A 56-year-old man presented with complaints of dysphagia and shortness of breath for the past 2 days. He denied chest pain, cough, fever, chills, or chest trauma. Ten days prior to hospital admission, the patient was self-treated with the Heimlich maneuver after choking on a piece of candy. The patient had a 120-pack-year history of smoking and a medical history significant for emphysema. He had been using his inhalers regularly. In the ambulance, the patient received two albuterol nebulizer treatments without relief of his symptoms.

Physical examination revealed a tall, thin man who was anxious and dyspneic. He was afebrile, with a pulse of 120 beats/min and a respiratory rate of 24 breaths/min. Oxygen saturation was 88% on room air. Neck examination revealed the trachea deviated to the left and jugular venous distention. Chest examination revealed the patient to be barrel-chested with decreased excursion. Breath sounds were diminished bilaterally with forced expiratory wheezes noted at the bases. Point of maximum intensity was displaced to the xiphoid process.

Laboratory findings revealed a normal CBC count and differential. A chest radiograph (Fig 1) showed mild hyperinflation and clear lung fields. The trachea deviated to the left with air under the trachea. There was no evidence of new cardiopulmonary disease when compared to previous radiographs.

**Figure 1.** Chest radiograph showing mild hyperinflation and clear lung fields with trachea deviation to the left.

**Figure 2.** CT scan revealing a 4.5-cm emphysematous bulla in the right apical region.

---

*From the Departments of Surgery (Dr. Olenchock) and Medicine (Dr. Rowlands), the Research Institute (Dr. Reed), and Divisions of Cardiothoracic Surgery (Dr. Garzia) and Pulmonary and Critical Care Medicine (Dr. Zasik), St. Luke’s Hospital and Health Network, Bethlehem, PA.

Manuscript received June 11, 2002; revision accepted November 12, 2002.

Reproduction of this article is prohibited without written permission from the American College of Chest Physicians (e-mail: permissions@chestnet.org).

Correspondence to: Stephen A. Olenchock, Jr., DO, St. Luke’s Hospital, Department of Surgery, 801 Ostrum St, Bethlehem, PA 18015; e-mail: olenchock@pol.net
A CT scan of the chest was obtained (Fig 2, 3). It revealed a 4.5-cm emphysematous bulla in the right apical region. The bulla extended medially into the thoracic inlet and posterior to the trachea, displacing the mediastinum to the left and compressing the esophagus and trachea. A ventilation/perfusion scan revealed a ventilation defect in the apex of the right lung.

What is the diagnosis?

**Figure 3.** CT scan showing the bulla extended medially into the thoracic inlet and posterior to the trachea, displacing the mediastinum to the left and compressing the esophagus and trachea.
Diagnosis: Herniation of an emphysematous bulla into the mediastinum as a result of increased intrathoracic pressure from foreign body aspiration and performance of the Heimlich maneuver.

Several factors contributed to this rare complication of bullous emphysema. The underlying disease process is characterized by abnormal enlargement of the air spaces distal to the terminal bronchiole, accompanied by destruction of their walls and without obvious fibrosis. These anatomic changes result in decreased elastic recoil, increased airway resistance, and decreased maximal expiratory flow rates. The lungs become hyperinflated and may demonstrate focal areas of bulla formation, which are thin-walled structures with diameters > 1 cm. They are most commonly seen in the upper portions of the lung, are relatively avascular, and do not participate in gas exchange.1

Foreign body aspiration results in an acute increase in airway resistance and intrathoracic pressure. A person who aspirates a foreign body reflexively performs the Müller maneuver in an effort to cough. The Müller maneuver generates negative intrathoracic and transpulmonary pressures with attempted inspiration against the obstruction. Following the attempt to inspire, the choking individual attempts to cough. The cough reflex begins with closure of the glottis and contraction of the abdominal and thoracic expiratory muscles. Intrathoracic pressures may exceed 200 mm Hg with each cough, increasing the force of expiratory flow. When observers of a choking victim initiate the Heimlich maneuver, external forces are applied by performing subdiaphragmatic thrusts. This lifesaving technique facilitates the expulsion of the foreign body by increasing intra-abdominal pressures, exaggerating the role of the diaphragm during expiration, and increasing intrathoracic pressure.2

All of these factors played a role in the herniation of the bulla as seen on the CT scan. The patient was referred to thoracic surgery for thoracotomy and repair. Examination of the pleural space revealed an adhesion between the apex of the right lung and the mediastinal pleura, with a large bulla herniated into the mediastinum. The patient underwent a right upper lobe bulla resection. He had an uncomplicated postoperative course and was discharged to home on the fourth postoperative day.

This case demonstrates a rare complication of bullous emphysema from increased intrathoracic pressure. Spontaneous pneumothorax is a much more common occurrence in this situation.

References