

Persistent Central Bronchospasm Caused by Esophageal Ulcer Complicated with Esophageal Fistula and Mediastinal Abscess

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Abstract

Bronchospasm caused by an esophageal fistula or mediastinal abscess is not uncommon. Most of patients occur in small and medium-sized airways. It is rare to take the presentation of persistent central branch tracheal spasm and acute hypoxia as the primary symptoms. This article describes a 63-year-old female patient had a 1-day history of wheezing. Chest CT scan showed evident extensive stenosis of the bilateral central bronchi, and the formation of an abscess around the esophagus. Esophagoscopy revealed esophageal fistula. The patient received a series of anti-infective, antispasmodic, and antiasthmatic therapy methods, and recovered soon. Esophageal fistula caused by esophageal ulcer could occur in some tumor patients, resulting in mediastinal infection for the patients. But esophageal ulcers caused by accidental fishbone stuck in the throat are seldom. Most of the patients firstly may present with some symptoms related to digestive system organs. The study demonstrates the case is the rare presentation of a persistent central bronchial spasm caused by an esophageal ulcer, esophageal fistula, and mediastinal abscess induced by fishbone. We suggest that when patients accidentally are stuck in the throat with fishbone, they should seek medical assistance timely to make a definite diagnosis and treatment as early as possible.

Keywords: Esophageal ulcer • Esophageal fistula • Mediastinal abscess • Bronchospasm

Introduction

Bronchospasm is characterized by spasmodic contraction of bronchial smooth muscle, narrowing of the airway, increased resistance during ventilation, dyspnea, and clinical manifestations of acute hypoxia, or carbon dioxide retention state. Most bronchospasm occurs in patients with chronic obstructive pulmonary disease, bronchial asthma, or increased vagus nerve excitability induced by anesthesia or surgery [1,2]. Bronchospasm often occurs in the small airway of the lung and rarely causes the central bronchial spasm. At the same time, accidental fishbone stuck in the throat is easy to cause digestive tract symptoms such as foreign matter sensation in the pharynx. But the occurring of acute hypoxia symptoms induced by it is rare. We report a case of acute hypoxia caused by esophageal fistula, mediastinal bacterial abscess, and persistent central bronchial spasm induced by fishbone.

Case Presentation

A 63-year-old female with a 1-day history of dyspnea presented to an urgent care in a department of respiratory and critical care of Rongcheng People's Hospital in Weihai, China. Looking back upon her history, the patient also has a 7-day history of swallowing discomfort, 2-day history of mild coughing and expectoration. When the patient had eaten some fish seven days ago, she stated that she had some uncomfortable symptoms with dysphagia, foreign matter sensation in the pharynx, without dysphagia, retrosternal burning sensation, acid regurgitation, belching, the upper belly pain, and abdominal

distension et al. She had a mild cough two days ago and felt coughing a small amount of white sticky sputum. She also felt chest tightness and shortness of breath when being light exercise. But she had no fever or chills. One day ago, she felt that the symptoms of cough and expectoration were worsening further. In the end, the patient felt noticeable wheezing, and she was unable to lie down. Only when she was in the sitting position state, she felt the symptom of wheezing slightly relieved. At the same time, she became febrile to 38.6 °C. Meanwhile, she also accompanied by symptoms of dysphagia and choking when drinking water. The patient had no history of hypertension, diabetes, coronary heart disease, and cerebral infarction, and also no history of bronchial asthma, chronic obstructive pulmonary disease, trauma, and surgery et al.

On admission, the physical examination revealed a body temperature of 38.5°C, heart rate of 110 beats per minute, the respiration rate of 26 beats per minute, blood pressure of 140/96 mmHg, and oxygen saturation of 86% when the patient was breathing ambient air. The patient was in a sitting and breathing state and could not lie on her back; her lips were cyanotic. Lung auscultation revealed wheezing rale, which was obvious at end-of-breath, and no moist rale. Some subsequent laboratory results revealed abnormal data as follow: WBC (white cell counts) of $16.3 \times 10^9/L$, of which 86.6% were neutrophils (reference value <75%). CRP (C-reactive protein) of 108.6 mg per liter (reference value, <21.4 mg per litre). PH (acidity or alkalinity gradients range) of 7.47 (reference value, 7.35-7.45), PCO_2 of 33.3 mmHg (reference value, 35-45 mmHg), PO_2 of 71 mmHg (reference value, ≥ 90 mmHg), HCO_3^- of 25.1 mmol per litre (reference value, 22-27 mmol per litre). A chest Computed Tomography (CT) scan taken on the hospital on day 1 showed a series of abnormal manifestations: First, obvious and extensive stenosis of bilateral left and right main bronchus. Second, inflammatory exudative lesions of the lung with a small amount of pleural effusion on both sides. Third, the density shadow of soft tissue after bronchus carina, which was suspected diagnosis of enlarged lymph nodes or esophageal lesions (Figure 1A).

