CASE REPORT

Asymptomatic paradoxical and symptomatic pulmonary air embolism during central venous catheter insertion

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Abstract A 65-year-old man developed respiratory distress during insertion of a central venous catheter (CVC). The presence of gas in the pulmonary trunk and ascending aorta was observed on computed tomography (CT) scans performed immediately after insertion, and paradoxical air embolism (PAE) was diagnosed. There were no symptoms of cerebral or coronary arterial embolism, and the patient was maintained in the same supine position as during CVC insertion. CT conducted after 200 min confirmed disappearance of the gas, and the resting position was discontinued. No subsequent symptoms of PAE occurred. In this patient with respiratory distress during CVC insertion, CT revealed PAE, and PAE was resolved and systemic arterial embolism did not occur by maintenance of the supine position and O₂ administration. This case also highlights the potential risk for the occurrence of asymptomatic PAE related to CVC insertion.

Key words Paradoxical embolism · Air embolism · Central venous catheter · Complication

Introduction

Paradoxical air embolism (PAE) is a complication reported to occur during the insertion, maintenance, disconnection, or removal of a central venous catheter (CVC).1–3 Most of these reports are of CVC-related PAE and describe symptoms of cerebral or coronary arterial embolism; reports of CVC-related PAE without symptoms of systemic arterial embolism are rare, however, and the diagnosis is more elusive.2 A report of echocardiographic monitoring during neurosurgery in the sitting position showed that 14% of patients had asymptomatic PAE, which may be a cause of subsequent cerebral or coronary arterial embolism.4

We herein report a case of PAE with observation of gas in the pulmonary artery and ascending aorta on chest computed tomography (CT) performed because of the development of respiratory distress during CVC insertion.

Case report

A 65-year-old man presented with right-sided organized pneumonia and spontaneous pneumothorax. Upon hospitalization, a pleural cavity drain was inserted, and further evaluation revealed stage IV esophageal carcinoma. The patient was transferred to our hospital for irradiation and chemotherapy.

The CVC insertion (9.6F Hickman catheter, single lumen; Bard, Salt Lake City, UT, USA) was conducted in the interventional radiology suite. Preoperatively, the patient had a performance status of 3, a percutaneous SpO₂ of 92% on room air, and no hepatic, renal, or clotting abnormalities. He was lucid, and his blood pressure was 135/102 mmHg. The pleural cavity drain had been clamped. The procedure was performed using an IVR-CT system (AXIOM Artis dTA and SOMATOM Sensation 16; Siemens, Erlangen, Germany). The patient
was placed in a supine position, and the electrocardiogram (ECG), percutaneous SpO₂, and blood pressure were monitored during the procedure.

Under echo guidance, a 20-gauge intravenous needle (Medikit, Miyazaki, Japan) was inserted into the right internal jugular vein. After confirming insertion of the tip into the vein, the inner needle was removed, and the catheter was occluded with a finger to prevent introduction of air. After a syringe was connected to confirm that blood could be aspirated from the catheter and a 0.025-inch J-tip wire (Medikit) was subsequently inserted, the finger occluding the catheter was removed, leaving the catheter open for around 3 s. A 4F 11 cm long angiosheath (Medikit) was inserted over the wire. At this time, the SpO₂ decreased to 90%. A 0.038-inch wire (Bard) was inserted through the 4F angiosheath, and the angiosheath was then replaced with a 10.5F peel-off sheath (Bard). The peel-off sheath dilator and wire were removed simultaneously, the catheter passing through a subcutaneous tunnel was inserted into the sheath, and the peel-off sheath was then peeled away. As far as possible the sheath was occluded with a finger to prevent any opening, but from removal of the dilator and wire until occlusion with the finger and when the finger was removed to insert the catheter into the sheath, the sheath was open for around 2–3 s. At this point, the patient exhibited coughing and dyspnea, and the SpO₂ decreased to 80%. Administration of 100% oxygen was started, and the SpO₂ increased to 97%; at this point the dyspnea was alleviated.

After catheter insertion was completed, plain chest CT was performed to evaluate the cause of the respiratory distress. Because an interventional radiology (IVR) CT system was used, scans could be performed without changing the patient’s position (Fig. 1). Gas was seen to be present in the pulmonary trunk and ascending aorta, and PAE was diagnosed. The time elapsed between 4F angiosheath insertion and CT scanning was 10 min. Fortunately, there were no symptoms of cerebral or coronary arterial embolism. A small amount of gas was observed in the ascending aorta, but no air was seen in the left atrium or left ventricle. Therefore, we decided to wait for vascular absorption of the air, without changing the patient’s position, and then perform a follow-up CT scan.

Additional CT scans were performed 30, 90, and 200 min after 4F angiosheath insertion (Fig. 1). At 30 min the gas in the pulmonary trunk had disappeared. At 200 min the gas in the aorta had disappeared, the resting position was discontinued, and the procedure was completed. After administration of 100% oxygen, the SpO₂ was maintained. On head CT performed the following day there were no signs of cerebral infarction; and cardiac enzymes were not elevated. Treatment was administered using the CVC until the patient’s death from esophageal cancer 3 months later; however, no symptoms of paradoxical embolism arose.

Fig. 1. Computed tomography after central venous catheter insertion. After catheter insertion, imaging was performed in the supine position. A, B At 10 min after 4F angiosheath insertion, air is visible in the ascending aorta (arrow) (A) and the pulmonary artery trunk (arrowhead) (B). C At 200 min after 4F angiosheath insertion, air in the ascending aorta has disappeared.