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**CASE REPORT**

# Cerebral Air Embolism – A Rare Complication of Computed Tomography Guided Lung Biopsy

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## ABSTRACT

Thoracic lesions constitute a major chunk of the conditions presenting to a pulmonologist. They comprise a panorama of assorted etiologies ranging from benign lung lesions to aggressive malignancies. A tissue biopsy and its histopathological analysis is the gold standard for diagnosis. Computed tomography (CT)-guided lung biopsy is a safe and imminent tool for obtaining a tissue biopsy of underlying thoracic pathology. However, it has its own gamut of complications. The most common complications encountered include pneumothorax, hemorrhage, hemoptysis, iatrogenic infections, and sporadically air embolism. Cerebral air embolism is a fatal complication of CT-guided lung biopsy seen in a miniscule subset of patients. It requires urgent diagnosis and prompt therapy initiation. High-flow oxygen and hyperbaric oxygen therapy are usually helpful. Due to heterogeneous presentation, it usually remains undiagnosed. A high index of suspicion and early initiation of appropriate therapy can save precious lives. We hereby report a unique case of this rarefied complication.

**Keywords:** Air embolism, Computed tomography-guided lung biopsy, High flow oxygen

## INTRODUCTION

The causes of intrathoracic lesions are a Pandora's box. A tissue biopsy and histopathological analysis are extremely pertinent in these cases. The biopsy can be done through various approaches such as an image-guided, thoracoscopic, or open lung biopsy. Computed tomography (CT)-guided percutaneous needle biopsy of the lung is preferred as it is less invasive and associated with lower cost.[1,2] It is usually a fairly safe procedure and generally performed on a daycare basis. However, it also has its own set of procedure-related complications.[3-5] Air embolism although unorthodox, becomes noteworthy as it is potentially life-threatening with disastrous cardiac, pulmonary, or neurological effects and is associated with a high morbidity and mortality.[6-8] We herein report an intriguing case of air embolism after CT-guided percutaneous needle biopsy of lung.

## CASE REPORT

A 65-years-old man, chronic smoker presented symptoms of cough and exertional breathlessness for 2 years. The symptoms progressed with dysphagia and intermittent fever for 3 months. He was on therapy for systemic hypertension and diabetes mellitus for the past 8 years. The general examination was unremarkable. The respiratory system examination revealed signs of hyperinflation. His hematological and serum biochemical investigations, chest radiograph, electrocardiogram,

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and arterial blood gas (ABG) analysis were normal. Contrast-enhanced computed tomography (CECT) of thorax showed a heterogeneously enhancing partly necrotic mass in anterior mediastinum in the pre-tracheal and right paratracheal region, measuring approximately 5.2 × 4.5 × 4.7 cm with invasion into anterior segment of right upper lobe, loss of fat planes and multiple enlarged pre-carinal, subcarinal, right hilar, and supraclavicular lymph nodes. Mild pericardial effusion and centrilobular emphysema were also appreciated. A two-dimensional echocardiography showed mild pulmonary hypertension. Bronchoscopy was normal. The patient was posted for a CT-guided biopsy of the mediastinal mass done aseptically through posterior approach by a coaxial technique with needle of size 20 Gauge, 20 cm length with 1 cm throw. During the procedure, the patient developed hemoptysis, severe respiratory distress and became unconscious and unresponsive on CT scan table. On quick examination his Glasgow coma score was 5, SpO2 was 60%, respiratory rate was 28/min, pulse rate was 110/min, and breath sounds were reduced on the left side of the chest with decerebrate rigid posturing. The patient was started on oxygen supplementation. ABG was suggestive of an acute type one respiratory failure. Pneumothorax [Figure 1] was managed urgently with intercostal drainage (ICD) which improved SpO2 to 85% but the patient still remained unconscious with a rigid posture. A CT brain done detected cerebral air embolism in anterior aspect of superior sagittal sinus [Figure 2]. The patient was managed with hyperbaric oxygen therapy (HBOT) and he started improving neurologically. The ICD was removed on complete expansion of the lung. The patient recovered partially with a residual bilateral lower limb weakness which was managed with physiotherapy. The mediastinal mass biopsy histopathology report showed a lymphoproliferative disorder. The patient was referred to oncology services for management of the same.

