Recurrent Cough and Expectoration for 10 Years: A Case Report

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Abstract
Rationale. Most cases of cystic fibrosis occur in Europe, with only a few occurring in Asia. Pulmonary cystic fibrosis is not a rare disease, but in children it is a potentially life-threatening condition. Children suffering from pulmonary cystic fibrosis rarely survive to adulthood, and responses to treatment are generally poor. The most common cause of cystic fibrosis is a genetic mutation on chromosome 7. Patient concerns. A 15-year-old boy with healthy parents suffered from a recurrent cough and expectoration for nearly 10 years. Six years previously, a definitive diagnosis of pulmonary cystic fibrosis and hepatic cirrhosis was made at the Beijing Children’s Hospital. The first occurrence of hematemesis occurred 1 year ago. The main symptoms, which caused this period of hospitalization, were cough, expectoration, and hematemesis. Diagnoses. The underlying cause was finally determined to be the cystic fibrosis transmembrane conductance regulator gene (p.G970D). After genetic and sweat testing performed at the Beijing Children’s Hospital in 2012, a definitive diagnosis of cystic fibrosis was made. Interventions. The patient was administered hemostatic treatment, antibiotics, and cough relief and sputum reduction therapy. Outcomes. The patient’s condition rapidly improved and continued to remain stable, though future relapse is possible following respiratory tract infections. Lessons. This case indicates that in the case of any child that presents a recurrent cryptogenic cough and expectoration, whether accompanied by hematemesis or not, pulmonary cystic fibrosis should be considered. In order to determine underlying causes and prepare for cystic fibrosis transmembrane conductance regulator modulator therapy, genetic and sweat testing are recommended to be conducted if available.

Keywords
pulmonary cystic fibrosis, hematemesis, cystic fibrosis transmembrane conductance regulator

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Introduction
Pulmonary cystic fibrosis (CF) is not a rare disease, but it is a potentially life-threatening disease in children. The most common cause is a genetic mutation on chromosome 7. Clinical symptoms may be aggravated by respiratory tract infections. This study describes the case of a 15-year-old boy who suffered from a recurrent cough and expectoration over a 10-year period, the underlying cause of whose symptoms clearly being pulmonary CF, as confirmed through genetic and sweat testing.

Case Presentation
On February 20, 2017, a 15-year-old boy with a 10-year history of recurrent cough and expectoration was presented. A definitive diagnosis of pulmonary CF was made through genetic testing (mutation on p.G970D) and sweat testing at the Beijing Children’s Hospital in 2012. Additionally, a definitive diagnosis of hepatic cirrhosis was also made at the Beijing Children’s Hospital 6 years previously. The first episode of hematemesis occurred in June 2017, which improved after an antibiotic’s regimen and hemostasis treatment.

Six days earlier, the patient’s parents reported he had begun coughing again, accompanied by sticky white and yellow sputum, chest pain and distress, nausea without dyspnea, hemoptysis, and so on, and presented a fever, which reached a maximum of 38.0°C. Chest and upper abdomen computed tomography scans revealed double-lung emphysema and mild bronchiectasis complicated by multiple liver conditions including hepatic cirrhosis.
collateral circulation formation, and a slight amount of ascites. Examinations carried out on February 20, 2018, indicated the following abnormalities: blood count (white blood cell count = 10.3 × 10^9/L, hemoglobin = 131 g/L, platelet = 130 × 10^9/L), liver functionality (total bilirubin = 136.9 µmol/L, aspartate transaminase = 76.9 U/L, alanine transaminase = 63.5 U/L), levels of prothrombin time (18.1 seconds), and activated partial thromboplastin time (48.6 seconds). Other biochemical tests, including C-reactive protein, were normal, and the serum G test was positive (135.50 pg/mL). Pathogens including methicillin-resistant Staphylococcus aureus, Pesudomonas pyocyaneum, gram-positive cocci, fungi, and Mycoplasma pneumonia immunoglobulin M were all detected from the sputum culture, gram stain, serum G test, and respiratory tract profile (immunoglobulin M), while tuberculosis was absent from the sputum culture and tuberculin skin test. The patient was diagnosed with bronchiectasis, complicated by infection, CF lung, esophagogastric vein ligation (postoperative), hepatic cirrhosis decompensation, chronic disease-related malnutrition, hyperbilirubinemia, multiple organ failure (heart, liver, lung), and acquired coagulation dysfunction. These symptoms resolved after administering antibiotics and nutritional supplementation. However, after a transfusion of approximately 250 mL of fresh blood on March 6, 2018, the patient suffered a sudden episode of hematemesis, accompanied by dizziness, weakness, palpitations without fever, tachypnea, and loss of consciousness. On admission the patient was treated by hemostasis under endoscopic and other supportive agents. The patient’s symptoms rapidly improved, and he was soon discharged.

Figures 1 and 2 show respectively double-lung emphysema, minor bronchiectasis complicated by infection, and diffuse liver diseases.

**Discussion**

CF is a genetic multi-organ disease predominantly characterized by pulmonary involvement, typically resulting in respiratory failure and premature death. Most patients with pulmonary CF die from related complications, such as respiratory failure or pulmonale. Recent advances in genetic functions research and genetic testing have made it possible to make accurate early diagnoses of suspected CF and mutation-specific therapies, and the prospect of truly personalized medicine enable patients to enjoy a high quality of life, even into adulthood.

Pulmonary CF is characterized by inflammation and reshaping of the airways in addition to mucus accumulation, leading to respiratory symptoms such as coughing, expectoration, chest distress, and shortness of breath. In severe cases, respiratory failure and pulmonary heart disease will follow. Diagnostic confirmation should be focused on positive observation of suggestive clinical features in both children and adults, but may also be accomplished through positive sweat testing or review of family history in the case of asymptomatic infants. The objective of CF treatment is to prevent respiratory tract infection, reduce the quantity and viscosity of lung mucus, improve breathing function, and maintain adequate nutrition. When available, some patients may also be treated using CF transmembrane conductance regulators. Though cited as the most promising approach, genetic-level treatment is currently lacking.

Four years ago, at age 11, the patient was accurately diagnosed with pulmonary CF and hepatic cirrhosis, in addition to other complications, which severely affected his quality of life. If this diagnosis were to have been made when he primarily presented a recurrent and unexplained cough, and if given appropriate treatment, his
quality of life and life expectancy might be much better. This case serves as a reminder that children with recurrent coughs and multiple organ damage should be identified with CF.

Author Contributions
TH: Contributed to conception and design; contributed to acquisition; drafted manuscript; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.
CL: Contributed to design; contributed to analysis; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.
DL: Contributed to conception; contributed to analysis and interpretation; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

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Informed Consent
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