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Case report - Thoracic general

Systemic air embolism in a patient with ingestion of a foreign body

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Abstract

Air embolism is defined as the entry of gas into a vascular structure. Frequently it is iatrogenic and can result in serious morbidity and mortality. We describe the case of a 59-year-old woman who presented with mediastinitis as a result of ingestion of a fishbone. Mediastinal debridement was performed which was complicated in the postoperative period by a systemic air embolism, as documented by computed tomography and clinical features.

Keywords: Systemic air embolism; Esophageal perforation; Acute mediastinitis

1. Introduction

An esophageal perforation resulting from foreign body ingestion is a rare entity. The majority of complications associated with this event are well described in the literature, such as, retroesophageal abscess, mediastinitis, pericarditis, pneumothorax or pneumomediastinum [1].

The use of invasive procedures has resulted in an increase in the number of cases of systemic air embolism. These can lead to serious morbidity and occasionally death. The associated symptoms depend on the localization of the emboli, and include cardiovascular, pulmonary and neurologic sequelae [2, 3]. Several mechanisms of air entry into the vasculature have been described in the literature. In this report, we present a patient with mediastinitis complicated by an arterial air embolism, which may have originated from a number of possible sources.

2. Case report

A 59-year-old woman was admitted to the hospital for the evaluation of clinical symptoms which were compatible with acute mediastinitis. Her medical history was not significant. She visited the emergency room with high temperature, chest pain, dyspnea and general malaise four days after choking on a fishbone. The hemogram showed leukocytosis with a left deviation and thrombopenia. Computed tomography (CT) of the thorax revealed a foreign body in the middle-third of the esophagus which was in contact with the left atrium. There was also evidence of mediastinitis (Fig. 1a). A digestive endoscopy was performed to retrieve the fishbone under sedation. After that, with an intravenous line, right radial arterial catheter, and a right subclavian triple-lumen central line in place, anesthesia was induced. During the endoscopy, we observed that the fishbone was lodged in the anterior wall of the esophagus. Immediately, the patient was intubated with a left-sided double-lumen endotracheal tube (37 ch). Mechanical ventilation was commenced with a tidal volume of 670 ml and positive end-expiratory pressure of 5. Subsequently, the patient underwent a right posterolateral thoracotomy to perform a complete debridement and insertion of chest drains. During the surgery two large necrotic ulcers were found on the anterior and posterior surfaces of the esophagus, respectively. After extubation the patient developed frequent flexion tonic-clonic seizures in the left foot which became secondarily generalized. These were controlled with barbiturate infusions. Her postoperative period was further complicated with a loss of consciousness and cardiac arrest which responded to resuscitation maneuvers. However, it was necessary to maintain her on mechanical ventilation. The electrocardiogram (ECG) revealed ST-segment elevation in leads II, III and aVF and an acute myocardial infarction was confirmed by a Troponin T increase (8.2 mg/ml). Simultaneously the patient developed multiple erythemathous cutaneous lesions on thorax, neck and face which were compatible with livedo reticularis and facial angioedema (Fig. 2a). A cardiac angiogram was performed the same day and showed normal coronary arteries. A control CT-scan realized the next day, did not demonstrate intracranial pathology. However, there was an air bubble in the left atrium (Fig. 1b,c,d). Transthoracic echocardiography revealed normal left ventricular function. The right ventricle appeared moderately dilated, with severe dysfunction. No intracardiac septal defects or bubbles of air were detected. The patient's hemodynamic

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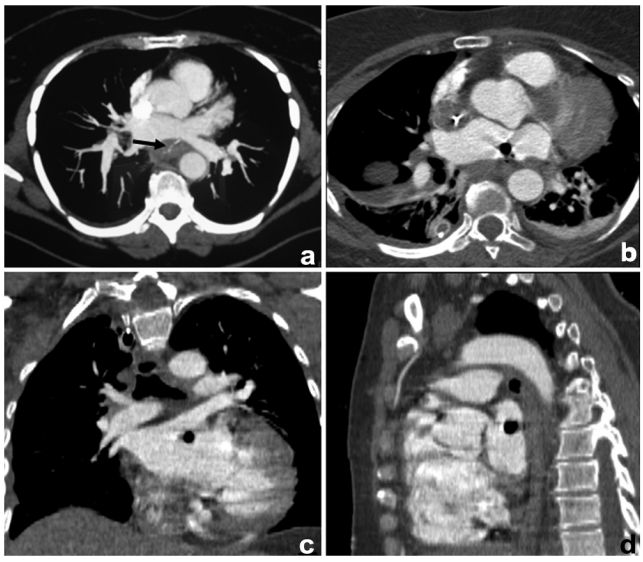

Fig. 1. CT images. (a) A fishbone in the esophagus in contact with the left atrium (arrow). (b, c and d) A bubble in the left atrium demonstrated on different CT sections of the thorax. Mediastinal, pleural or pericardial air collections can be excluded and air embolism may be assumed.

