



Successful treatment of intracardiac air embolism using intracardiac catheter aspiration

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Intracardiac air embolism is uncommon, however it is a serious condition which frequently leads to catastrophic complications during or after invasive procedures resulting in significant morbidity and mortality. For a successful resuscitation of patients with intracardiac air embolism, hyperbaric oxygen therapy is critical.^[1,2] Still, due to a hyperbaric chamber's unavailability at many hospitals and concerns about patient movement resulting in further embolism during transport, such treatment method is gradually diminishing. We present a case of acute-onset right-sided heart failure from massive intracardiac air embolism that was successfully treated with an intracardiac catheter aspiration procedure instead of hyperbaric oxygen therapy.

A 78-year old man with a history of hypertension, diabetes mellitus, and ischemic heart disease presented to the emergency department with dyspnea (NYHA FC III-IV) and chest discomfort. The patient had been complaining of coughs and sputum over the past week. In the morning of admission day, he had got an intramuscular injection at the hip. He had undergone coronary artery bypass graft three years ago and had been well until this present admission. ECG and chest X-ray were normal with no widening of the mediastinum or pleural effusion observed, and blood chemistry was also normal except for the high brain natriuretic peptide (BNP) level [952 (0–100 pg/mL)]. Transthoracic echocardiography (TTE) showed severe diastolic dysfunction and pulmonary hypertension with inferior vena cava (IVC) plethora. A chest CT was done, which revealed a large amount of air in the right atrium, right ventricle, and pulmonary artery (Figure 1A–1B). In addition, there were air bubbles in brachiocephalic veins, left subclavian and axillary vein, right internal jugular vein, and the pre-thyroid

area. He was placed in Trendelenburg position and kept on 100% oxygen via non-rebreather mask due to the unavailability of a hyperbaric chamber at our hospital. However, the patient had persistent worsening of dyspnea and hypoxemia. As an alternative method, we decided to perform an air aspiration using an intracardiac catheter. We used a 5-French pigtail catheter with multiple side holes for aspiration and suction was provided by hand with a lockable 30 mL syringe. Air aspiration was performed on the right atrium and ventricle several times under a fluoroscopic guidance. A few hours later, follow-up chest CT demonstrated that previous air embolism had fully resolved (Figure 1C–1D) and the patient was able to make full recovery after two days without any sequela.

Air embolism can occur as a result of direct communication between an air source and the vasculature as well as a pressure gradient favoring the passage of air into the vessel. Surgery, central line placement and removal, positive pressure ventilation, trauma, hemodialysis, pacemaker placement, cardiac ablation, and decompression sickness are some of the common causes of air embolism.^[3,4] A venous air embolism eventually causes an obstruction in the pulmonary circulation, and it could be life-threatening. It is usually characterized by an acute-onset right-sided heart failure from cor pulmonale. As a result of its significant morbidity and mortality, it is important that physicians are prepared to deal with such fatal complication.

Treatment of air embolism depends upon the clinical condition of the patient. In most patients, therapy which includes mechanical ventilation, vasopressors, volume resuscitation, and supplemental oxygen is adequate. On the other hand, hemodynamically unstable patients and patients with end organ damage or neurological deficits should be treated with definitive therapy such as hyperbaric oxygen.^[2]

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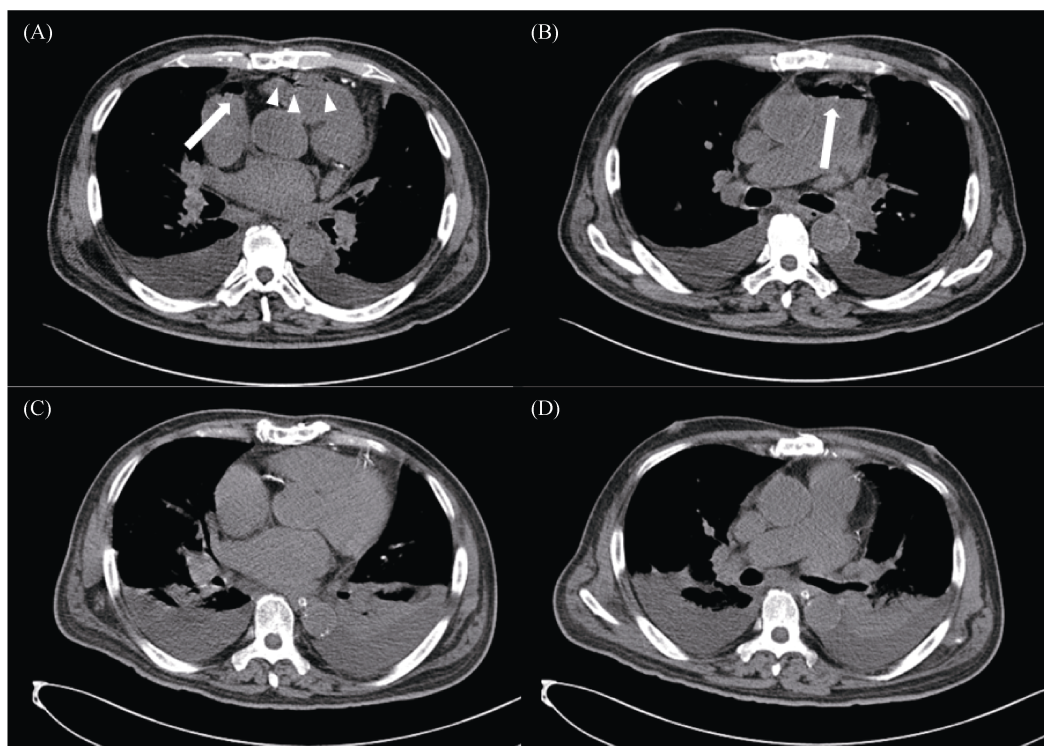


Figure 1. Non-contrast CT scan of the chest in patient with intracardiac air embolism. (A): Axial non-contrast CT shows the presence of free air in the anterior part of the right atrium (arrow) and ventricle (arrowheads); (B): arrow points towards large amount of air in the pulmonary artery; (C & D): after air aspiration, follow-up chest CT demonstrates disappearance of air in the right atrium and ventricle, and pulmonary artery.

However, if this therapy is unavailable, aspiration of air directly from the circulation using intracardiac catheter aspiration with a multiple side-hole catheter such as 5-French pigtail catheter, as was done in our case, may be a more useful and safe treatment.

In this case, the patient denied all previous invasive procedures before this event except for the intramuscular injection on that day. Unfortunately we could not find a definite cause of this intracardiac air embolism. Although his previous injection history had little impact on this complication, we could not completely exclude this procedure as a cause of this event.

Finally, air embolism should be emphasized as a differential diagnosis whenever there is a clinical suspicion after any invasive procedures related with blood vessels. Air embolism is an emergency, therefore early diagnosis and

prompt treatment of this condition are highly imperative as any delay in diagnosis and treatment can result in lives lost.

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