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Case Report

Isolated Right Ventricular Air Embolism^{☆,☆☆,★}

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ABSTRACT

Vascular air embolism (VAE) is an uncommon but potentially life-threatening event often associated with various procedures and diagnostic tests. Understanding this challenging incident will enable physicians to evaluate, diagnose and manage this incident successfully. We present a case of a 73-year-old male who developed air in the right ventricle after intravenous contrast-enhanced computed tomography (CT) imaging. We aim at highlighting this challenging clinical scenario and emphasizing ways to assess the risks and implement means to prevent and treat accordingly.

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Introduction

Air embolism is a rare but potentially life-threatening event that occurs when air enters the vascular system. It can occur iatrogenically during various procedures and tests and could likely be prevented with appropriate precautions. The presence of air in the right ventricle is so rare. Symptoms can range from relatively asymptomatic to cardiovascular collapse and death and are dependent on the volume and rate of air entering the vasculature.

Case report

A 73-year-old man known to have hypertension, and benign prostatic hyperplasia presented with abdominal pain associated with constipation of 4 days and obstipation.

Vital signs were stable. On physical examination, the patient was anxious, and there was diffuse tenderness on abdominal palpation. After stabilizing the patient and giving him pain medications, a CT scan of the abdomen with intravenous contrast was performed. Intravenous injection of iodine material to the right peripheral vein was injected by power injector, at a rate of 5 mL per second with a delay of 30 seconds for a total volume of 200 mL. No issues were noted

Abbreviations: VAE, Vascular Air Embolism; CT, Computed Tomography; IR, Interventional Radiology.

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Fig. 1 – Abdominal CT scan showing air in the right ventricle.



Fig. 2 – CT scan showing complete resolution of the air embolus.

during the injection period. There was some tachycardia to a HR of 110 bpm after 5 minutes of the procedure experienced by the patient as mild palpitations.

The radiologist had found a significant stool burden in his colon but no other acute findings and promptly recognized an air in the right ventricle of 100 mL in volume (Fig. 1). The cardiology team, along with the cardiothoracic team, was consulted for this finding. A STAT echocardiogram was performed showing air in the right ventricle. The patient was placed in a reverse Trendelenburg position. He was managed conservatively, without showing any findings of clinical deterioration. The patient remained hemodynamically stable, on room air. The next day, a repeat imaging showed the disappearance of air in the right ventricle (Fig. 2).

The patient was managed nonoperatively. He was kept NPO for 2 days due to ileus, and a nasogastric tube was inserted.

After 72 hours, the patient was able to pass stools. He was discharged after 7 days without any sequelae.

Discussion

While the true incidence of air embolism is unknown, as many instances go unreported, one study included a series of over 11,000 central venous catheter placements and found an incidence of 1 in 772 [1]. This complication can arise in a range of clinical situations including interventional radiology (IR) procedures, trauma, barotrauma, central line placement and removal, and certain types of surgical interventions such as cardiac and neurosurgery [2]. Important risk factors for vascular air embolism include surgery and vascular puncture, especially in the sitting position or when the operative site is within 5 cm above the heart [3]. In our case, the air in the right ventricle was accidentally caused by a diagnostic imaging procedure.

The pathophysiology of VAE is essential for its appropriate management. When air enters the venous system, it flows with venous blood to the right atrium and ventricle and is ejected into the pulmonary artery. A venous air embolism occurs when air enters the venous system and eventually causes an obstruction in the pulmonary circulation [1]. The physiologic effects of venous air embolism are similar to that of pulmonary embolism of any etiology as evidenced by: (1) elevated pulmonary artery and right ventricular pressures; (2) increased ventilation/perfusion mismatch; (3) intrapulmonary shunting; and (4) increased alveolar dead space [4].

In fact, the mortality of VAE is related to the volume and rate of introduction of air to the vascular system. In human beings, injection of 200 mL of air into the right ventricle has been reported to be fatal [5]. Larger air bubbles are also more likely to cause hemodynamic disturbance than smaller air bubbles [6]. In our case, information regarding the rate and volume of intravenous catheter contrast administration was suspected to be less than 200 mL of air.

VAE has a wide range of clinical signs and symptoms depending on the severity of air concentration in the blood. Some patients would experience mild symptoms, while others might have severe ones. They are usually nonspecific and could be neurological, vascular, and pulmonary symptoms. Importantly, reduced oxygen saturation on pulse oximetry is considered a late sign of vascular air embolism [4].

Prompt management of air embolism holds significant improving outcomes. Immediate management includes placing the patient on high-flow oxygen and in the right lateral decubitus position [7]. High flow oxygen may also aid the reabsorption of nitrogen gas from the bubble into the blood, reducing the size of the air embolus [8].

Conclusion

In conclusion, we report an unusual case of an air embolism to the right ventricle detected incidentally on imaging. We aim at highlighting this challenging clinical scenario and emphasize

ing ways to assess the risks and implement means to prevent and treat accordingly.

Patient consent

The patient gave informed consent by telephone on the April 4, 2022. The call was witnessed and a signed witness statement is available upon request.

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