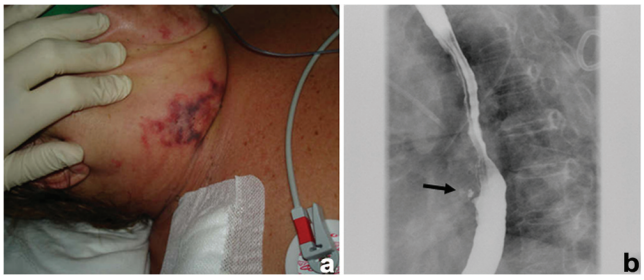

Fig. 2. (a) Livedo reticularis lesions on the neck of the patient. (b) Esophagogram showing a fistula on the anterior face of the middle-third of the esophagus (arrow).

status improved over the next 15 days and she was weaned from mechanical ventilation on the 16th post-operative day. A magnetic resonance imaging (MRI) of the thorax performed one week after extubation showed a collection in the submucosa of the esophagus, which was compatible with granulation tissue from the previous foreign body. There were no air bubbles in the left atrium. An esophagogram was performed one month after the thoracotomy showing the presence of a fistula on the anterior face of the middle-third of the esophagus (Fig. 2b). A further esophagogram performed ten days later confirmed that the fistula had sealed. The patient initiated progressive tolerance and was discharged to home with a good progress.

3. Discussion

An arterial air embolism is defined as the entry of air into the pulmonary veins or directly into the arterial vasculature resulting in adverse systemic effects. It is a very difficult to diagnose entity if it is not suspected by physicians [3]. In the arterial circulation, air bubbles act as emboli and can cause ischemia in target organs, particularly the heart and the brain [4]. The clinical symptoms in our case, including loss of consciousness, confusion, focal neurological symptoms, livedo reticularis, cardiac arrhythmias and ischemia have been described as sequela of arterial gas embolism in the literature [2, 3]. Central nervous system complications of air emboli range from non-specific findings such as a change in mental status to more serious sequelae, including seizure activity or cerebral infarction. Our patient exhibited tonic-clonic activity. Imaging studies of the brain are often normal even in the presence of severe neurological abnormalities [5]. In our case, the cranial CT images did not show any abnormality. The patient also suffered an acute myocardial infarction confirmed by ECG and cardiac enzymes but with normal coronary arteries. Finally, the patient had evidence of livedo reticularis. These findings, together with the CT evidence of an air bubble in the left atrium, suggest that our patient suffered a systemic air embolism.

Air can reach the arterial circulation through its entry into the veins or directly into the arteries. A paradoxical air embolism occurs when air introduced into the venous circulation crosses an atrial or ventricular septal defect and gains direct access to the systemic arterial system without been filtered by the pulmonary vasculature [6, 7]. This mode of introduction was ruled out in our case because the echocardiography did not reveal evidence of a septal defect or the presence of air bubbles in the right atrium or ventricle. However, a gas bubble was observed within the left atrium on the CT images. Air can also reach the arterial circulation directly from the pulmonary veins. In our case it is possible that mechanical ventilation during surgery resulted in barotraumas from the rupture of an overdistended alveolus. This has been previously reported in the literature in pediatric and adult population [4, 6–8]. A recent report described an adult patient with a systemic air embolism and intra-coronary and intra-cerebral gas. These findings were demonstrated by CT and confirmed by post-mortem. The authors postulated that the embolism resulted from mechanical ventilation [9].

Hyperbaric oxygen therapy has been considered the mainstay of therapy in patients with an air embolism. The management of a clinically significant air embolism includes measures to prevent further entry of air into the vasculature and to limit the expansion of the embolus. Blood pressure and central venous pressure should be supported with fluids, vasopressors and ionotropes [10]. In our case, after the initial resuscitation, the patient demonstrated no residual clinical sequelae. Therefore, it was deemed unnecessary to use the hyperbaric oxygen therapy.

In summary, this report represents an in vivo documentation of systemic air embolism demonstrated by CT and clinical features. Massive air embolism is a rare complication that should be considered when dramatical clinical features occur, including mental status changes, seizures of unknown etiology or myocardial injury in critically ill patients.

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