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CASE REPORT

Unilateral postobstructive pulmonary edema following double-lumen endobronchial tube intubation

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Received 20 November 2007; accepted 18 December 2007

KEYWORDS

Anesthesiology
ventilation;
Pulmonary edema;
Thoracic surgery;
Upper airways

Summary

Herein, we report a male patient underwent a video-assisted thoracoscopic resection of left lower lobe intralobar bronchopulmonary sequestration that developed unilateral postobstructive pulmonary edema following double-lumen endobronchial tube intubation. Pulmonary edema subsided after receiving positive pressure ventilation at positive end-expiratory pressure of 5 cm H₂O and the patient was extubated 24 h later. To prevent this complication, correct placement of the tube should be assessed by auscultation during intermittent ventilation of each lung and fiberoptic bronchoscope should always be performed through both tracheal and bronchial lumens after intubation.

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Case report

A 41-year-old asymptomatic Thai man underwent a video-assisted thoracoscopic resection of left lower lobe intralobar bronchopulmonary sequestration. After the induction of

anesthesia with thiopental (150 mg), propofol (100 mg), fentanyl (25 mcg), and atracurium (30 mg), the trachea was intubated with a 37F left double-lumen endobronchial tube (Broncho-CathTM, Tyco Healthcare Mallinckrodt, Westmeath, Ireland). With both cuffs inflated, correct placement of the tube was assessed by auscultation during intermittent ventilation of each lung. The patient was then placed in a right lateral decubitus position and the operation was begun with selective right lung ventilation. Anesthesia was maintained with atracurium infusion (30 mg/h) and isoflurane (0.8–1.2%). During inspection by telescope in the left

Abbreviations: ICU: intensive care unit; PEEP: positive end-expiratory pressure; POPE: postobstructive pulmonary edema.

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thoracic cage, the ventilation of the right lung through the tracheal lumen became increasingly difficult. Pulse oxymeter revealed the patient's oxygen saturation of 68%, despite of ventilation with 100% oxygen. The operation was held. Given decreased breath sound on the right chest, the anesthesiologist tried to readjust the position of the tube without significant improvement. Fiberoptic bronchoscopy was then performed through tracheal lumen. Herniation of the left main bronchus balloon into the trachea was found causing obstruction of the right lung. The double-lumen endobronchial tube was replaced with single lumen tube. The operation was then terminated. Closure of left thoracic

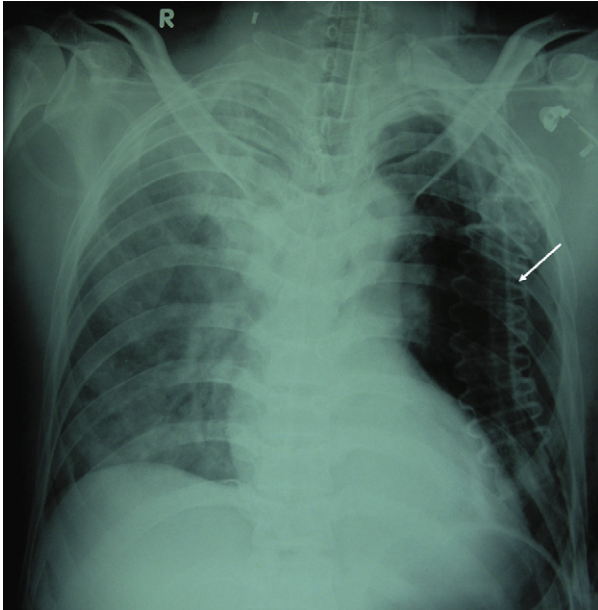


Figure 1 Chest radiograph revealing pulmonary edema on the right lung. Endotracheal tube is in placed and chest tube is demonstrated into the left pleural space (arrow).

