

# Upper extremity deep vein thrombosis after migration of peripherally inserted central catheter (PICC)

## A case report

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### Abstract

**Introduction:** Peripherally inserted central venous catheters (PICC) are widely used in cancer patients and ultrasound-guided PICC insertion could improve success rate. The tip position of the catheter should be located at the border of lower one-third of the superior vena cava (SVC) and cavo-atrial junction. The migration is malposition at the late stage after PICCs were inserted, and catheter malposition was associated with thrombosis and other complications.

After patient's informed consent, we report a case of a 66-year-old male with twice catheter migrations resulting in thrombosis after being diagnosed with cardiac cancer.

**Conclusion:** The correct position of the catheter tip can ensure the normal use of PICC and reduce the complications. For the migrated catheter, it should be removed as soon as possible, and when thrombosis has been developed, standard anticoagulant therapy should be given.

**Abbreviations:** DVT = deep vein thrombosis, PICC = peripherally inserted central venous catheter, SVC = superior vena cava.

**Keywords:** deep vein thrombosis, migration, peripherally inserted central venous catheter

## 1. Introduction

Peripherally inserted central catheter (PICC) is widely used in cancer patients for chemotherapy.<sup>[1–3]</sup> The tip position of the catheter should be located at the border of lower one-third of the superior vena cava (SVC) and cavo-atrial junction. The migration is malposition at the late stage after PICCs were inserted, and catheter malposition was associated with thrombosis and other complications.<sup>[2,4,5]</sup> In this case, we report a patient with twice catheter migrations resulting in thrombosis.

## 2. Case presentation

A 66-year-old male with primary cardiac cancer with pulmonary metastasis was admitted to oncology ward for chemotherapy. PICC was successfully inserted with ultrasound guidance on the basilic vein of the left upper arm on November 14, 2016, and the

x-ray film showed that the catheter tip was positioned at the lower one-third of SVC (Fig. 1). After 3 days, patient was discharged from the hospital, and came back for catheter care as outpatient once a week. Patient was readmitted for chemotherapy after 2 weeks, and the usage of PICC was normal.

On December 19, 2016, the nurse found the infusion speed was normal when the patient was in supine position, but in a semi recumbent position, the infusion speed was slow. While adjusting the position back to the supine position, infusion rate became normal. Therefore, catheter malposition was suspected, and the new x-ray film showed that the catheter migrated to internal jugular vein and folded back to the jugular vein, and the catheter tip positioned in the left brachiocephalic vein (Fig. 1). There was neither swelling nor pain on upper limb, and the arm circumference was same as before the catheterization while evaluating the left upper arm limbs. The color ultrasound result showed thrombosis was developed in the internal jugular vein, subclavian vein, axillary vein, and around the PICC in left upper arm. Then, routine anticoagulation therapy was given.<sup>[6,7]</sup>

On December 23, 2016, patient was allergic to the PICC dressing. Because the catheter could not be removed during the treatment of anticoagulation, continuous gauze dressing change was given. After 2 weeks of anticoagulation, the allergy was not improved, and fever was presented. Catheter-related infection<sup>[8,9]</sup> was suspected, so the catheter was removed completely without discomfort.

Due to chemotherapy need, patient was secondly inserted with PICC under the guidance of ultrasound on the basilic vein of the right upper arm on January 18, 2017, and x-ray film showed that the catheter tip was positioned at the lower one-third of SVC and cavo-atrial junction (Fig. 2). There was no discomfort during the infusion process. Patient was readmitted for chemotherapy on February 5, 2017, and complained of headache after chemother-

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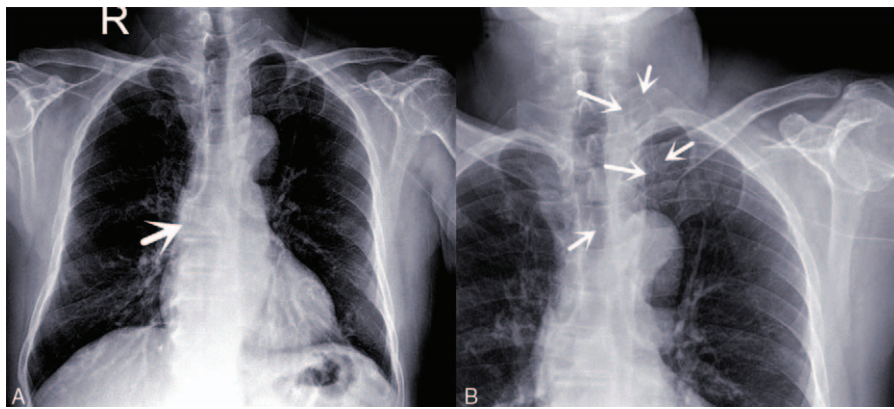
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**Figure 1.** (A) Chest x-ray demonstrating PICC tip located in lower one-third of superior vena cava (white arrow). (B) Chest x-ray demonstrating PICC migration and tip located in left brachiocephalic vein (white arrows). PICC = peripherally inserted central venous catheter.

