

Case report

Plastic bronchitis in a child with acute dyspnea and atelectasis: A case study

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Plastic bronchitis is an uncommon pathologic cast formation in the tracheobronchial tree. A bronchial cast can cause a range of conditions ranging from mild to severe that can lead to airway obstruction. We describe a previously healthy one-year-old boy who developed acute left lung atelectasis and respiratory distress due to plastic bronchitis. He presented with a high-grade fever and productive cough. His chest x-ray showed total left lung atelectasis. His condition did not rule out the presence of a foreign body in the airway or an obstruction due to secretion. Plastic bronchitis obstructing the left main bronchus was diagnosed and removed by rigid bronchoscopy. Bronchoscopy was crucial in this case for both diagnosis and therapeutic cast removal; however, understanding of the regulation of mucus production and clearance is vital for the prevention of new secretion obstructions. *Chiang Mai Medical Journal* 2020;59(1):29-32.

Keywords: plastic bronchitis, bronchial cast, children, atelectasis

Introduction

Plastic bronchitis, bronchial cast or fibrinous bronchitis, an uncommon airway obstruction condition, is characterized by cast formation in the tracheobronchial tree and can cause partial or complete airway obstruction (1,2). Even though this is a rare disease, it can cause life-threatening airway complications. Our case report describes the case of a 1-year-old boy who presented with two-day-high-grade fever with productive cough which was diagnosed as a bronchial cast associated with a hyperreactive airway.

Case report

The patient was a 1-year-old boy who presented with a high-grade fever and productive cough which began 2 days prior to arrival. He had a fever of 38.8-40.7 °C and tachypnea at 44 breaths/min. Intravenous cephalosporin, oral azithromycin and a salbutamol nebulizer were prescribed.

He had previously had an episode of wheezing at 10 months for which salbutamol nebulizers were given. His mother had earlier been diagnosed with allergic rhinitis. Two days later, the boy developed dyspnea and had oxygen desaturation in room air. Chest radiography showed total left lung atelectasis (Figure 1), so the patient was given oxygen therapy at 2 LPM and referred to hospital.

During physical examination, he looked dyspneic. His temperature was 39.3 °C, BP 114/72 mmHg, HR 130/min, RR 40/min, O₂ saturation (room air) 93%, body weight 9.5 kg. He had subcostal and intercostal chest wall retractions. Chest auscultation revealed decreased breath sound and dullness on percussion at the left lung.

Blood test results were as follows: complete blood count; Hb 10.7 g/dL, Hct 35.1%, WBC 8,500 cells/cm³ (69% polymorphonuclear cells, 31%

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Received: November 15, 2018, **Revised:** December 20, 2018; **Accepted:** December 22, 2018.





Figure 1. Chest X-ray showing total left lung atelectasis

mononuclear cells) and platelets $267,000/\text{mm}^3$. Blood chemistry results were glucose 90 mg/dL, BUN 6 mg/dL, creatinine 0.25 mg/dL, Na 139 mmol/L, K 4.2 mmol/L, Cl 101 mmol/L, CO_2 19 mmol/L. A nasopharyngeal swab for an influenza type A/B and RSV screening test was negative. Oxygen therapy of 3 LPM via oxygen cannula, cefotaxime (150 mg/kg/day) and azithromycin (10 mg/kg/day) were provided.

Forty-eight hours after the start of treatment, his symptoms had not improved. An otolaryngologist conducted an emergency bronchoscopy revealed multiple whitish materials in the left main bronchus. The bronchial casts were removed by rigid suction and foreign body forceps (Figure 2). Pathology evaluation found fibrinous materials rich in eosinophils (Figure 3). Special

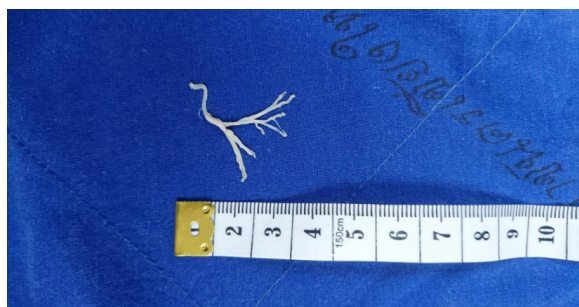


Figure 2. Material removed from the left main bronchus

stains (GMS and PAS) were negative for fungus.

After removal of the cast material, he looked well, chest auscultation recorded minimal rhonchi in both lungs, and a chest x-ray showed improvement. Salbutamol pMDI and fluticasone propionate via pressurized metered-dose inhaler (pMDI) were started. Two weeks after discharge, the boy was able to participate in normal daily life without dyspnea on exertion.

Discussion

Plastic bronchitis (mucoid impaction, fibrinous bronchitis, pseudomembranous bronchitis, Hoffman's bronchitis or cast bronchitis), is an unusual condition caused by the formation of bronchial plugs which partially or completely obstruct the bronchial lumen (1-5). These casts result in mild to moderate symptoms, e.g., fever, cough, dyspnea and chest pain; however, they can cause a life-threatening condition such as hypoxia or cardiac arrest. These symptoms are difficult to differentiate from a foreign body aspiration or an asthmatic attack. Similarly, physical examination reveals the same symptoms of decreased breath sounds and increased efforts to breathe. Chest radiography shows atelectasis of the affected side and hyperinflation of contralateral affected lungs in each of those cases (4,5).

