



Plastic bronchitis associated with influenza virus infection in children: A report on 14 cases



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ABSTRACT

Background: Plastic bronchitis (PB) is a rare disease characterized by formation of bronchial casts. It is usually associated with congenital heart disease, sickle cell disease, lymphoma, and lung diseases such as asthma and pneumonia.

Objectives: To report 14 cases of PB with influenza A or influenza B infection.

Methods: We analyzed the clinical manifestations, bronchoscopic and histologic findings, clinical courses, and outcomes.

Results: These cases indicate that PB is a life-threatening complication of severe influenza. Plastic bronchitis should be considered in the diagnosis of children with acute respiratory distress such as lung atelectasis accompanied by influenza.

Conclusions: Diagnosis should be made by bronchial endoscopy and histopathology, and bronchial casts removed as early as possible.

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1. Introduction

Most patients with seasonal influenza exhibit self-limited symptoms and recover without complications [1]. However, the recent emergence of several new contagious influenza strains, such as H1N1 [2] and avian influenza A (H5N1) [3], underscore the potential dangers of influenza. Plastic bronchitis (PB) is a potentially fatal complication of severe influenza, occurring most frequently in children [4]. It is characterized by the formation of obstructive bronchial casts, often leading to acute respiratory failure [5]. In the current report, we recorded and analyzed the clinical manifestations, bronchoscopic and histologic findings, clinical courses, and outcomes of 14 children with PB associated with influenza virus infection admitted to our Pediatric Intensive Care Unit (PICU) from August 2009 to April 2013.

2. Materials and methods

2.1. General information

Fourteen children with PB associated with influenza A or influenza B virus infection were admitted to the PICU of

Guangzhou Women and Children's Medical Center from August 2009 to April 2013. Over the same period of PICU, 41 patients with influenza were studied (FA, 31 cases, FB, 10 cases). There were 1459 cases of influenza in hospitalized children during the same period (41/1459, 2.8%). 41 cases were tracheal intubation mechanical ventilation, and 20 (20/41, 48.8%) of them were performed with fiberoptic bronchoscopy, 14 patients were diagnosed as PB, and 6 other cases were diagnosed as endobronchial inflammation. All 14 cases involved Chinese boys, age 1 year and 10 months to 4 years and 9 months of age (median: 3 years). Cough, fever and wheezing (Table 1) were the most common initial symptoms. Throat swabs and reverse transcription polymerase chain reaction detection was used to confirm influenza A or B infection. One case occurred in 2009, 3 in 2010, 3 in 2011, and 6 in the winter of 2012, accounting for 0.17% (1/600), 0.9% (3/327), 1.13% (3/266), and 1.35% (6/445) of all children hospitalized with influenza, respectively. One case (4.5%, 1/22) occurred in spring of 2013. Four cases were accompanied by underlying diseases. Two patients had a history of wheezing, one patient had allergies with skin rash, and one had nephrotic syndrome.

2.2. Clinical manifestations

All patients had fever, aggravated cough, wheezing, and breathing difficulties on admission. The median duration of symptoms at admission was 3 days. Three patients had suspected

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Table 1
Clinical characteristics of Patients with PB comparing with non-PB influenza infection patients.

Groups (case)	Age (average value)	Gender (case)	First symptom (case)	Imaging features	Treatment	Mechanical ventilation (average)	Bronchoscopy findings/biopsy	Prognosis
Non-PB FA/FB infection (27)	3 Years, 7 months-10 years)	Male (21) female (6)	Fever (27), cough (27), tachypnea (6), wheezing (6)	Increased bronchovascular shadows (20), lung patchy, opacity (12), heaves (4)	Bronchofiberscope (6), steroid (20), endotracheal intubation and mechanical ventilation (27)	5.1 Days	Bronchial hyperemia and edema, white sticky phlegm (6), pathological examination of fibrinoid material, neutrophil (2)	Complete recovery (27)
PB (14)	3 Years (1 year 10 months-4 years 9 months)	Male (14)	Cough (14), fever (14), wheezing (11) respiratory distress (8)	Infiltration shadow (11), atelectasis (9), cutaneous emphysema (3), pneumothorax (2)	Bronchofiberscope (14), steroid (14), endotracheal intubation and mechanical ventilation (14)	4.3 Days	Pathological examination of endobronchial hyperemia and edema, see plastic like material in the bronchi (7), I type (7), undo (7 cases)	Complete recovery (12), recurrence (1), death (2)