After admission, we diagnosed the lesion as a series of names as follow: Firstly, central bronchial stenosis; Secondly, pulmonary infection; thirdly, mediastinal infection; fourthly, esophageal tumor? Considering the presence of incomplete obstruction of the main bronchi, we took care of the patient under an ECG monitoring, with high-flow oxygen inhalation, inhalation of terbutaline

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and budesonide, and cefoxitin treatment to control infection et al. remedial measures. After six hours, the oxygen saturation of the patient rose from 86% to 92%, and the symptoms of her wheezing eased, but her movement ability was limited, and she could not take the supine position. Otherwise, she would experience significant difficulty breathing. ECG monitoring showed her heart rate fluctuated from 90 to 110 beats per minute, and the pulse oxygen monitoring data showed that the oxygen saturation fluctuated between 92% and 94%. On days 3 of hospitalization, the patient felt that her wheezing symptom was significantly reduced in the resting state, and she could lie flat to have a rest. She was accompanied by a mild cough, reducing sputum volume, without any fever symptoms.

A contrast chest CT scan of mediastinal showed the following images that patchy increased density in the right lung, which was more significant than the previous range and the boundary of the lesion, was not clear. The bilateral pleural effusion area was more extensive than before, the trachea and bronchi were unobstructed, and the lumen of the left and right central bronchi became significantly dilated than before, the wall of which did not become thickened (Figure 1B). We also found that multiple soft tissue masses after the tracheal carina within the mediastinum, and the adjacent esophageal wall becoming more thickened, with a maximum thickness of about nine mm; multiple soft tissue masses and inhomogeneous enhancement of the thickened esophageal wall after tracheal carina inside the mediastinum. We considered them as the following diagnoses: First, esophageal wall partial thickening, inflammatory lesions? Tumor? Second, multiple soft tissue shadows under the tracheal Carina and in the posterior mediastinum, which were considered as mediastinal infection and multiple abscesses? Third, pulmonary inflammatory lesions; fourth, bilateral pleural effusion (Figures 1C and 1D). Esophagoscopy examination showed that there was a five-mm-diameter fistula in the right posterior wall of the esophagus, from which a large amount of pus flowed out. It's about thirty-one-cm-distance from the incisors. The surrounding mucosa is congested, and the relaxation and peristalsis are regular. We diagnosed the lesion with esophageal fistula (Figure 1E).

Discussion

Bronchospasm refers to the reversible spasmodic contraction of a bronchial smooth muscle caused by some pathogenic factors, narrowing of the airway, complete or incomplete airway obstruction, and increased resistance in the process of ventilation. The primary manifestation of which is expiratory dyspnea, hypoxia or carbon dioxide retention in the body, and acute respiratory failure occurs, for severe cases, it can lead to malignant clinical events such as cardiorespiratory arrest. Previous studies have shown that bronchospasm often occurs in patients with bronchial asthma, chronic obstructive pulmonary disease, heart failure, and allergies. Bronchospasm in the hospital or nosocomial bronchospasm often occurs in the perioperative

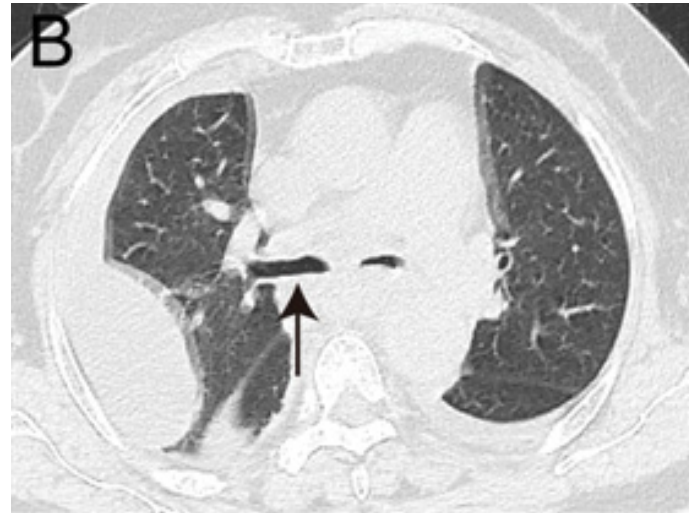


Figure 1B. On hospital day 3, the short arrow represents the narrow bronchus dilated, and the degree of bronchospasm improved than before.

