

Prikaz bolesnika | Case report

Non-resolving atelectasis after foreign body aspiration in a 17-month-old boy: a case report

Perzistirajuća atelektaza nakon aspiracije stranog tijela u 17-mjesečnog dječaka: prikaz bolesnika

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Abstract

Foreign body aspiration is an important emergency and cause of morbidity and mortality in children. We present a 17-month-old boy who developed pneumonia and atelectasis a few weeks after unnoticed peanut inhalation. Despite prompt foreign body removal atelectasis persisted for three months. This case highlights the importance of timely diagnosis and treatment of foreign body aspiration.

Sažetak

Aspiracija stranog tijela je hitno stanje te važan uzrok morbiditeta i mortaliteta u dječjoj dobi. Prikazujemo 17-mjesečnog dječaka s upalom pluća i atelektazom nekoliko tjedana nakon neprimjećene aspiracije kikirikija. Atelektaza je perzistirala tri mjeseca usprkos promptnom uklanjanju stranog tijela. Ovaj prikaz naglašava važnost pravovremene dijagnoze i liječenja nakon aspiracije stranog tijela.

Introduction

Foreign body aspiration is a common cause of morbidity and mortality in children despite attempts of prevention, diagnostic and therapeutic possibilities^(1,2). Foreign body aspiration occurs in every age group but mostly between one and two years of age⁽¹⁾. Clinical presentation varies – symptoms can be mild but respiratory distress and death can also occur. In most cases, an episode of choking, paroxysmal cough and unilateral wheezing occurs. Symptoms resemble those of asthma, pneumonia or tracheobronchitis. Diagnosis is based on thorough patient history, clinical examination and chest X-ray while the golden standard for definite diagnosis is bronchoscopy. Obstructive emphysema is the most common radiological finding⁽¹⁾. Rigid bronchoscopy is the golden standard for foreign body

removal. Delay in diagnosis and foreign body removal increases the risk for complications: bronchopneumonia, atelectasis, bronchiectasis and lung abscess.

Case report

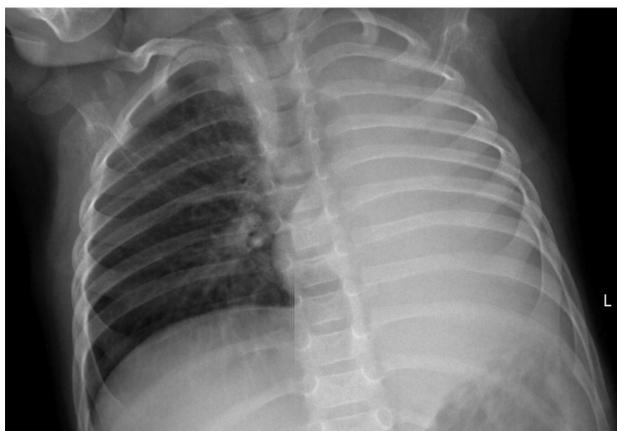
We present a 17-month-old boy who was admitted to the University Hospital for Infectious Diseases „Dr. Fran Mihaljević“ in February 2019. He presented with fever up to 39.5 °C, cough and purulent nasal discharge lasting for four days. During the past month he had three episodes of fever and cough which resolved spontaneously. The boy was regularly vaccinated and his medical history was insignificant. He lived with his parents and elder brother in Zagreb and attended day care. During January his brother and father had a mild respiratory infection. At admission, parents denied the

possibility of foreign body aspiration, but afterwards remembered that a few weeks prior to admission he ate peanuts and had an episode of cough.

On admission the patient was alert, in good general condition, febrile, with peripheral blood oxygen saturation of 92%. Bronchial breath sounds were present below the left scapula on auscultation while exhalation was unremarkable. The rest of physical exam was normal. The value of C-reactive protein was 126.1 mg/L with a normal value of leukocytes ($13.4 \times 10^9/L$) and mild neutrophilia (75.3%). Influenza virus type A was detected in nasopharyngeal aspirate using molecular method (PCR, polymerase chain reaction) while no other pathogen was detected.

Chest X-ray on admission showed complete shading of the left hemithorax with atelectasis characteristics, mediastinal shift and right lung herniation into the left hemithorax (Figure 1). Lung consolidation without pleural effusion was visualized on thoracic ultrasound.

