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Case Report

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# Iatrogenic air embolism following contrast injection during CT pulmonary angiography: a rare but serious complication

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## ABSTRACT

Air embolism is a rare but potentially life-threatening clinical condition resulting from the entry of air into the vascular system. Although it most commonly occurs following surgical or invasive procedures or trauma, it can also arise during imaging procedures involving contrast media administration. This report presents a case of a 73-year-old female patient who developed intravascular air embolism during thoracic CT angiography following intravenous contrast injection. The patient was successfully managed with oxygen therapy and conservative monitoring.

**Keywords:** Iatrogenic complications, air embolism, contrast injection

## INTRODUCTION

Vascular air embolism is a serious clinical condition caused by air bubbles obstructing the arterial or venous circulation. Although iatrogenic air embolism is rare, it carries a high risk of morbidity and mortality, requiring rapid diagnosis and treatment.[1,2] It typically occurs after surgical interventions, intravascular catheterizations, hemodialysis, or trauma. Air embolism during contrast injection in imaging procedures is an extremely rare event.[3] This case aims to draw attention to this uncommon complication by presenting an iatrogenic air embolism that developed during contrast administration in thoracic computed tomography (CT) angiography.

## CASE

A 73-year-old woman initially presented to her family physician with complaints of chest pain. Due to the persistence of symptoms and the need for further evaluation, she was referred to the emergency department. Her past medical history included diabetes mellitus, hypertension, and coronary artery disease, for which she was on regular medication.

On examination at the emergency department, her vital signs were as follows: blood pressure 110/60 mmHg, heart rate 90 bpm, oxygen saturation 91%, body temperature 36.8°C, and blood glucose level 150 mg/dl. She was alert, cooperative, and oriented, with no neurological deficits. Systemic examination was unremarkable. The chest pain was nonspecific and persistent. Electrocardiography revealed no abnormalities, and cardiac troponin levels were within normal limits.

Given the ongoing chest pain and borderline oxygen saturation, pulmonary thromboembolism was suspected, and thoracic CT angiography was ordered. For thoracic CT angiography, a 22-gauge (G) intravenous catheter was placed in the patient's left antecubital vein. A total of 180 ml of iodinated contrast material was administered. During the contrast injection at the rate of 4 ml/s, the patient developed sudden-onset back pain. Her heart rate increased to 120 bpm, oxygen saturation dropped to 88%, and blood pressure decreased to 95/55 mmHg. CT angiography revealed intravascular air densities in the right ventricle and pulmonary trunk (**Figure 1**).

The findings were attributed to air embolism likely introduced during contrast injection. The patient had no recent history of surgery or invasive intervention. She was admitted to the pulmonary ward and managed conservatively in the left lateral decubitus position with 10 L/min oxygen therapy. A follow-up thoracic CT performed on day 3 demonstrated complete resolution of the air embolism (**Figure 2**). The patient's clinical course remained stable, and she was discharged after her symptoms resolved.

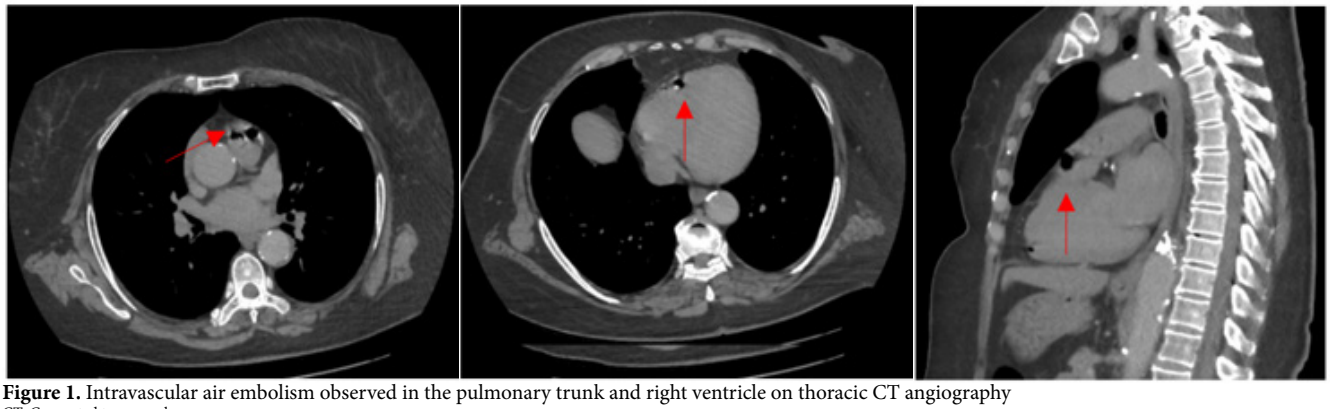

**Figure 1.** Intravascular air embolism observed in the pulmonary trunk and right ventricle on thoracic CT angiography
CT: Computed tomography