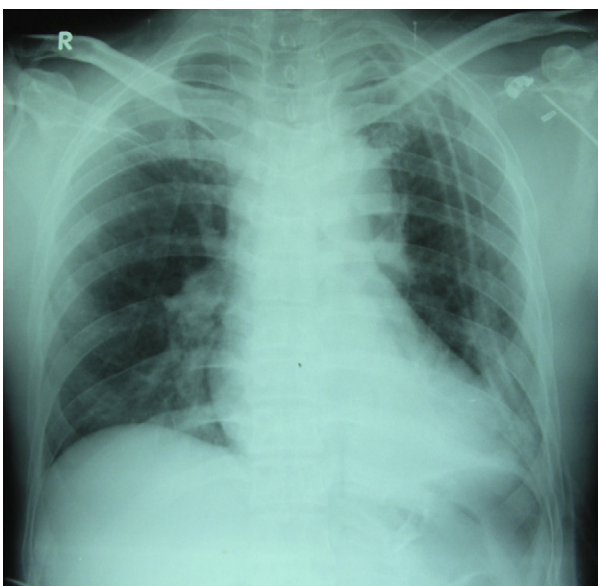


Figure 2 Chest radiograph taken 24 h later showing significant improvement of pulmonary edema.

incision was provided and chest tube was inserted into the left pleural space. With the two-lung ventilation, the oxygen saturation dramatically increased to 100%. However, suctioning of the endotracheal tube afterward yielded a moderate amount of pink, frothy secretions.

The patient was then transferred post-operatively to the intensive care unit (ICU) and put on positive pressure ventilation at positive end-expiratory pressure (PEEP) of 5 cm H₂O. A portable chest radiograph demonstrated right unilateral pulmonary edema (Figure 1). Pulmonary edema subsided and the patient was extubated 24 h later. The follow-up chest radiograph showed significant improvement of pulmonary edema (Figure 2). Two weeks later, thoracotomy was performed for resection of bronchopulmonary sequestration with single lumen endotracheal intubation. The operation was success without any complication.

Discussion

Postobstructive pulmonary edema (POPE) is the sudden onset of pulmonary edema following upper airway obstruction. Symptoms usually develop within 1 h of the precipitating event.^{1,2} The presence of tachypnea, tachycardia, frothy pink pulmonary secretions, progressive oxygen desaturation and chest radiograph findings of pulmonary edema in the setting of upper airway obstruction suggest the diagnosis of POPE.

According to the pathogenesis, there are two recognized types of POPE.³ Type 1 POPE usually follows acute airway obstruction. It requires a forceful attempt to inhale against an obstruction which creates highly negative intrathoracic pressure. This results in increased venous return, decreased cardiac output and leads to fluid transudation into the alveolar space. The mechanical stress developing from respiration against an obstructed upper airway may also cause direct injury to the alveolar-capillary membrane, resulting in an acquired permeability defect.⁴ In contrast, type 2 POPE needs the obstructing lesion to produce a modest level of PEEP and increases end-expiratory lung volume. By relieving of the obstruction, resulting in the sudden removal of the PEEP, leads to interstitial fluid transudation and pulmonary edema.³ The type 2 POPE could be an explanation for the development of respiratory distress in our patient.

Various causes of POPE were previously described.^{1,2,5} However, to our knowledge, there has been no previous report of double-lumen intubation as an etiology. Inadequate tube placement might allow the tube slipped easily and resulted in obstruction of the right lung. To prevent this complication, correct placement of the tube should be first assessed by auscultation during intermittent ventilation of each lung^{6,7} and fiberoptic bronchoscope should always be performed through both tracheal and bronchial lumens after intubation. During passage through the tracheal lumen, the proximity to the main carina and lack of herniation of the left main bronchus balloon into the trachea should be obtained. Passage through the bronchial tube should demonstrate that the tip does not block the orifice of the left upper lobe. When location is considered satisfactory, the tube should be strapped with the tape to prevent tube displacement.

In summary, we described the first case report of unilateral POPE caused by double-lumen endobronchial tube displacement. To prevent this complication, correct placement of the tube should be assessed for the safety of patients.

Financial support

None.

Conflict of interest statement

None.

Acknowledgments

The authors thank Dr. Pensupa Raweelert and Dr. Orapitchaya Krairit for constructive suggestions and English editing.

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