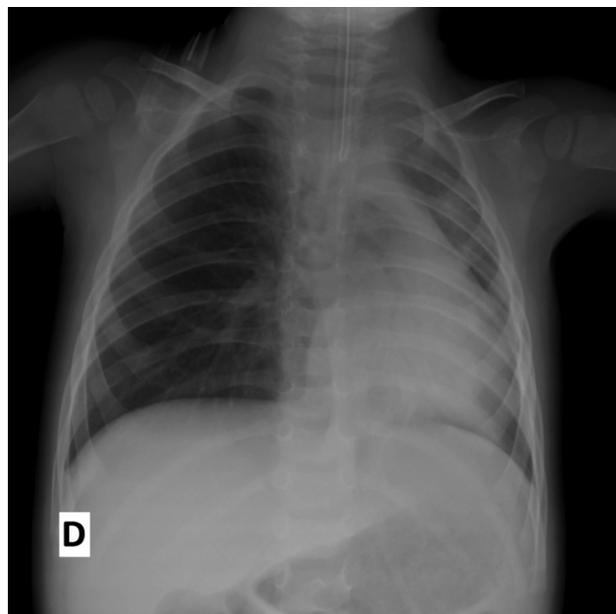
FIGURE 1. CHEST X-RAY AT ADMISSION



Empirical antibiotic therapy with ceftriaxone was started, initially without the need for oxygen therapy. Since foreign body aspiration was suspected due to the radiological finding, bronchoscopy under general anaesthesia was performed at the Department of Otorhinolaryngology, Head and Neck Surgery, University Clinical Hospital Center "Sestre milosrdnice". A foreign body obstructing the left main bronchus was detected. Four peanuts, which obstructed all segmental bronchi, were removed with a rigid bronchoscope. After removal, no other foreign bodies were visualized. The patient was then transferred to the Paediatric Intensive Care Unit, University Hospital for Infectious Diseases „Dr. Fran Mihaljević“, Zagreb. He was mechanically ventilated with CPAP (continuous positive airway pressure) modality during the first 24 hours. Afterward he was breathing spontaneously and required oxygen therapy during 10 days. The patient

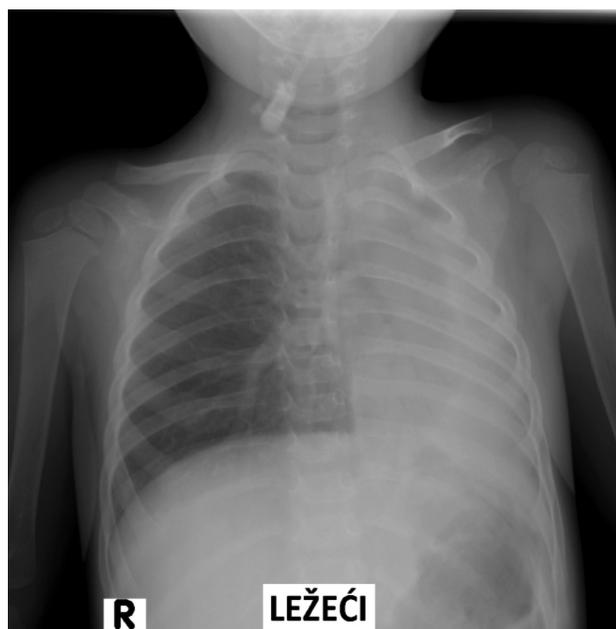
was treated with dual antimicrobial therapy: ceftriaxone for 15 days and clindamycin for 10 days alongside oseltamivir for influenza and corticosteroid therapy (dexamethasone). On chest X-ray performed on the 4th day incomplete repeated ventilation of lung parenchyma was described (Figure 2).

FIGURE 2. CHEST X-RAY ON THE 4TH DAY



On the 8th day the boy became tachydyspnoic, required increased volume of oxygen therapy and his radiological findings worsened, showing infiltrate progression with left lung ventilation disturbances (Figure 3).

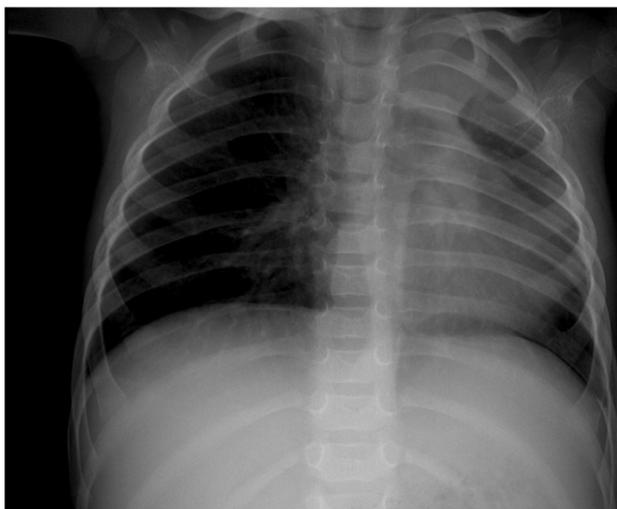
FIGURE 3. CHEST X-RAY ON THE 8TH DAY



Repeated bronchoscopy showed fibrin deposits throughout tracheal and bronchial mucosa, serous secretion in lower parts of the lung (dominantly left) along with segmental bronchi constriction, but there were no signs of foreign body. Pulmonary hygiene was carried out.

Defervescence occurred on the 9th day and from the 12th day onwards the boy did not require oxygen therapy. Clinical improvement was accompanied with normal breath sounds.

FIGURE 4. CHEST X-RAY ON THE 12TH DAY



Just before hospital discharge, chest X-ray revealed incomplete left lung parenchyma repeated ventilation (Figure 4). He was discharged in good general condition and with normal vital functions.

Afterwards the boy was in clinically good condition except mild respiratory infection caused by respiratory syncytial virus which occurred two weeks after discharge. Chest X-ray was repeated almost two months after discharge and still showed persistent atelectasis of the left upper lobe. Repeated bronchoscopy revealed thick secretion in the left bronchus but without signs of foreign body. Chest X-ray performed a month later showed normal lung parenchyma transparency.