**Figure 2.** Resolution of intravascular air embolism in the pulmonary trunk and right ventricle on follow-up thoracic CT
CT: Computed tomography

## DISCUSSION

Air embolism can occur due to factors such as direct communication between the vascular system and an air source, a favorable pressure gradient, and the patient's positioning. The risk is particularly high during surgeries like neurosurgical and otorhinolaryngological procedures, where elevated positions and low venous pressures facilitate air entry. Other contributing factors include hypovolemia, central venous catheterization, and mechanical ventilation.[4,5] Modern high-pressure injectors are generally equipped with air-sensing systems that can effectively warn or stop the injection when air is detected within the tubing, thereby reducing the risk of air entry into the patient. Nevertheless, air introduced during external tube connections may not be adequately eliminated by conventional saline test injections. Furthermore, the injection process is difficult to monitor in real time by technicians, nurses, or patients, making it challenging to detect the inadvertent entry of air bubbles during contrast administration.[6]

Air embolism most frequently involves the venous system and presents with pulmonary symptoms. Arterial embolism is rarer but can lead to severe outcomes.[4,7] In this case, the embolism developed due to contrast injection during CT imaging, which is an uncommon cause. In patients receiving high-flow contrast injections, failure to adequately eliminate air from injector systems can result in such complications.[3]

Air embolism should be suspected in patients who suddenly develop respiratory distress during procedures known to carry risk, such as IV catheter placement. Similarly, previous case reports of air embolism have also noted that patients symptoms during injection were non-specific.[8] Symptoms vary based on embolus size; while small emboli may be asymptomatic, larger ones can cause dyspnea, chest pain, cough, dizziness, and more. Common physical signs include tachycardia, tachypnea, and hypotension, as observed in our case.[9]

ECG in air embolism often shows sinus tachycardia. In venous embolism, signs of right heart strain such as peaked P waves, right bundle branch block, and right axis deviation may be seen.[4] In our patient, only sinus tachycardia was noted, without any specific ECG changes.

Diagnosis relies on imaging. Chest X-rays may show hyperlucency, pulmonary edema, or focal oligemia. CT can reveal air in the main pulmonary arteries, right heart chambers, or veins, although findings are often nonspecific.[10] No single imaging modality is sufficiently specific; therefore, clinical suspicion—especially in the presence of risk factors is key to diagnosis and management.[5]

Treatment typically involves high-flow oxygen and positioning the patient in the left lateral decubitus position. Positioning the patient in the left lateral decubitus and Trendelenburg position, known as Durant's maneuver, helps to relieve right ventricular outflow tract obstruction by promoting the migration and trapping of air in the apex of the right ventricle.[11] Hyperbaric oxygen therapy may be used when available.[12] Although hyperbaric oxygen therapy is not first-line treatment, it should be implemented if there is concern for paradoxical embolism and may also be a useful adjunct in severe cases.[1] In our case, diagnosis was made via CT, and the patient was successfully managed with conservative measures including oxygen therapy and positioning.

## CONCLUSION

Although air embolism resulting from contrast injection is rare, it is a potentially serious complication. This case highlights that even routine imaging procedures may carry unforeseen risks, emphasizing the importance of meticulous technique and appropriate patient monitoring. Preventive measures during intravenous contrast administration, along with early diagnosis and management, are critical to patient outcomes. Prompt evaluation, high-flow oxygen therapy, and correct positioning can prevent severe complications. This case aims to raise awareness among clinicians regarding the importance of recognizing and managing rare yet life-threatening events such as air embolism.

## ETHICAL DECLARATIONS

### Informed Consent

The patient signed and free and informed consent form.

### Referee Evaluation Process

Externally peer-reviewed.

### Conflict of Interest Statement

The authors have no conflicts of interest to declare.

### Financial Disclosure

The authors declared that this study has received no financial support.

### Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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