

Sweet Potato Was Not So Sweet: Undetected Foreign-body Aspiration in a Healthy Child Leading to Acute Bronchial Asthma

Yuri DOWA^{*1}, Yoshiyuki YAMADA^{*2}, Masahiko KATO^{*2,3}, Naoki MATSUMOTO^{*4}, Yuichi KAMA^{*2,3}
and Takashi SHIIHARA^{*1}

^{*1}*Department of Neurology, Gunma Children's Medical Center*

^{*2}*Department of Allergy and Immunology, Gunma Children's Medical Center*

^{*3}*Department of Pediatrics, Tokai University School of Medicine*

^{*4}*Department of Anesthesiology, Gunma Children's Medical Center*

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Introduction: Sweet potato may contain furanoterpenoids, including ipomeamarone, which cause lung edema.

Case presentation: A 10-year-old schoolgirl was hospitalized with asthma exacerbation and acute pneumonia. Chest radiographs showed a diffuse opacity of the left lung and hyperpermeability of the right lung. Computed tomography indicated foreign-body aspiration. Flexible bronchoscopy revealed an inhaled piece of sweet potato obstructing the left main bronchus. Although the patient's dyspnea worsened after removal of the sweet potato, she recovered with the treatment based on the 2014 Japanese Childhood Asthma Guidelines.

Conclusion: Cases of sweet potato aspiration need careful treatment after removal of the foreign body.

Key words: Aspiration, sweet potato, ipomeamarone, children, asthma

INTRODUCTION

Foreign body (FB) aspiration in the airways of children is a common cause of death in Japan [1]. The national "Healthy Parents and Children 21" campaign was launched in 2001 to promote a variety of approaches aimed to improve the health standards of mothers and children [2]. One target of this campaign was the prevention of accidental injury and death. Health care workers from different municipalities educated parents in accident prevention through the provision of handbooks for mothers and children, perinatal classes, and infant health checkups. The Japanese Society of Emergency Pediatrics and the Japanese Society of Pediatric Pulmonology produced a leaflet in 2013 and developed a Smartphone application [3, 4]. Through these efforts, FB aspiration fatalities in 2013 decreased to approximately one-sixth of the fatalities recorded in 1995 [3]. However, FB aspiration injuries continue to occur.

Sweet potato synthesizes and accumulates phytoalexins when infected by fungi. Farm animals fed moldy sweet potatoes develop interstitial pneumonia [5].

This report presents the case of a school girl who was admitted to the hospital with a severe acute asthma exacerbation due to sweet potato aspiration.

CASE PRESENTATION

A 10-year-old schoolgirl with normal intellectual functioning was transported to the hospital by an ambulance owing to acute exacerbation of bronchial asthma. She had difficulty breathing and woke up 6 h before hospitalization. Due to her poor response to inhaled β -stimulants with disodium chromoglycate, she could not lie down or sleep well. Four hours later, she was administered a second β -stimulant by inhalation; however, her dyspnea and pale face persisted. Her mother brought her to our hospital by their family car, where the patient presented with severe retraction and nasal alar breathing and had difficulty breathing when lying down. Her body temperature was 36°C, heart rate was 125 beats per minute, and percutaneous oxygen saturation was 87%. Her breath sounds were weak in the left lung field. Chest radiography revealed a diffuse opacity in the left lung, hyperpermeability in the right lung (Fig. 1), and slight mediastinal emphysema. Blood examination showed a peripheral white blood cell count of 5,600/ μ L and a C-reactive protein level of 0.4 mg/dL. Venous blood gas analysis results were as follows: pH, 7.35; pCO₂, 38.4 mmHg; pO₂, 34.8 mmHg; HCO₃, 20.4 mmol/L; and base excess, -4.3 mmol/L. She had no recollection of any recent choking episode or aspiration.

The patient showed no signs of intellectual disability and had a past history of bronchial asthma, which

