Perinatal/Neonatal Case Presentation

Peripherally Inserted Central Catheter Using the Saphenous Vein: Importance of Two-View Radiographs to Determine the Tip Location

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Two cases are described in which a peripherally inserted central catheter tip in the saphenous vein appeared to be in the inferior vena cava by an anteroposterior abdominal radiograph, but a lateral view revealed the catheter tip to be outside the inferior vena cava. The actual location of the catheter tip placement may be misleading with a single radiograph. Two-view radiographs should be considered to assure the proper catheter tip placement.
Journal of Perinatology (2005) **25,** 674–676. doi:10.1038/sj.jp.7211363

INTRODUCTION

Peripherally inserted central catheters (PICC) are widely used in the care of preterm and critically ill neonates. PICCs provide central venous access for fluids, medications and concentrated nutritional solutions. A number of complications are associated with migration of the catheter tip into collateral vessels or perforating the central vein.[1–3] Extravasated fluid resulting from catheter tip migration can accumulate in the pleural or pericardial space through an upper extremity catheter, or in the subarachnoid space, renal pelvis, peritoneal cavity, retroperitoneal space or the abdominal wall through a lower extremity catheter.[4] Therefore, care must be taken to place the catheter tip in a satisfactory position before the catheter is used. Radiography using contrast clearly demonstrates the position of the catheter, but the exact location of the catheter tip may be difficult to determine even with contrast.[5] We discuss two cases of unusual catheter tip location by radiography that appeared to be in the inferior vena cava (IVC) by a single, anteroposterior view. However, a lateral view identified the tip to be outside the IVC.

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CLINICAL PRESENTATION

Patient 1

This infant was delivered at 26 weeks with a birth weight of 1122 g. On the 4th day of life, a polyurethane PICC line (L-cath, Luther Medical Products, Tustin, CA, 24 gauge, 22 cm length) was placed in the right saphenous vein. The catheter was advanced to the premeasured length. On the anteroposterior view, the PICC appeared to be in the lower IVC (Figure 1a). However, the lateral view showed the PICC running along the anterior abdominal wall, possibly in the interior epigastric vein (Figure 1b). Contrast was not used since the line was radiopaque. Since there was excellent blood flow, the line was left in place but removed 2 days later after it infiltrated. Parenteral nutrition containing an 11% dextrose and 20% intralipid solution was infusing through the line at the time of infiltration. There was no sequela resulting from the infiltrate and the infant had an uneventful recovery.

Patient 2

This infant was delivered at 30 weeks with a birth weight of 1555 g. A polyurethane PICC line (Vygon catheter, Vygon Corporation, East Rutherford, NJ, 23 gauge, 25 cm length) was inserted into the left saphenous vein on the 2nd day of life. Iohexol 3020 mg I/ml (Omnipaque 180, Amersham Health, Princeton, NJ) was the contrast used during the radiograph to confirm adequate catheter placement. After 8 days, this infant began to have increased apneic episodes. A lumbar puncture was carried out as part of a septic work-up. The cerebral spinal fluid was described as milky white and blood tinged. Parenteral nutrition containing a 15% dextrose and 20% intralipid solution was infusing through the line at the time of the radiography study. Abdominal radiographs were carried out to identify the catheter tip location because the fluid was suspected to be intralipid. The catheter tip appeared to be in the IVC by the anteroposterior abdominal film (Figure 2a) but a lateral view showed the tip to be directed posterior to the IVC (Figure 2b). Contrast was injected into the PICC and the ascending lumbar vein and epidural space were highlighted (Figure 2c). The line was removed 3 days later when the spinal fluid subsequently grew a coagulase-negative Staphlococcal organism. The infant was treated with two weeks of vancomycin. After antibiotic treatment was initiated, the follow-up spinal fluid culture was negative. The infant had an uneventful recovery.