foreign body aspiration (3/14 cases, 21%). Other patients had allergies (1/14 cases, 7%), a history of wheezing from common cold but no underlying diseases (3/14 cases, 21%), and nephrotic syndrome (1/14 cases, 7%). The other 10 patients were previously healthy. The median of white blood cell count on admission was 15.3×10^9 and an increase in the proportion of neutrophils was observed (median: 82.1%). An increase in serum C-reactive protein was also recorded in 13 patients (median: 18.6 mg/L). Ten cases had increased serum IgE (median: 987 IU/mL), six increased aspartate aminotransferase (median: 337 U/L), eight elevated lactate dehydrogenase (median: 525 U/L), and six cases exhibited both increased creatine kinase (median: 1055 U/L) and creatine kinase isoenzyme (median: 70 U/L). Arterial blood gas analysis indicated that all patients had respiratory failure, four patients with hypoxemia and 10 with hypoxemia and hypoventilation.

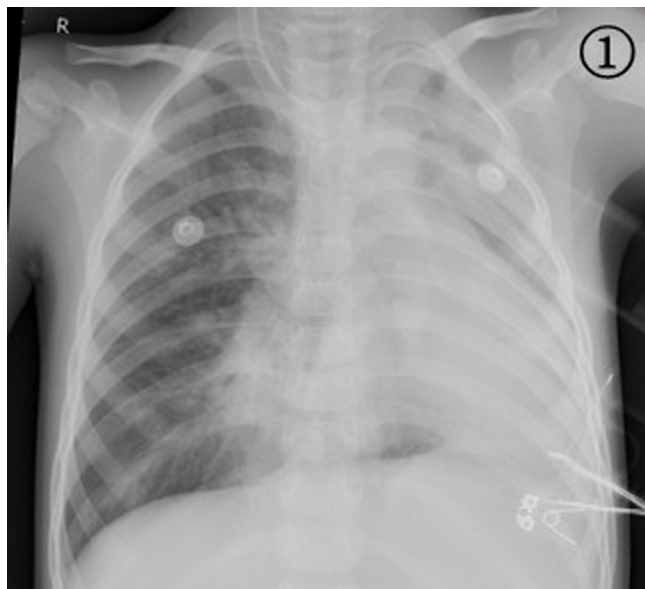


Fig. 1. A 3-year-old boy with a 4-day history of fever and a 3-day history of cough and shortness of breath was admitted to the PICU and diagnosed with plastic bronchitis and influenza A virus infection. Chest X-ray before bronchoscopic removal of casts reveals shadows in bilateral lung and atelectasis in the left lower lobe.

The most common radiographic finding was atelectasis (Fig. 1) (9/14 cases, 64%) and patchy inflammatory effusion (11/14, 79%). Five cases of atelectasis occurred in the left lung, three in the right lung, and one in the bilateral lung. Ten cases with patchy inflammation effusion occurred in the bilateral lung, whereas one case occurred only in the right lung. Two patients had pneumothorax (14%), one mediastinal emphysema (7%), three Subcutaneous emphysema (21%), and eight parapneumonic effusion (57%) (Table 2).

2.3. Treatment and prognosis

All patients were admitted in the PICU and required endotracheal intubation, mechanical ventilation, and flexible bronchoscopy. Bronchial lavage under sedation and local anesthesia was performed in all patients. Yellow or white viscous sputum and several tree-like casts were extracted from the bronchi (Fig. 3). Four cases underwent repeated bronchoscopy because symptoms such as shortness of breath and hypoxia show little improvement after the first bronchial lavage procedure. Lung shadows on chest X-ray gradually diminished after bronchial lavage (Fig. 2). Histological examination of the bronchial casts in seven patients revealed fibrinous materials containing large numbers of eosinophils, neutrophils, and lymphocytes.

All cases were treated with systemic corticosteroids and antibiotics. Eight cases were given oseltamivir, and the one case with nephritic syndrome required blood-purifying therapy because of severely impaired renal function. All patients required endotracheal intubation and mechanical ventilation from one to 12 days (median: 5 days and 18 h). The indications for bronchoscopy were the following. Chest X-ray examination showed four cases with bronchial foreign body, one case with atelectasis, and eight cases with poor response to mechanical ventilation. In 12 cases, removal of casts resulted in alleviation of dyspnea, and chest X-rays revealed a marked improvement in lung condition. Re-examination revealed no patchy shadows on chest X-ray or computed tomography at discharge from the hospital. After a series of effective treatments, 11 patients recovered without recurrence (78.6%), while one patient with PB associated with influenza A virus infection was infected severely with influenza B virus two months later. Unfortunately, two children (2/14 cases, 14.3%) admitted in the PICU died, one due to hypoxia 12 h after admission and the other from multiple organ failure 4 days after admission. Other patients without recurrence of respiratory infection, asthma attack, and PB were discharged within one year.

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