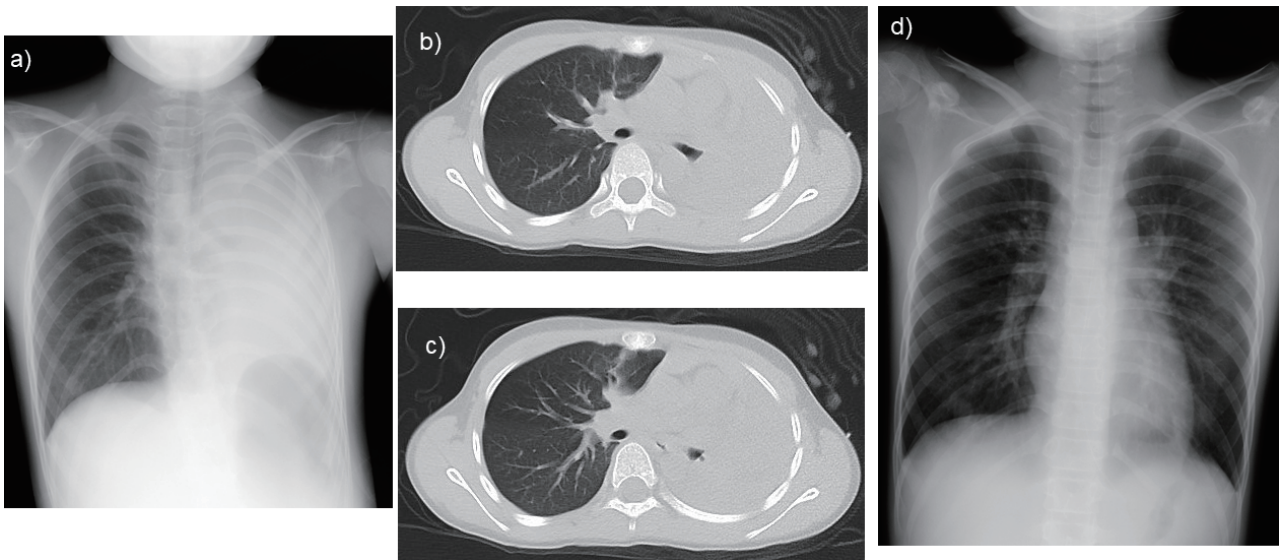


Fig. 1 Chest radiograph and computed tomography
 a) Left lung consolidation upon admission.
 b), c) The air in the left main bronchus disappeared halfway.
 d) After extubation, hyperpermeability and flattened diaphragm are noted in both lungs.

was well managed by her family doctor. She had not developed any respiratory symptoms following more than 3 months of treatment with oral pranlukast and disodium cromoglycate inhalation. Her asthma was considered well controlled according to the 2014 Japanese Guidelines for Childhood Asthma [6].

On admission, she was initially diagnosed with a severe acute exacerbation of bronchial asthma induced by atypical pneumonia and received an intravenous hydrocortisone sodium succinate injection (10 mg/kg/dose) and continuous dl-isoprenaline inhalation with 10 L/min oxygen. Despite 3 h of dl-isoprenaline inhalation and prednisolone administration (0.5 mg/kg/dose, every 8 h), her percutaneous oxygen saturation only reached a maximum level of 90%. Therefore, intravenous aminophylline (4 mg/kg/dose, every 8 h) was administered; however, she did not respond well to the medication. A chest computed tomography revealed a total collapse of the left lung (Fig. 1). FB aspiration was suspected, and she subsequently underwent intubation and flexible bronchoscopy. A piece of sweet potato was removed from the left main bronchus (Fig. 2). Before completion of the bronchoscopy, we confirmed that no small pieces of sweet potatoes remained in both bronchi. The child's mother then recalled that she had eaten baked sweet potato 4 days prior to the hospitalization.

After removal of the FB, her left respiratory sound became audible. However, her auscultation findings gradually changed to wheezy sounds in both lung fields. Her wheeze and retractive breathing worsened within 6 h after removal of the FB. She was unable to rest due to respiratory distress, despite receiving an increased dose of sedative drugs. Arterial blood gas analysis indicated hypocarbonemia and hyperventilation. Although intravenous aminophylline administration improved her respiration, it had a limited effect. After she had been extubated, her chest radiography revealed bilateral pulmonary hyperinflation. She was treated with continuous dl-isoprenaline inhalation with 10 L/min oxygen, nasal high-flow therapy, predniso-

lone (2 mg/kg/day), and an aminophylline intravenous infusion (4 mg/kg/dose, every 8 h), following which her respiratory status improved. She was eventually discharged 12 days post-admission.

We informed the patient and her parents about the research and obtained their consent.

DISCUSSION

Among children, FB aspiration and inhalation can lead to severe sequelae [7]. FB injuries can be asymptomatic or the symptoms can be non-specific [8]. Choking, an acute cough, and a prolonged cough are the most-common presenting symptoms [9–12]. Moreover, on examination of children with FB aspiration, diminished breath sounds in the right lung (19.6%) and the left lung (30.4%) were heard, followed by wheezing (26%) and stridor (5.4%) [9].

Gregori *et al.* reported that the major common complications of FB aspiration were bronchitis and purulent bronchitis (12%), bronchospasm (10%), dyspnea (9%), pneumonia and/or atelectasis (20%), pneumothorax (6%), and odynophagia (3%) [13]. They also reported that the most-common FBs that caused complications were nuts, seeds, berries, peas, corns, and beans (64%) and fish bones (12%).