Journal of Perinatology 2005; 25:674–676

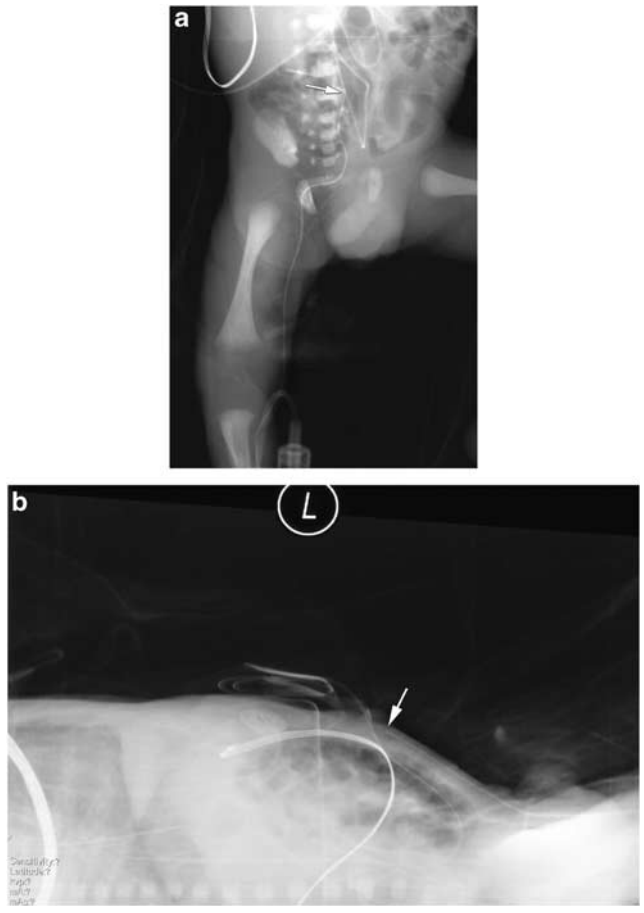

Figure 1. (**a**) Anteroposterior radiograph of the abdomen. The arrow is pointing to the tip of the PICC at L5. (**b**) Lateral radiograph. The arrow is pointing to the tip of the PICC.

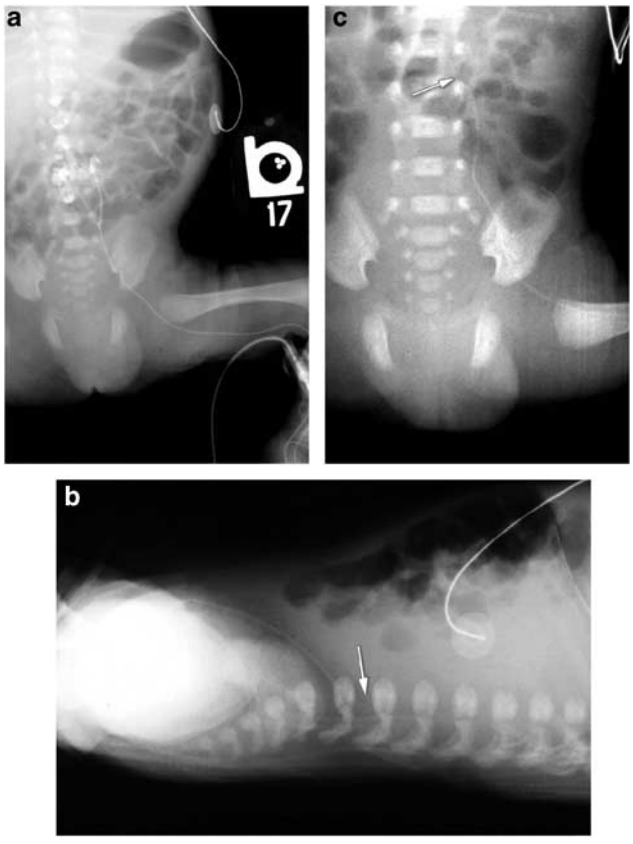

Figure 2. (**a**) Anteroposterior radiograph of the abdomen. The arrow is pointing to the tip of the PICC at L3. Note the legs are flexed. (**b**) Lateral radiograph. The arrow is pointing to the tip of the PICC at the L4 vertebral body. Note the legs are extended. (**c**) Anteroposterior radiograph of the abdomen. The PICC tip is located in the ascending lumbar vein. Contrast is highlighting the epidural space.

DISCUSSION

We report two cases where the tip of a PICC introduced in the saphenous vein appeared to be properly located in the IVC on an anteroposterior radiograph, but the lateral radiograph identified the catheter tip to be outside the IVC. In the first case, the catheter was inserted into a superficial abdominal vein anterior to the IVC and subsequently infiltrated. Baker and Imong[6] has previously described a similar catheter placement which resulted in abdominal wall cellulitis. In the second case, the catheter was inserted posterior to the IVC and was infusing into the epidural space resulting in meningitis. Inadvertent placement or migration of a PICC tip in the ascending lumbar or intervertebral vein has been previously described.[3,6,7] Ohki et al.[1] has recommended placing the catheter tip above L3 because the ascending lumbar vein usually joins the common iliac vein around L5 or S1. In both described cases, the catheter tip was assumed to be in the IVC since the line appeared to be near mid-line. The tip location was only found to be outside the IVC following further evaluation with a lateral radiograph.

PICCs have become the standard in the care of high-risk neonates. Proper placement of a PICC via the saphenous vein in the IVC may be misleading with a single anteroposterior radiograph. Two views would assure the initial catheter tip placement was not outside the IVC. We caution that despite initial documentation of appropriate catheter tip location within the IVC, subsequent migration of the catheter tip may still occur.[4] Frequent catheter tip monitoring may be required to reduce the risk of complications.

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