統的極低體重嬰兒身上。方法是經周圍靜脈插入中心靜脈導管，或者隧道中心靜脈導管（如布魯維克導管或希克曼導管）。文獻中有報導關於使用周圍靜脈插入硅導管在早產嬰兒內，引致中心導管破裂的個案，卻沒有關於早產嬰兒內布魯維克中心靜脈導管的破裂及栓塞。本文報告這宗罕見案例，並討論有關的修復技術。

had embolised to the right atrium (Fig 2). The patient was transferred to a regional paediatric cardiac centre for removal of the embolised catheter. Within 48 hours of its discovery, the fragmented catheter was removed without complications, via the left femoral vein through a 4-French sheath with a 5-mm Microvena Amplatz gooseneck snare device. There were no complications (eg femoral vein thrombosis, bleeding, and prolonged radiation exposure) during and after the procedure. A postoperative echocardiogram showed no thrombus in the right atrium and ventricle.

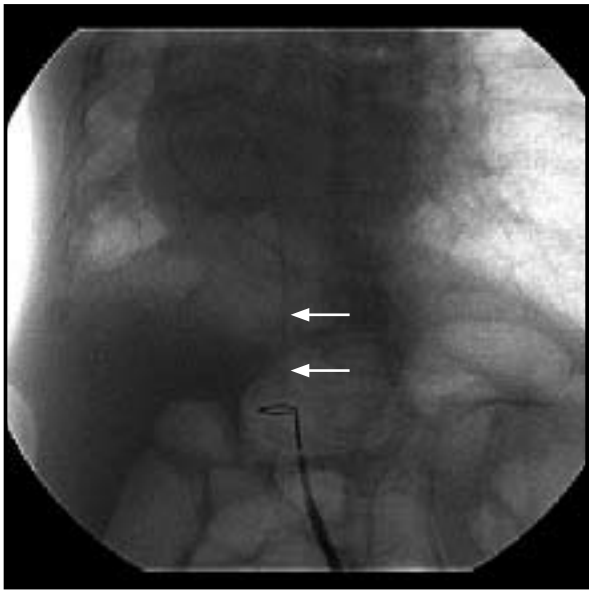

FIG 2. Anterior-posterior radiogram showing embolised Broviac catheter (arrows) being caught by a 4-French, 5-mm Microvena Amplatz gooseneck snare

Discussion

Central and PICC lines are being used increasingly for reliable intravascular access in small infants. Central venous catheter fractures are rare, but constitute a serious complication of their use. These occur more commonly in catheters inserted peripherally.[5,6] Factors predisposing central and PICC to breakage are related to the characteristics of the catheter, the insertion, the removal technique, and the clinical problems for which they are used. Silicone catheters are prone to fracture at or near the entrance site, where the calibre of the line narrows.[3] Catheter damage may be caused by the introducer needle in PICC lines.[7] The injection of a small amount of radiopaque contrast at the time of line placement may be useful, not only for determining the location of the catheter tip, but also for giving an early indication of whether there has been introducer needle-associated damage to the catheter at the time of placement. Weakening of the catheter may also result from being incorrectly placed where it may be affected by the tricuspid valve and right ventricular movements.[8] The catheter may rupture in the axilla due to repeated stress on the same point, caused by flexion and extension of the axilla.[1] There have been reports of central venous catheter fractures at the point of entry into the subclavian vein related to repeated compressions of the catheter between the clavicle, first rib, and costoclavicular ligament.[9] High-pressure infusion is considered the probable cause of rupture in patients with prior histories of catheter blockage. It is possible that in attempts to flush the line when it is blocked, caregivers may be using pressures above that recommended by the manufacturer. This may be caused by using small syringes of 5 mL or less, or by applying vigorous force to the syringe.[10]

The risks of leaving catheter fragments in the patient include pulmonary embolism, sepsis, arrhythmias, and cardiac perforation.[11] Although some patients may be completely asymptomatic, the risk of complications is considerable.[10] In view of this, an attempt should be made to remove the broken catheter. Patients with extremely low birth weight may have underlying conditions such as severe bronchopulmonary dysplasia, making them poor candidates for surgical retrieval. In a literature review, we found reports of five successful cases of percutaneous retrieval of intracardiac catheter fragments in premature infants.[2,4,12] All were silastic catheters peripherally inserted (PICC). The retrieval devices used were a helical basket catheter (High Flex Basket 3wire-2, 5F-90cm, Art. No. 42240070) and an Amplatz gooseneck snare (3F). The femoral vein was the site of entry in three reported cases; the umbilical vein was used in one.

In our case the catheter was a Broviac catheter inserted using a cut down. There was no possibility of introducer needle-associated damage to the catheter as reported in the five previous cases. There was a history of catheter blockage. The ruptured catheter was noted very soon after successful relief of the blockage. We therefore consider the fracture to be caused by the high-pressure infusion. The retrieval

device used was a 4-French, 5-mm Amplatz gooseneck snare as used in previous reported cases.[1,3,8,9,13] When catheter embolisation occurs, prompt retrieval using an intravascular approach is possible in infants. Although technically challenging, our case added to the list of successful retrievals of the fragments using the gooseneck snare technique.

In conclusion, we report the first case of a Broviac catheter fracture in a low-birth-weight infant, managed successfully by percutaneous retrieval. It is possible that excessive pressure generated by using a small syringe (≤5 mL) when attempting to relieve a blockage resulted in the catheter fracture. Radiographs should be taken when a catheter blockage is relieved suddenly. We want to make our colleagues aware of this complication, the possible causes of fracture of this type of catheter, and the available method of retrieval.

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