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Cranial air embolism after transthoracic lung biopsy: A case report of a rare complication

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Abstract

Cerebral air embolism is a rare and fatal complication of computed tomography-guided transthoracic lung biopsy. Lesions with pulmonary vein involvement—especially cavitary lesions—require particular care during procedures performed with a guided needle. Only 2 ml of an air embolism reaching the cerebral arteries is fatal, and a 1-ml cardiac air embolism can be fatal. Hyperbaric oxygen therapy should be started immediately to reduce mortality and ensure recovery among patients who develop unconsciousness and extremity paralysis during or after the procedure including when diagnosed with cranial CT imaging. Hyperbaric oxygen therapy has been reported to reduce mortality by up to 7% and reduces neurological deficits after 48 hours—even in delayed cases. Thus, transthoracic lung biopsy is important for the diagnosis of peripheral lung masses. Here, we present a rare complication after this procedure. Our goal here was to contribute to early diagnosis and treatment by creating awareness.

Keywords: Lung biopsy, CT, Air embolism

Introduction

Cerebral air embolism usually develops after invasive medical procedures and presents with clinical findings such as loss of strength in the extremities, confusion, and speech difficulties. It is a rare cause of cerebral infarction caused by air bubbles blocking the cerebral vessels [1]. Its etiology has been associated with a number of medically invasive procedures such as central venous catheter intervention, laparoscopic/endoscopic procedures, bronchoscopy, dialysis, and lung biopsy [2]. Computed tomography-guided lung biopsy is frequently preferred—especially in peripheral lung masses. There are complications that require conservative or invasive procedures such as hemorrhage and pneumothorax. However, as in the case presented here, cerebral air embolism is a very rare and fatal complication (0.02% to 0.07% of cases in the literature): This rate is estimated to be higher in asymptomatic patients because it cannot be diagnosed [3, 4]. In this respect, we think that our case will contribute to the literature and raise awareness.

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Informed Consent
The authors stated that the written consent was obtained from the patient presented with images in the study.

Conflict of Interest
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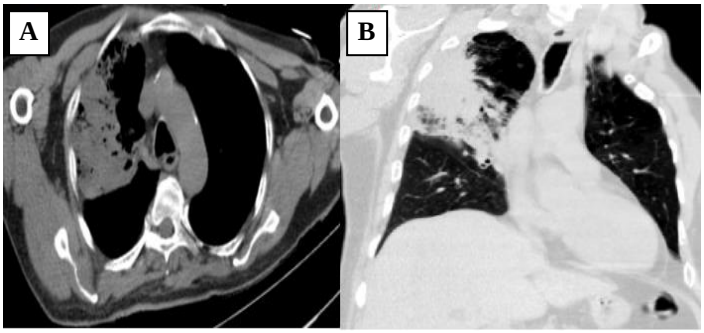
Case presentation

Here, a 75-year-old male patient presented to the emergency department with complaints of dyspnea, persistent cough, and hemoptysis. Laboratory tests showed that sedimentation and C-reactive protein values were high. Thorax CT showed a mass lesion was observed in the upper lobe of the right lung. A lesion with high-density ground-glass areas was detected extending from the apical part of the upper lobe of the right lung to the posterior (Figure 1 A-B). There was no shrinkage in the lesion after antibiotic therapy.

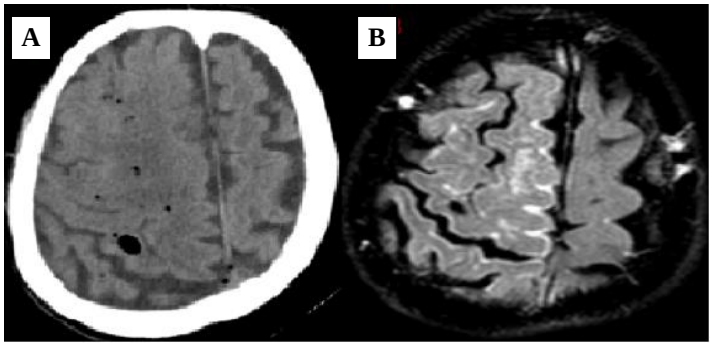
Figure 1: Thorax CT shows a mass lesion extending posteriorly from the upper lobe apical segment in the right lung in the mediastinum and parenchyma window (A-B)



Positron emission tomography (PET) indicated a SUV max value of 9.6. The patient was processed for thorax biopsy under the guidance of computed tomography from the lesion, which was found to be suspicious for malignancy. After cleaning the area, the patient was placed in a decubitus position, and a sample was taken under sterile conditions via a coaxial 17-gauge introduced via an 18-gauge core biopsy needle after local anesthesia. The process was then terminated. The patient was diagnosed with an adenocarcinoma and was biopsied again one week later for molecular testing. This process was repeated and three samples were taken. Control imaging was also performed, and no pneumothorax or hemothorax detected.

When the patient was starting to stand, there was a sudden loss of strength and a change in consciousness on the left side. Areas compatible with air embolism were then observed on cranial CT. Cranial MR showed curvilinear signal changes in the FLAIR sequence due to increased vascularity in the sulci (Figure 2 A-B). The patient had decreased saturation and a general worsening condition; they were intubated and died shortly thereafter. Permission was obtained from the patient's daughter to present the case and share the CT and MRI images.

Figure 2: Cranial tomography image shows millimeter-scale air densities in the parietal lobe on the right (A). Cranial MR image shows curvilinear signal changes in FLAIR imaging due to increased vascularity in the sulci (B).



Discussion

Air embolisms can be evaluated in two categories. Venous embolisms (as in this case) usually do not pass into the arterial circulation and do not cause cardiac or cerebral embolism. However, this assumes that the patient does not have congenital cardiac defects (ventricular, atrial, or septal defects). In contrast, arterial embolisms may reach the heart or brain with systemic circulation and cause systemic problems [5, 6]. In our case, an intracranial air embolism developed because of an arterial embolism. Only 2 ml of air reaching the cerebral arteries can be fatal; 0.5 or 1 ml of air reaching the coronary arteries can cause myocardial infarction [7].

Several factors have been suggested to increase the risk of air embolism: using a guide needle or a thick needle, coughing during the procedure, cavitary lesions, or involvement of the pulmonary vein. However, air embolisms are sometimes found with thinner needles without using a guide [8]. A guide needle was used in our case as well. Therefore, some air enters the parenchyma during each biopsy. However, no air enters in biopsies performed without using a guide, and thus the risk of air embolism is also reduced. In the treatment of cerebral air embolism, it is important to give hyperbaric oxygen at 2.5-3 atmospheres for four hours [9]. Emergency hyperbaric oxygen therapy can reduce mortality by up to 7% and even in delayed cases it provides a reduction in neurological deficits after 48 hours [10]. There is no hyperbaric oxygen center in our center, and thus this treatment could not be applied because patient transport was not possible. Thus, there are limitations in our case. The procedure was done carefully by experienced people knowing the risk factors, but there can be rare and fatal complications such as air embolisms. Emergency intervention should be performed in patients who develop confusion.

Conclusion

Cerebral air embolism is a rare but fatal complication of lung biopsy. Although it is very rarely reported in the literature, the number is thought to be higher especially in asymptomatic cases. Cranial tomography plays an important role in the diagnosis. This case will hopefully raise awareness of this risk.

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