apy. The x-ray showed that the catheter tip migrated to the right internal jugular veins again (Fig. 2), and the color ultrasound result showed no thrombosis was found. Catheter was removed successfully, and portacath was recommended to the patient.

### 3. Discussion

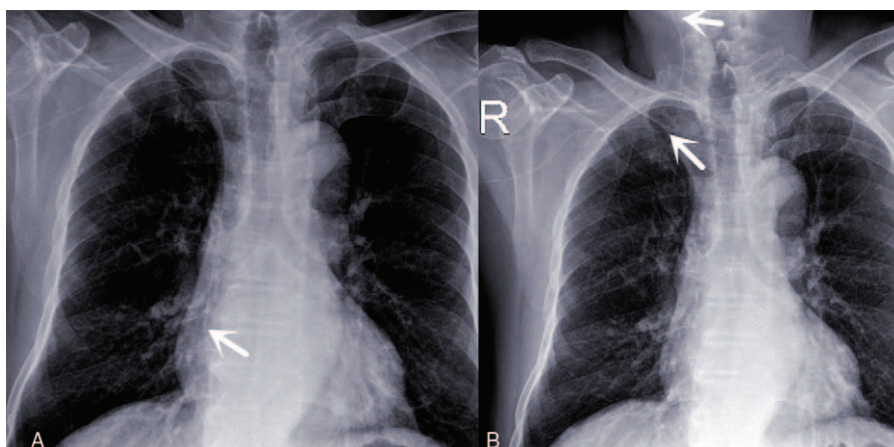
PICCs are widely used in cancer patients and catheter migration is one of the uncommon complications.<sup>[3]</sup> Catheter migration usually occurs in a few days or months after catheterization, accompanied with catheter plugging, changing in drip speed, swelling on catheterized arm or neck pain and headache after infusion, and it was diagnosed by x-ray.<sup>[4]</sup> It is also associated with changing in intrathoracic pressure, occurrence of congestive heart failure, activity of upper limb or neck, positive pressure ventilation, high pressure injection, or catheter care technique.

The first catheter migration was found by changing in infusion speed associated with the change of body position. The second catheter migration was found by headache complained by patient himself. He also complained of severe gastrointestinal reaction, frequently nausea, vomiting, and sneezes after chemotherapy. These all could cause the change of intrathoracic pressure. The lumen of SVC is wide, and its flow speed is fast. However, PICC is light and soft, which is floating in the vessel. The entrance of SVC

is located at strong counterforce between the left brachiocephalic vein wall and the vortical flow. When the patient coughed and vomited, it would cause strong contraction in diaphragm, abdominal and chest wall muscle. The volume and pressure of thoracic cavity were altered along with changing of central venous pressure and blood flow. Repeated altered blood flow also increased the probability of catheter migration.

Catheter malposition is a major risk factor for PICC related venous thrombosis.<sup>[2,5]</sup> Development of internal jugular vein thrombosis is related to the migration of catheter into jugular vein. After PICC migrates to the internal jugular vein, because the direction of liquid medicine flow from catheter is opposite to venous return, and the medicine stays too long in partial vein will damage the intima and exposure vascular endothelial, platelet aggregation results in thrombosis. When the catheter tip migrates to the vein outside the SVC, due to diameter of other vascular lumen is smaller and it has less blood flow, the hemodynamics will be slow, the contact time of hypertonic liquid or chemotherapeutic drugs with intima extends, blood vessel wall damages, eventually leading to thrombosis.

In conclusion, the correct position of the catheter tip can ensure the normal use of PICC and reduce the complications. In clinical practice, we should pay more attention to the condition of PICC usage and listen to the patient's complaint carefully. For the



**Figure 2.** (A) Chest x-ray demonstrating PICC tip located in lower one-third of superior vena cava and cavo-atrial junction (white arrow). (B) Chest x-ray demonstrating catheter tip migrated to the right internal jugular vein (white arrows). PICC = peripherally inserted central venous catheter.

migrated catheter, it should be removed as soon as possible, and when thrombosis has been developed, standard anticoagulant therapy should be given.

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