FB aspiration symptom patterns are not usually identical. When FB aspiration is not witnessed, there is a high risk that the symptoms may be misdiagnosed as a gastrointestinal or respiratory infection. Symptoms seem to depend primarily on the anatomical location [8]. FB aspiration injury may present with a non-specific onset and with various symptoms, clinical course, and examination results. Therefore, the injury is usually diagnosed within a 2-h to 5-month time frame [7]. Previous reports have highlighted that FB injury may mimic bronchial asthma exacerbation [14, 15]. In addition, it is important to note that FB injury is likely to induce severe acute exacerbation of bronchial asthma. In this case, our patient was initially diagnosed with a severe acute exacerbation of bronchial asthma due to lower respiratory tract infection. However, the child's

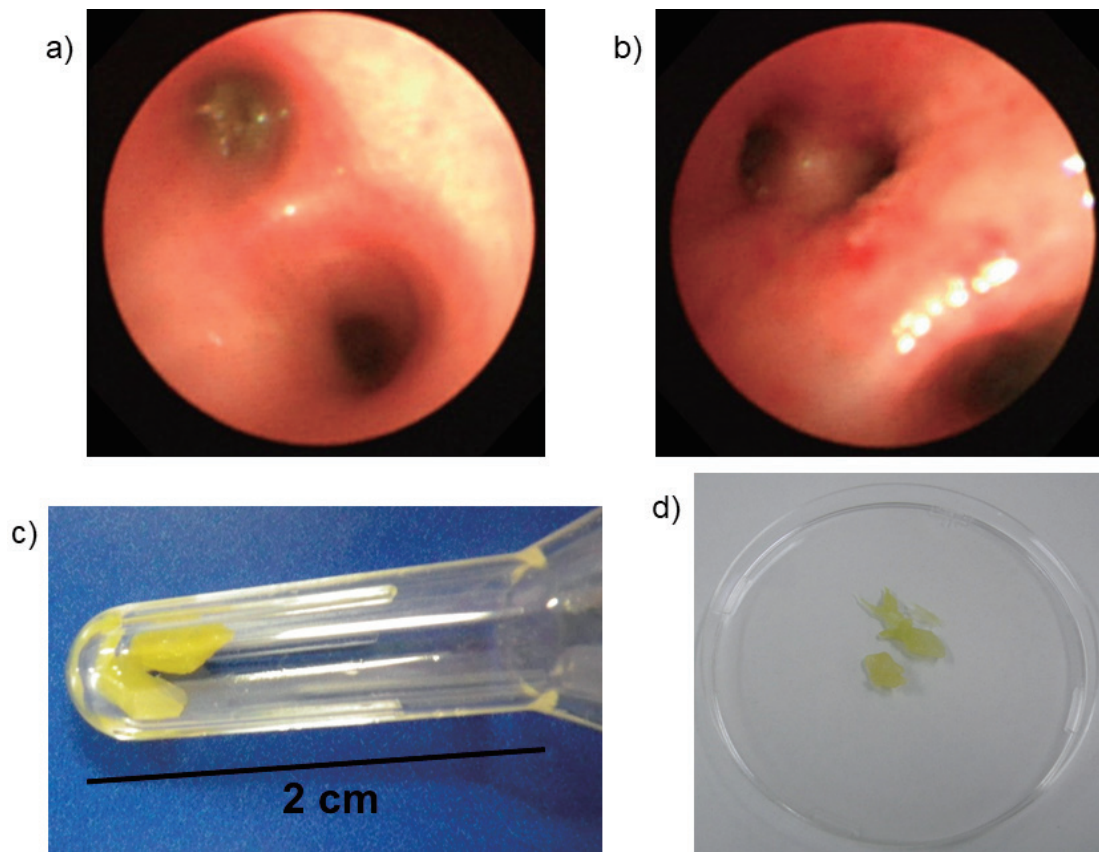


Fig. 2 Bronchoscopic findings and the removed sweet potato pieces
The left main bronchus was obstructed by a sweet potato.

condition was different from that usually seen in individuals with asthma exacerbation, as she presented with asymmetric breath sounds and abnormal plain chest radiography results. Her acute exacerbation of bronchial asthma was likely triggered by the inflammation resulting from the sweet potato aspiration.

Unilateral lung opacity implies pleural effusion or atelectasis. Unilateral pleural effusion is caused by pneumonia, cancer, malignant lymphoma, and tuberculosis. As these diseases gradually progress, the patients rarely feel dyspneic. On the other hand, unilateral atelectasis is caused by acute lobar pneumonia, mucus plug, and FB aspiration [16]. In our case, the patient was a healthy child who suddenly developed breathing difficulty and did not have respiratory symptoms and fever before the onset of these problems.

Sweet potato synthesizes various phytoalexins, collectively known as furanoterpenoids, infected by fungi [17]. Phytoalexins are antimicrobial substances synthesized de novo by plants that accumulate rapidly in areas of pathogen infection. Furanoterpenoids, including ipomeamarone, cause hepatotoxicity, pneumonia, pulmonary edema, and cattle deaths [18]. Wamalwa reported that damaged sweet potato contained ipomeamarone in the apparently healthy parts of the infected sweet potato. We could not reveal whether the baked sweet potato accumulated ipomeamarone, but such a toxin had the potential to worsen her condition.

In conclusion, sweet potato aspiration injury needs intensive care for pneumonia and pulmonary edema following FB removal.

CONFLICT OF INTEREST

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