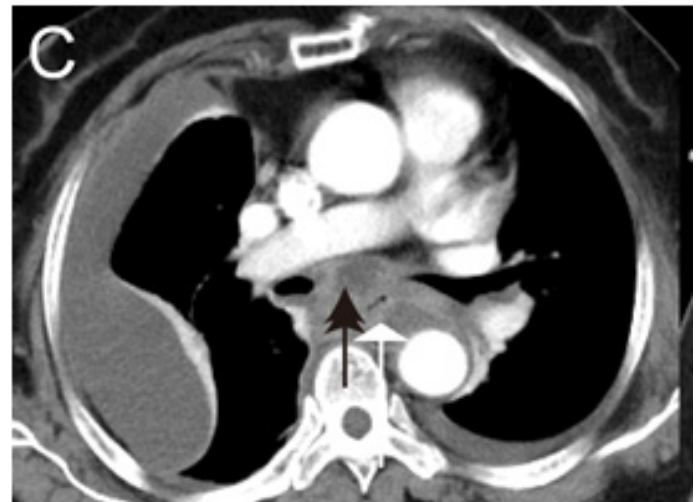


Figure 1C. On third day of hospitalization, the enhanced CT cross-sectional image shows that the low-density area pointed by the black arrow is the formation of small abscesses beside the esophagus in the mediastinum and the white arrow points to the esophagus.



Figure 1D. The mediastinal axial CT image shows a double black arrow representing the esophagus and a white arrow representing a small abscess in front of the esophagus in the posterior mediastinum.

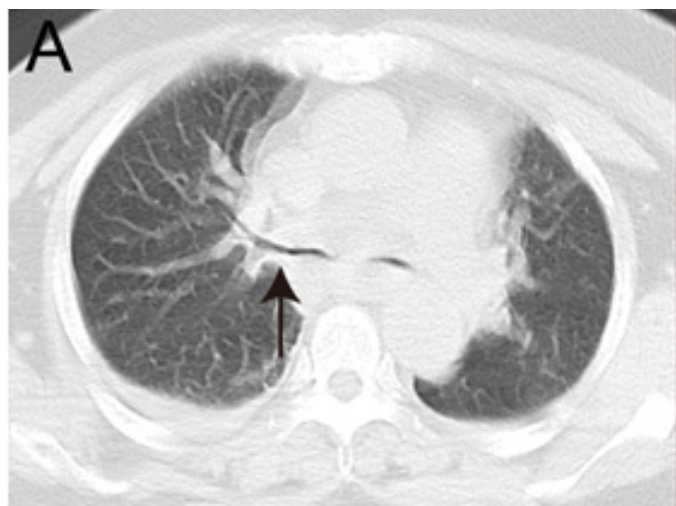


Figure 1A. The short arrow represents the main bronchus in spasm on admission.

period or is induced by endotracheal intubation, anesthetic induction, artificial pneumoperitoneum, and surgical stress [3,4].

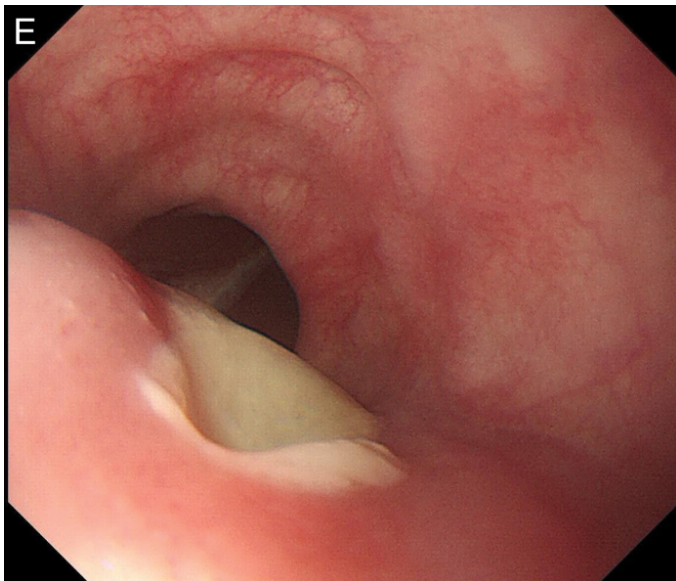


Figure 1E. On hospital day 7, Esophagoscopy reveals a massive discharge of pus in the fistula.

