Case report

Mechanical insufflation-exsufflation-related bilateral pneumothorax

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1. Introduction

Mechanical insufflation-exsufflation (MI-E) devices are frequently used in patients with respiratory muscle weakness to increase their cough peak flow and assist them in improving cough effectiveness and clearing mucus from the airways. An 89-year-old male was admitted to our university hospital due to fever and loss of appetite. He was diagnosed with lung abscess and pulmonary nontuberculous mycobacterial disease. He was unable to independently expectorate phlegm due to frailty. Subsequently, MI-E was introduced. On day 3 after its introduction, chest X-ray examination revealed bilateral pneumothorax, and use of the MI-E device was discontinued. After conservatively observing the clinical course, pneumothorax was improved on day 12 after it occurred.

Although scientific evidence regarding MI-E is currently limited, healthcare professionals often do not have an alternative in clinical practice. However, treating physicians should consider the risk of MI-E-related pneumothorax, despite its low occurrence rate.

2. Case report

An 89-year-old male was admitted to our university hospital due to fever and loss of appetite. Chest X-ray examination revealed an infiltration with a cavity in the right lower lung field, and the patient was hospitalized based on suspicion of lung abscess. He previously suffered from pulmonary tuberculosis, and presently has Alzheimer’s dementia, diabetes mellitus, and lipid metabolism abnormality. He stopped smoking in his twenties. His physical examination findings are described below. His height and weight were 160 cm and 42.3 kg, respectively. Vital signs were a heart rate of 97 beats/min, respiratory rate of 17/min, SpO2 of 98%, and body temperature of 36.2 °C. Course crackles were heard in his right lower lung field. A hemogram showed leukocytosis of $9.17 \times 10^9/\mu L$, and the levels of C-reactive protein were elevated at 15.51 mg/dL, indicating inflammatory findings.

Chest X-ray examination revealed an infiltration with a cavity in the right lower lung field (Fig. 1a). Chest computed tomography showed consolidation with a cavity in the right lower lobe and background mild weakness. He experienced bilateral pneumothorax within a few days after the introduction of the MI-E. Although the pneumothorax was improved, the complication had a negative impact on his clinical course. Aging of the population worldwide will lead to an increase in the use of MI-E in various situations. Therefore, treating physicians should be aware of this potential complication.

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pulmonary fibrosis (Fig. 1b).

The sputum smear was positive for acid-fast bacilli, and sputum polymerase chain reaction examination was positive for *Mycobacterium intracellulare*. Moreover, sputum culture revealed the presence of *Methicillin-susceptible Staphylococcus aureus* (MSSA). Therefore, he was diagnosed with pulmonary nontuberculous mycobacterial disease and lung abscess due to infection with MSSA. After hospitalization, intravenous meropenem was administered for 2 weeks to treat the lung abscess. Although the blood inflammatory reaction improved, a cavitary shadow persisted. Therefore, additional treatment with oral erythromycin was initiated due to the presence of *Mycobacterium intracellulare*.

On admission, the patient encountered difficulty in independently expectorating phlegm due to his general frail condition and low ADL. Therefore, an MI-E (CoughAssist® E70; Phillips Respironics, Inc., USA) was introduced with inspiratory and expiratory pressures of +20 cmH₂O and −20 cmH₂O, respectively. Although his symptoms and vital sign remained unchanged, on day 3 after the introduction of MI-E, chest X-ray examination revealed a bilateral pneumothorax with a collapse rate of 17% (Fig. 2). Therefore, use of the MI-E device was discontinued. The airspace of the pneumothorax was small; thus, we selected a conservative therapy and observed the clinical course. On day 12 after occurred pneumothorax was improved, as shown through chest X-ray examination (Fig. 3).

However, his general condition and ADL worsened, and oral ingestion became impossible. Aspiration pneumonia occurred and, eventually, he expired on day 60 following admission.

3. Discussion

The use of MI-E devices, especially in patients with NMDs or SCIs, or in intensive care units, increases in expectation of clearing airway secretions, reducing the occurrence of repeated airway infection, preventing atelectasis, assisting extubation, and lowering the rate of emergent admission. Recently, its use has expanded to patients with respiratory muscle weakness without NMDs or SCIs, despite the currently limited scientific evidence to support this application. In this
In conclusion, we should be aware of the risk of pneumothorax when using MI-E. In addition to scientific evidence, further discussions on the practical application, instruction, adverse effects, and team medicine concerning the use of MI-E are warranted to increase the benefit and reduce the risk.

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Appendix A. Supplementary data

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