Displacement of a peripherally inserted central catheter after injection of contrast media

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DESCRIPTION

A peripherally inserted central catheter (PICC) was inserted through the right basilic vein and placed within the superior vena cava of a patient for fluid and medication administration during postoperative management of bladder cancer.

Following the development of sepsis, contrast-enhanced CT was performed to detect infectious foci. The tip of the PICC appeared displaced into the internal jugular vein in the early phase and was placed on the superior vena cava in the delayed phase (figure 1). In the second CT scan performed 2 days later, the tip of the PICC had moved again in the early phase, resulting in it being placed on the superior vena cava in the delayed phase (figure 2). The rates of contrast injection for the first and second CT scans were 4.1 mL/s and 4.7 mL/s, respectively.

The power PICC is approved by the US Food and Drug Administration for power injection of contrast medium in adults and children. However, migrating PICC lines following power injection of contrast media has been reported at an estimated rate of 8.2%–15.4%.^{1,2}

Based on our experience, we present some suggestions for using power PICC as the preferred injection line of contrast media. First, we need to consider the flow rate of the contrast media. Newton's third law of motion states that when one object exerts a force on a second object, the second object exerts a force that is equal in magnitude and opposite in direction on the first object. The movement of

Figure 1 Images from the first CT and chest radiography. (A) Early phase: the tip of the PICC is moving in the superior vena cava. The black arrow indicates that the PICC is undulating in the superior vena cava. (B) Delayed phase: the tip of the PICC is placed on the internal jugular vein. (C) Chest radiography after the CT image: the tip of the PICC is placed on the internal jugular vein. The black triangles indicate the position of the PICC. The black circle indicates that the PICC is directed into the right internal jugular vein. The white arrows indicate the position of the FDL catheter inserted through the left internal jugular vein and placed in the superior vena cava as vascular access for CRRT. PICC, peripherally inserted central catheters; FDL, flexible double lumen; CRRT, continuous renal replacement therapy.

Figure 2 Images from the second CT and chest radiography. (A) Early phase: the tip of the PICC has moved into the superior vena cava. (B) Delayed phase: the tip of the PICC is placed on the superior vena cava. (C) Chest radiography after CT imaging: the tip of the PICC is placed on the superior vena cava with a loop at the beginning of the internal jugular vein. The black triangles indicate the position of the PICC. The black circle indicates that the PICC forms a loop at the beginning of the internal jugular vein. The white arrows indicate the position of the FDL catheter inserted through the left internal jugular vein and placed in the superior vena cava as vascular access for CRRT. PICC, peripherally inserted central catheters; FDL, flexible double lumen; CRRT, continuous renal replacement therapy.

the PICC at the opposite site can be minimised to reduce the energy on the tip of the PICC from the injection of contrast. Second, warm contrast media should be used. Poiseuille's law shows that the flow rate through a tubular structure is directly affected by the length and diameter of the catheter, medium viscosity and injection rate. Warm contrast medium could reduce resistance through the PICC because viscosity is inversely proportional to temperature. Third, we need to place the tip of the PICC in a slightly deeper position within the superior vena

Patient's perspective

We are very pleased with all the kindness and care we received in the hospital. In the end, we hope that doctors all over the world have learned something from my father's case.

Learning points

- ▶ The peripherally inserted central catheter (PICC) line can be used as the injection site of contrast media during CT studies. Patients are more comfortable because an additional peripheral venous route is not required.
- ▶ We should be careful when identifying the location of the tip of the PICC following the injection of contrast media.

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Images in...

cava: zone A, the lower half of the superior vena cava, and the upper right atrium. This could prevent the tip of the PICC from becoming misplaced after the injection of contrast media, although the tip still moves slightly within a vessel. Fourth, we need to check the position of the tip of the PICC after injection. If necessary, interventions such as removal or replacement of the catheter may be required because of malpositioning of the catheter tip.

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