Plastic bronchitis is categorized into 2 types of cast. Type 1 casts (cellular or inflammatory casts) are composed of neutrophilic or eosinophilic

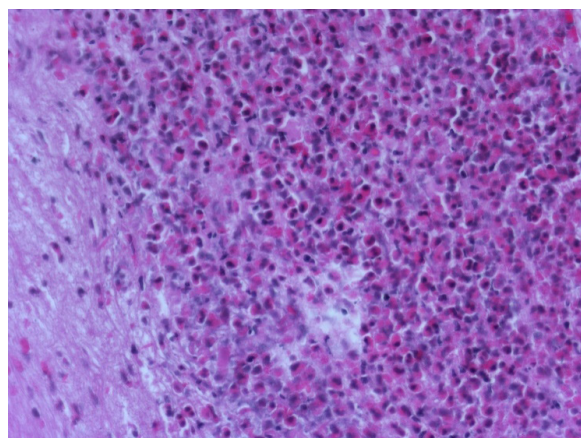


Figure 3. Material removed from left main bronchus was fibrinous and rich in eosinophils

inflammatory infiltrated fibrin, or Charcot-Leiden crystals which are associated with inflammatory or underlying allergic diseases such as asthma, pulmonary infection and cystic fibrosis. Type 2 casts are acellular casts or hypocellular casts which are composed of mucin. Type 2 casts are commonly associated with cardiac diseases, especially following Fontan surgery (1,4,6).

Bronchoscopy can help to confirm a diagnosis, revealing thick casts obstructing the airway. Removal of the casts is the accepted treatment for plastic bronchitis. However, is essential to not only remove the casts but also to determine the cause and treat the underlying diseases. A bronchodilator, corticosteroid, macrolide, or mucolytic and airway clearance therapy can be used for treatment. Other treatment options include aerosolized heparin, urokinase, tissue plasminogen activator (tPA) and dornase alpha. The progression and history of plastic bronchitis depends on the type of cast and the underlying diseases (7-10).

In this case, a 1-year-old boy presented with a high-grade fever and cough. Then, he developed total left lung atelectasis and did not respond to antibiotics and salbutamol nebulization, so the team investigated to rule out the foreign body aspiration using bronchoscopy. After the material was removed, he developed wheezing which responded to a salbutamol nebulizer. Pathology results showed infiltration of eosinophil in fibrinous materials which were associated with his underlying disease. Consequently, we treated him for hyperreactive airway disease and prescribed a controller.

When a child presents with respiratory distress and atelectasis but does not improve with initial treatment, a bronchoscopy should be carried out to rule out foreign body aspiration, airway abnormalities and plastic bronchitis. Although plastic bronchitis is a rare disease, it can result in serious airway complications and requires urgent treatment. Furthermore, causes and underlying diseases associated with plastic bronchitis need to be investigated.

Abbreviations

cm³: cubic centimeters, dl: deciliters, FiO₂: fraction of inspired oxygen, GMS: Gomori Methenamine Silver stain, kg: kilograms, LPM: liter(s) per minute, mg: milligram, ml: milliliter, mm³: cubic millimeter, mmol: millimol, PAS: Periodic Acid-Schiff stain, pMDI: pressurized metered dose inhaler, tPA: tissue plasminogen activator

Authors' contributions

KS wrote the first draft of the manuscript; KS, HK, PM and SR performed the clinical practice. All authors reviewed the manuscript and approved the final version.

Consent for publication

Patient/guardian consent was obtained for publication of this case report.

Ethics

This case report was approved by the Research Ethics Committee, Faculty of Medicine, Chiang Mai University

Acknowledgements

Chiang Mai University Hospital

Conflict of interest

No conflict of interest.

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รายงานผู้ป่วยเด็กโรค plastic bronchitis มาด้วยอาการหายใจเหนื่อยและปอดแฟบ

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Plastic bronchitis เป็นภาวะการอุดตันทางเดินหายใจจากการสร้างเสมหะเหนียวข้นที่พบได้ไม่บ่อย โดยอาการเป็นได้ตั้งแต่อาการเล็กน้อยจนถึงขั้นเสียชีวิต รายงานผู้ป่วยฉบับนี้รายงานผู้ป่วยเด็กชายไทยอายุ 1 ปี ได้รับการวินิจฉัยเป็น plastic bronchitis มาพบแพทย์ด้วยอาการไอสูง ไอมีเสมหะ ภาพถ่ายทางรังสีพบปอดแฟบด้านซ้ายทั้งหมด ซึ่งภาวะดังกล่าวไม่สามารถแยกได้จากการสำลักสิ่งแปลกปลอม การตรวจวินิจฉัยและการรักษาทำได้โดยใช้ rigid bronchoscope การใช้กล้องส่องตรวจทางเดินหายใจประเมินจะช่วยวินิจฉัยและรักษาผู้ป่วยเด็กที่มาพบแพทย์ด้วยอาการปอดแฟบและหายใจลำบาก นอกจากนี้การเข้าใจเกี่ยวกับพยาธิสภาพของการสร้างและการกำจัดเสมหะเป็นกุญแจสำคัญในการป้องกันการเกิดเสมหะอุดตันในระบบทางเดินหายใจ **เชียงใหม่เวชสาร 2563;59(1):29-32.**

คำสำคัญ: plastic bronchitis, bronchial cast, เด็ก, ปอดแฟบ