Discussion

Foreign body aspiration mostly occurs in children less than 3 years of age due to incomplete dentition, i.e. lack of molars and uncoordinated swallowing act^(1,2). Inhaled foreign bodies are mostly organic, in the first place fruit, vegetables and nuts⁽³⁾. Our patient matched the criteria – he was under three years and aspirated peanuts.

Organic foreign bodies cause greater acute inflammation than non-organic (bone, plastic, metal, etc.).

Salt and oil in the nut irritate the bronchial mucosa causing intense local chemical inflammatory reaction around the nut leading to early obstruction of the tracheobronchial tree and making bronchoscopic recognition and removal very difficult⁽⁴⁾. Some organic foreign bodies and certain pill aspirations may result in exuberant granulation tissue within a few hours of aspiration. Peanuts, for example, have a high oil content that leads to an exuberant reaction.⁽⁵⁾ Organic foreign bodies such as seeds, beans and corn can absorb water and with subsequent swelling, partial obstruction can change to total obstruction.⁽⁶⁾

Complete airway obstruction caused by foreign body aspiration leads to hypoxia and respiratory distress, while partial obstruction causes symptoms such as cough, wheezing, increased salivation, stridor and, rarely, respiratory distress⁽⁷⁾. Characteristic triad of symptoms consists of sudden onset of cough, wheezing and decreased lung sound on the affected side⁽¹⁾. Paroxysmal cough with history of choking has the highest sensitivity and specificity^(8,9). Cough is also the most common symptom in patients with late recognition of foreign body aspiration⁽⁸⁾.

Chest X-ray should be performed when foreign body aspiration is suspected, but normal chest X-ray does not rule out this diagnosis. In this case, chest X-ray was performed due to repeated episodes of fever, cough and respiratory auscultation signs and according to radiological findings foreign body aspiration was suspected.

Foreign body aspiration leads to numerous complications including death in 4 to 7% of cases⁽⁷⁾. Death occurs due to choking during the acute phase (foreign body in the airway or oesophagus pressing tracheal membranous part, reflex cardiac arrest after vagal stimulation), or later, as a consequence of complications (pneumonia, haemoptysis, etc.)⁽¹⁰⁾.

Unrecognized foreign body aspiration carries a significant risk of complications. The risk for complications is 2.5 times higher if the diagnosis is made more than 24 hours following the event⁽¹¹⁾.

The most common complication is pneumonia which occurs in 15 to 30% of cases. Secondary bacterial infection occurs distally from foreign body obstruction, where secretion is retained. Pleural effusion can also be present in some cases. According to some researchers in up to 30% of patients granuloma forms around the foreign body making its removal harder. Granuloma forms in cases where foreign body persists for more than a week.⁽¹²⁾

In up to 15% of patients lung atelectasis develops distally from the point of obstruction. In this area of the lung, air is absorbed, the affected area loses volume,

retracts and collapses. After foreign body removal, localized lung oedema within reexpansion occurs⁽¹²⁾. In our patient, the disease was of longer duration and more complicated course, mostly due to late diagnosis. According to history obtained from parents, peanut aspiration occurred 2-3 weeks prior to diagnosis. Atelectasis retreated partially following treatment but persisted for an unusually long period, causing respiratory compromise and requiring repeated bronchoscopies. Granulation and bronchial oedema with consequent bronchial constriction and secretion retention were the most probable causes.

Bronchoscopy is the golden standard for diagnosis and should be done as soon as possible if there is clinical or radiological evidence or even just a suspicion of foreign body aspiration. Some authors consider it worse to overlook foreign body aspiration than to have a high number of negative bronchoscopies.⁽¹³⁾

Mortality following foreign body aspiration was around 50% before bronchoscopy was introduced, but decreased significantly with anaesthesiology and ear, nose and throat surgery development. Rigid bronchoscopy is the golden standard for safe foreign body removal. Rigid ventilating bronchoscope in combination with a magnifier enables better visualization and ensures adequate ventilation. Complete visualization of the airway after foreign body removal is important so that the presence of other foreign bodies can be excluded⁽¹⁾.

Conclusion

Foreign body aspiration is a serious paediatric emergency, important cause of morbidity and mortality in children whose incidence has been stagnating for some time. Bronchoscopy is the golden standard for diagnosis and treatment and timely diagnosis is crucial for complication prevention. One should always consider foreign body aspiration in children with choking episode and wheezing and in children with cough paroxysm who had no symptoms afterwards.

We present a patient with pneumonia and non-resolving atelectasis due to late recognition of foreign body aspiration whose recovery was eventually complete.

REFERENCES:

- [1] Naragund AI, Mudhol RS, Harugop AS, Patil PH, Hajare PS, Metgudmath V V. Tracheo-Bronchial Foreign Body Aspiration in Children: A One Year Descriptive Study. *Indian J Otolaryngol Head Neck Surg.* 2011;66(SUPPL.1):180-5.
- [2] Parameswaran N, Das S, