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CASE REPORT

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Fatal air embolism: A grave complication during diagnostic flexible bronchoscopy

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Abstract

Flexible fiber-optic bronchoscopy is used to determine diagnoses in pulmonary diseases. It is considered as a safe procedure, although some complications might occur, one of which is cerebral air embolism. In this case, we present the air embolism after the bronchoscopy procedure, ending in fatality. We strongly recommend that bronchoscopists should keep this complication in mind and be aware of early symptoms pertaining to the patient's state of consciousness during bronchoscopy examination. Early treatment is essential in this situation.

KEYWORDS

air embolism, bronchoscopy, complication, hyperbaric oxygen therapy, lung pathologies

1 | INTRODUCTION

Flexible fiber-optic bronchoscopy has found wide use in determining adequate diagnoses for a range of lung pathologies. Bronchoscopy is an invasive procedure performed after the patient has undergone sedative preparations. This procedure is usually classified as a safe technique because reported cases of fatal complications are extremely rare. Referring to a study of 20,986 patients examined with flexible bronchoscopy, only 1.1% presented with a major complication, with a 0.02% mortality rate.[1]

Vascular air embolism (VAE) is a complication as rare as it is serious and can lead to fatalities, regardless of the type of VAE.[2,3] Other possible complications that occur during the bronchoscopy procedure may be associated with the presence of hemorrhage on the biopsy site, changes in heart rate, or vasovagal spasm.[4] Even rarer complications can be respiratory arrest, pneumonia, pneumothorax, and major hemorrhage.[5]

In the literature, cerebral air embolism presented after bronchoscopy is reported in only a few cases. As a result, data on this complication are rare. In 103,978 bronchoscopies studied by the Japanese Nationwide Survey, only one patient (0.001%) developed cerebral air embolism.[6,7]

Our case report shows air embolism in the cerebrum after the performance of the flexible bronchoscopy procedure.

2 | CASE REPORT

The 85-year-old patient, with concomitant high blood pressure, diabetes mellitus, and rheumatoid arthritis, for which he was treated regularly, had a persistent cough

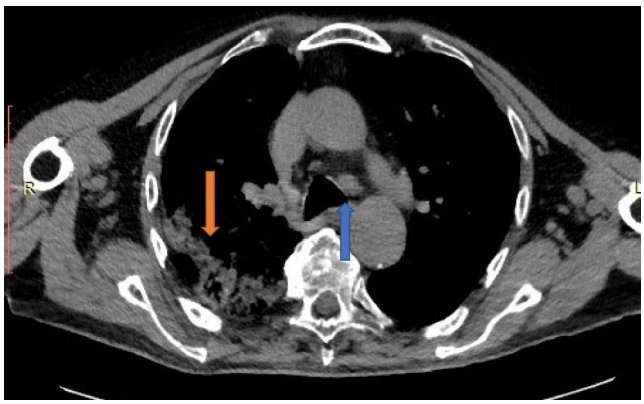

FIGURE 1 Mediastinal lymph nodes and pulmonary parenchymal change (see arrows)

with sputum for several months. A pulmonologist recommended a COVID-19 molecular test, which showed a negative result. Nothing significant came out on the chest radiograph. As the patient did not have any improvement and while taking medication, doctors recommended a bronchoscopy, during which specimens for biopsy were taken.

The procedure was performed under spontaneous ventilation with mild sedation by intramuscular administration of 10 mg pentazocine. Specimens were collected with 2-mm forceps through a sheath guide.

A few moments after the second specimen in the biopsy was received, the patient began to have difficulty in speaking, drowsiness, and convulsions and then failed to communicate with doctors. The patient received fosphenytoin and levetiracetam for clonic convulsion. We administered normobaric oxygen (NBO_2) therapy (10 L/min of oxygen delivered via a nonrebreathing mask) because hyperbaric oxygen (HBO_2) was not available at our hospital. The patient was monitored for approximately 2 h and then sent for a computerized tomography (CT) scan of the thorax and brain. The CT scan of the thorax showed changes in pulmonary parenchyma and lymph nodes in the mediastinum measuring 13 × 10 mm (Figure 1).

On the CT scan of the brain after bronchoscopy, several round black lucencies appeared at the gray-white interface, confirming the diagnosis of cerebral air embolism. These emboli were diffusely distributed, with the most pronounced being in the frontal, parietal, and temporal lobes with bubble diameters up to 3 mm (Figure 2).

The patient was given intravenous infusion during the examination, so the air most probably entered from the biopsy site. The patient was transferred to the intensive care unit, where he was treated with intravenous anticonvulsants to control seizures and was intubated. The patient's condition did not improve, and after 48 h, the patient deceased.

3 | DISCUSSION

Cerebral air emboli can lead to a reduction in consciousness level, focal neurological deficits, and seizures.

Due to its rarity, the right pathogenesis is still unclear. According to some reviewers, two factors exist that may cause cerebral air emboli during bronchoscopy.[8] The first is a portal entry, such as a defect in a blood vessel wall while the biopsy is taken,[9] and the second is jamming of the bronchoscope during the examination.[10]

Air cerebral embolism after the bronchoscopy procedure is a rare situation with few documented cases. The first case documented with air embolism was in 1922 by Schlaepfer K., et al.[11] They showed the incidence of air embolism due to the bronchoscopy procedures in diseases of the pleura and the lung. Due to the rarity of complications, the bronchoscopist needs to know not only the

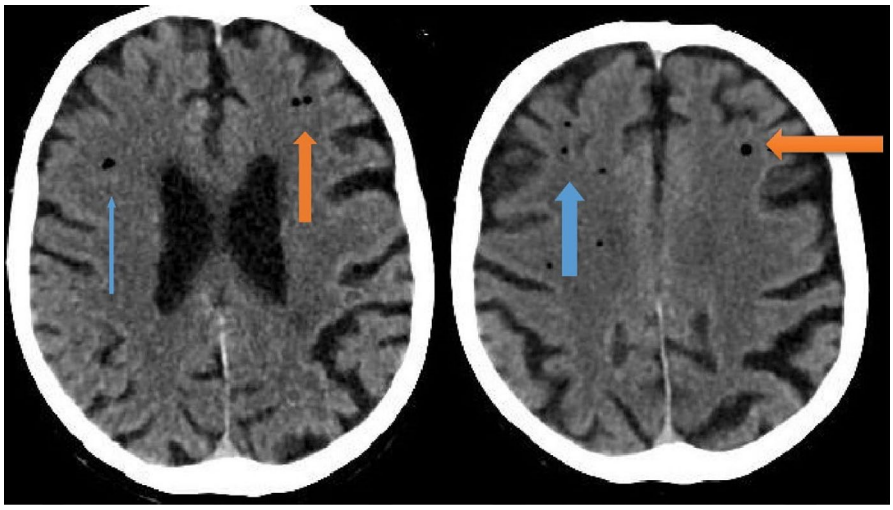

FIGURE 2 Native slice of axial CT appears cerebral parenchymal air bubble in the field of gas vascular embolism (see arrows)

risks of the procedure but also the early recognition and adequate treatment.[8] Due to the risk of a life-threatening situation, the situation must be recognized quickly.

Blanc et al. [12] cited the importance of early administration of hyperbaric oxygen therapy (HBOT). In their study, they show the advantages of HBOT administration within 6 h, but not more than 30 h. For this reason, the bronchoscopist should evaluate every early symptom that may occur, such as drowsiness, loss of consciousness, and changes in vital signs.[13] To avoid fatality, it is essential to begin early treatment within a few hours.[10] This involves putting the patient in the Trendelenburg position, avoiding positive pressure ventilation, and applying hyperbaric oxygen therapy.[14]

Hyperbaric oxygen therapy is considered the most effective treatment method because it reduces the measure of air bubbles and allows quick absorption of nitrogen within the bubble.[14,15]

In his study, Laydon AJ[15] shows the importance of HBOT. He concluded that emergency treatment including chest cardiac massage, combined with hyperbaric oxygen therapy, may decrease the mortality to 7%.

4 | CONCLUSION

Air cerebral embolism due to the bronchoscopy procedure is a rare complication. This situation in many cases may be life-threatening, ending in fatality. Bronchoscopists should manipulate carefully during the procedure. It is essential for the bronchoscopist not only to know this but also to be able to evaluate the early change in vital signs followed by adequate emergent treatment.

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CONFLICT OF INTEREST
There are no conflict of interest to declare.

AUTHOR CONTRIBUTIONS
VB, IZ, and BS contributed to the clinical data collection and prepared the case report. SB and HN contributed to the design of the case report presentation and performed the final revision of the manuscript.

ETHICAL APPROVAL
The need for ethics approval was waived according to national regulations.

CONSENT
Written informed consent was obtained from the patient's son for the publication of this case report and images.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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