

## Unanticipated complication of a malpositioned central venous catheter

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### Abstract

We report an unusual complication that occurred late in the postoperative period, due to a damaged and malpositioned peripherally inserted central catheter (PICC) used for central venous pressure monitoring during esophagocoloplasty and for postoperative parenteral nutrition. On the seventh postoperative day, the development of a leak from the neck wound coincided with the administration of intravenous fluids via the PICC. The leak had occurred as a result of slow erosion of the left internal jugular vein (IJV) by the damaged edges of the catheter.

**Key words** Peripherally inserted central catheter · Complications

### Introduction

The approach to central veins via a peripherally inserted central catheter (PICC) is more popular than the direct puncture of the central vein, because with a PICC, there is only a remote possibility of mechanical complications such as arterial puncture and pneumothorax. In addition, the rate of bloodstream infections is significantly lower compared with the rate seen with central venous catheters [1]. Embolism from a fractured fragment is more commonly reported than erosion of a vessel wall [2]. Erosion is likely to result from the frequent movement of the fractured tip of a catheter against the vessel wall.

### Case report

A 17-year-old girl, 150 cm in height and weighing 35 kg, was admitted for the treatment of esophageal stricture due to alkali ingestion 2 years previously. Barium studies and esophagoscopy revealed obstruction in the esophagus at a distance of 22 cm from the incisors. An uneventful feeding jejunostomy had been performed under general anesthesia 6 months previously for complaints of progressive dysphagia. She was now scheduled for midcolon esophagocoloplasty. Preanesthetic evaluation revealed a poorly nourished girl with good exercise tolerance and normal vital parameters (heart rate, 84 beats·min<sup>-1</sup>; blood pressure (BP), 140/20 mmHg; respiratory rate, 18 breaths·min<sup>-1</sup>), but carotid pulsations were prominent and early diastolic murmur of grade 3/6 could be heard in the aortic area. Echocardiography demonstrated severe aortic regurgitation, with normal left ventricular dimensions and systolic and diastolic functions.

Because she was asymptomatic, a decision was taken to operate for the esophageal stricture first, with 6-monthly follow up to assess the need for aortic valve replacement after her nutritional status and general condition had improved. A PICC (18-G, 70-cm-long Cavafix Certo 275 catheter; B. Braun, Melsungen, Germany) was passed through the right antecubital vein, at the first attempt without any resistance, and fixed at a length of 50 cm for the intraoperative monitoring of central venous pressure before induction of anesthesia. Invasive BP (20-gauge left radial artery cannula), ECG, peripheral oxygen saturation (SpO<sub>2</sub>), respiratory gas analysis, end-tidal carbon dioxide, nasopharyngeal temperature, and urine output were continuously monitored. An epidural catheter was used for providing intraoperative and postoperative analgesia in combination with general anesthesia. A side-to-side anastomosis was done between the ascending colon and the cervical esophagus after excising the terminal ileum

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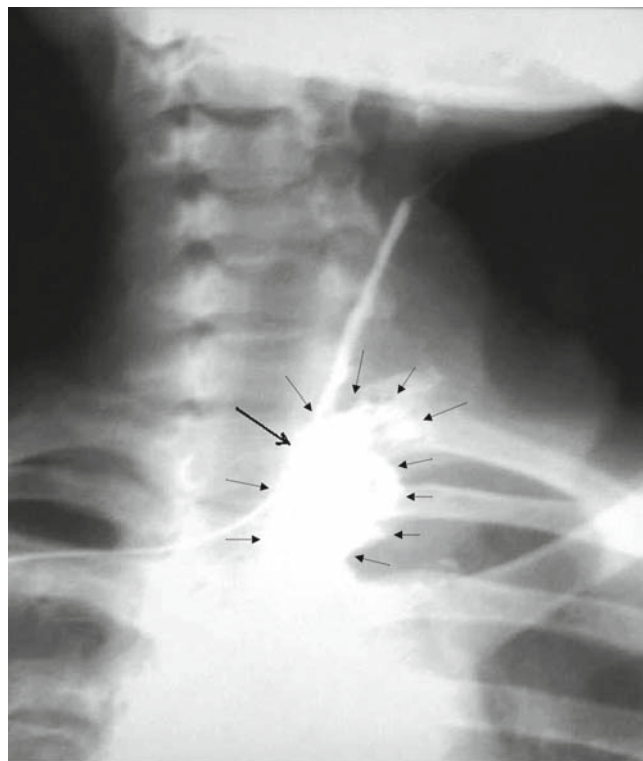
and the cecum; the descending colon was anastomosed end-to-side with the stomach; an ileosigmoid anastomosis was done to complete the procedure. The entire intraoperative period was uneventful and the hemodynamic status was stable throughout the procedure.

A chest X-ray was done immediately after the completion of surgery to rule out any possibility of pneumothorax, because the colon was mobilized to the neck through the chest. Unfortunately, the picture was hyperlucent and the tip or the course of the PICC was not visible on the chest radiograph. Because the patient had received repeated radiation exposures previously it was decided to do a repeat neck X-ray a day later to confirm the appropriate position of the central venous catheter. A radiograph of the chest done on the second postoperative day revealed the PICC tip positioned in the left internal jugular vein (IJV). Catheter-related sepsis can be a major concern with parenteral nutrition. Because the PICC was to be used only for parenteral nutrition, its repositioning was deferred considering the risk of contamination following its withdrawal and reinsertion. Removal was not considered, as other peripheral veins were small, tortuous, and thrombosed following their use for parenteral nutrition during preparation for surgery.