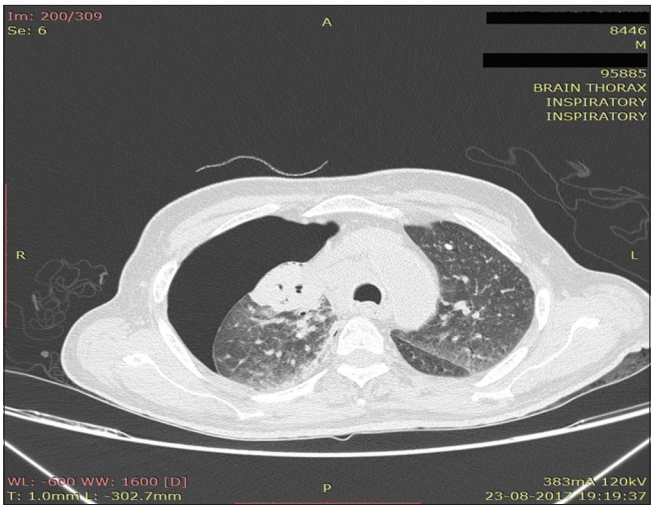


**Figure 1:** Axial image of computed tomography (CT) chest showing pneumothorax post CT-guided biopsy

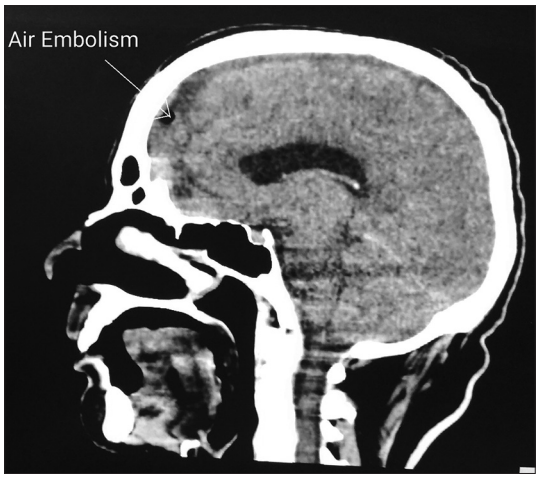


**Figure 2:** Sagittal image of computed tomography Brain showing air in the superior sagittal sinus

## DISCUSSION

Tissue biopsy of thoracic lesions forms an indispensable part of the workup. CT-guided biopsy is customarily considered a safe procedure. However, it does subsume its own set of complications such as pneumothorax, hemothorax, hemoptysis, and infections. Most of these can be recognized easily. The rate of pneumothorax rate varies widely from 5 to 50%. Up to 5–10% of patients, a large or symptomatic pneumothorax may require ICD.[9-11] The occurrence of pneumothorax also depends on the patient's underlying lung condition.[12] Pulmonary hemorrhage is the second most common complication with reported frequencies ranging from 4% to 27%.[13,14] Some rare complications like cerebral air embolism might also occur and may prove fatal if missed. Air in the vessels causes a foreign body-like blockade induces an inflammatory reaction secondary

to platelet activation and release of vasoactive substances. It is clinically associated with assorted multisystemic findings. The cardiac manifestations include chest pain, mill-wheel murmur, ST-T wave changes, right ventricular strain, and/or tachy/bradyarrythmia.[15] Respiratory manifestations include dyspnea/tachypnea, hypoxemia, and hypercarbia.[15] Neurological manifestations include seizures, encephalopathy, and ischemic infarcts with resultant focal neurological deficits.[15] Air embolism is thought to occur by two mechanisms. First, if the tip of the biopsy needle is lodged in a pulmonary vein and the inner stylet is removed, air embolism can occur during rapid inspiration when the atmospheric pressure exceeds the pulmonary venous pressure. Second, when a needle simultaneously traverses an air-containing space and adjacent pulmonary vein, a fistula can occur and air enters the vein when the alveolar air pressure is greater than the pulmonary venous pressure, especially during activities like coughing. Cerebral air embolism can lead to generalized seizures and neurologic deficit.[5] The temporal relationship between the injection of air and the sudden development of neurological symptoms leads to the presumptive diagnosis. Immediate therapeutic measures include the administration of oxygen and Trendelenburg position to enhance retrograde flow of bubbles from the cerebral arteries. HBOT helps to reduce cerebral ischemia as the compressed air bubbles are being resolved and facilitate the diffusion of small air bubbles from the pulmonary capillaries to the alveoli for elimination. It also reduces increased intracranial pressure in severe cerebral ischemia secondary to air embolism.[16,17] Before commencing biopsy, it is pertinent to assess patient's vital parameters meticulously and to rule out any neurological deficit. Cerebral air embolism can occur with biopsy of any intrathoracic lesions; however, mediastinal mass with their proximity to great vessels have a higher possibility of developing it. Cerebral air embolism to be considered as a likely differential if a patient develops altered consciousness and or evidence of neurological deficit following a CT-guided biopsy. CECT brain-based diagnoses and HBOT may be life-saving. A due clinical suspicion, punctual diagnosis, and expedited therapy form the crux of management and salvage precious lives.

## CONCLUSION

Cerebral air embolism is rare but life threatening complication of computed tomography guided biopsy. Early diagnosis, and prompt treatment can save life of patient. With this case report all treating physicians must be vigilant about this rare fatal complication and prevent mortality post CT guided biopsy.

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## CONFLICTS OF INTEREST

There are no conflicts of interest.

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