The mechanism of bronchospasm is related to chronic inflammation of bronchial mucosa, airway hyperresponsiveness, and increased excitability of the vagus nerve. Increased excitability of vagus nerve, activation of acetylcholine released, or neurohumoral stress reflex can make airway smooth muscle in a highly sensitive state and induce bronchospasm. Previous studies have reported that occult mediastinal emphysema during artificial pneumoperitoneum could induce bronchospasm [5,6]. Asthma-like symptoms often accompany gastroesophageal reflux disease. In severe cases, respiratory tract obstruction symptoms can often occur, which is also known as "gastroesophageal laryngeal organ syndrome." We speculated that the etiology is related to gastric contents returning to the esophagus, stimulating the mucosal receptors in the middle and lower part of the esophagus, and inducing bronchospasm by vagus nerve reflex [7,8].

However, the cases mentioned above report that bronchospasm mostly occur in the small airway, and the symptoms appear transiently, which could rapidly improve in a short time (usually about one hour or so) after administration when the patients received the treatment with hormone and bronchodilator drug. But the CT images of this patient show that the spastic stenosis of the left and right sides main bronchi is mainly persistent. There is a diffuse bacterial infection around the esophagus, visible accumulation of pus, and the formation of multiple purulent cavities around the esophagus in the posterior mediastinum. The esophagoscopy reveals an esophageal fistula and purulent secretion in the fistula. The diagnosis of esophageal fistula, posterior mediastinal infection, and abscess formation was explicit and decisive for the patient. Analysis of the causes of incomplete airway obstruction may be due to esophageal fistula complicated with mediastinal infection and multiple abscesses in the posterior mediastinum, especially the small abscesses directly stimulating the bronchial wall leading to persistent spasm and contraction of bronchial smooth muscle. At the same time, the purulent secretion in the posterior mediastinum stimulates the vagus plexus around the esophagus in the thoracic cavity, the hypersecretion of acetylcholine leads to the dysfunction of bronchial smooth muscle relaxation and contraction effect. Furthermore, the persistent spasm of the bronchial wall and lumen stenosis are also one of the essential reasons. Mediastinal infection is rare. And secondary mediastinal bacterial infection usually occurs in patients after tracheal or esophageal surgery or in patients with diabetes or immunodeficiency. This patient with esophageal fistula takes acute airway obstruction as the first symptom, and the manifestation is rare in the clinic. Esophageal fistula often has definite causes, such as esophageal fistula caused by trauma or esophageal ulcer, and esophageal fistula also caused by esophageal tumor or operation, esophageal diverticulum, Behcet's

disease and other immune connective tissue diseases with an esophageal ulcer. Some patients can also have esophageal fistula due to mediastinal lymph node inflammation, granuloma rupture, and erosion of the esophageal wall.

Among the etiological factors of middle esophageal ulcer, idiopathic esophagitis and reflux esophagitis are the most common disease. This patient had no medical history of trauma, surgery, drug abuse, diabetes, immune connective tissue disease, and tumor. The patient has ruled out the possibility of esophageal ulcers caused by reflux esophagitis with endoscopy. At present, the etiology of the esophageal fistula is not wholly determined. Because the patient comes from coastal rural areas, her daily diet mainly include all kinds of seafood, and the fish-based diet in this area contains all kinds of hard fish bones. At the same time, sadly, she also has a wolfing eating habit in this patients' daily lifestyle. We go back to history, and the patient remembers that she suddenly felt uncomfortable swallowing and extraneous matter sensation in her throat when eating fish. We speculate that there should be a high possibility of esophageal fistula caused by esophageal ulcers induced by fishbone infection in the wall of the esophagus. On admission, we have given a series of treatments to the patient with fluid feeding through a nasogastric tube inserted and antibiotics drug et al. On hospital day 7, the re-examination of esophagoscopy revealed a five-mm-diameter mucosal ulcer in the original place on the right posterior wall of the esophagus, white fur at the bottom of the ulcer, and no visible pus and fistula. Esophageal endoscopic ulcer histopathological examination showed chronic inflammatory changes. One month later, The CT examination showed that the mediastinal inflammation was absorbed and cured, and esophageal endoscopy showed that the ulcer had disappeared. We further deduce that the pathogen of illness for the patient may be persistent bronchial spasm induced by esophageal fistula caused by a benign esophageal ulcer, which is consistent with the reasonable inference of esophageal fistula, mediastinal abscess and left and right central bronchospasm caused by accidental fishbone thorn into the esophagus.

Conclusion

In this case, the imaging features and clinical symptoms of the central branch tracheal spasm are typical, and the difficulty in breathing caused by persistent central bronchospasm also is the primary presenting symptom for the patient. A chest CT enhanced scan supplies the abundant evidence of infection around the posterior mediastinum and multiple abscesses with diagnostic imaging. The esophagoscopy can play an essential role in identifying the underlying etiology, so the imaging findings are typical, and the case is rare.

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