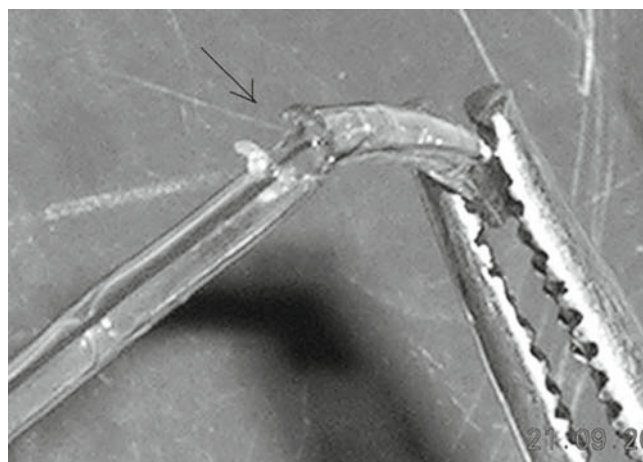
Intermittent leakage of clear fluid from the neck wound started occurring on the seventh postoperative day, causing concern of an anastomotic leak. Barium studies confirmed that the anastomosis was intact. On close scrutiny the leak was seen to be associated with the administration of intravenous fluids through the PICC. An angiogram through the PICC revealed the extravasation of contrast medium from the left IJV located 5 cm proximally from the tip of the catheter (Fig. 1). The leak stopped once the PICC was removed, and the damaged portion of the PICC could be seen, with irregular sharp edges 5 cm from its tip (Fig. 2). Removal of the PICC was smooth and free. There was no sign of suture material or any portion of the vessel wall adhering to the torn edges.

## Discussion

The radiographic incidence of central venous catheter malpositioning is low and the clinical use of malpositioned catheters is associated with few complications. However, determination of the catheter position by chest X-ray should be considered when mechanical complications cannot be excluded, aspiration of venous blood is not possible, or the catheter is intended for central venous pressure monitoring, high-flow use, or the infusion of local irritant drugs [3]. In our patient, the PICC was seen very close to the anastomosis in the left



**Fig. 1.** Angiogram showing peripherally inserted central catheter (PICC) from the right antecubital vein malpositioned in the left internal jugular vein (IJV) with contrast medium leaking out of the injured site at the level of the left IJV. The extravasated contrast medium from the left IJV is marked with *arrows*



**Fig. 2.** Removal of the PICC shows the site of damage, with sharp ragged edges, 5 cm proximal to its tip (*arrow*)

cervical region, but when the malpositioned tip was recognized there was no evidence of vascular erosion or fluid extravasation near the site. Such a malpositioned catheter should either be repositioned or reinserted, whereas our team (anesthetists and surgeons) decided

to leave the catheter undisturbed. The option of repositioning was decided against because the catheter tip could have become repositioned yet again at the same site, with the additional risk of contamination. It would have been more hazardous to remove and reinsert the catheter and place it near the anastomotic site again. On the other hand, PICC removal was deferred because the veins on the other side were small, tortuous, and difficult to visualize. The femoral vein was not considered to be a good option for delivering parenteral nutrition. The right IJV was not attempted as the area was still under the surgical dressing around the neck for the wound, while the right subclavian vein had already been used for parenteral nutrition earlier during admission. Long-lasting high fluid flow transfusion in the opposite direction of the blood flow is not advisable; however, if the flow rate is very slow, as is the case with the delivery of parenteral nutrients, the effects are likely to be minimized to a great extent.

Recognized complications of PICCs include thrombosis, infection, catheter occlusion, phlebitis, chronic venous insufficiency, and pulmonary embolus. PICCs cannot always be advanced to a central location for a number of reasons, including venospasm, venous tortuosity, and venous valves [4,5]. In such situations it is difficult to negotiate the elastic resistance owing to the long length of catheter that needs to be inserted from a peripheral site. Occasionally the catheter tip can get lodged in a small collateral vessel and it then becomes difficult to advance the catheter further.

Resistance to passage is most commonly encountered when the catheter tip is caught in a venous valve or becomes lodged in a small collateral vessel. In such situations continuous pressure to advance the PICC can result in kinking of the tip, and subsequent injections through the kinked or blocked catheter to flush the line might result in raised intraluminal pressure and wall disruption. However, the other most likely cause of catheter damage in our patient seems to have been the passage of the needle carrying the surgical suture through the wall of the malpositioned PICC (left IJV) during the side-to-side anastomosis between the ascending colon and the cervical esophagus in the neck region. Injury to the IJV wall is also likely to have occurred if the surgeon had damaged the catheter

within its lumen; however, in the angiography performed postoperatively the lumen of the IJV appeared complete, without any compromise, so it is unlikely the surgeon would have taken a suture through the vein. It is possible that the needle went through the vein and when oozing was noticed the needle was withdrawn without taking a stitch and the ooze was controlled by compression. The needle was likely to have pierced or grazed across the wall of the PICC while taking a suture bite, as the surgical procedure was being done adjacently. Consequently, the disrupted edges of the PICC slowly eroded the left IJV aided by the bounding carotid pulsations due to aortic regurgitation, resulting in leak from the surgical wound that, incidentally, was in close proximity to the eroded site. Nevertheless, preexisting damage due to a manufacturing defect should also be ruled out in PICCs that are enclosed in a sterile catheter sheath cover and a catheter brake. The opaque coverings make the proximal part inaccessible to inspection during insertion. Fracture of an indwelling PICC has been reported to be a late complication related to the duration of placement and line complications (blockage of the line or leaking from the insertion site) predisposing to the risk of embolization [2]. We therefore conclude that it is reasonable to list PICC disruption as a rare but potentially serious complication of this device that can lead to vascular erosion.

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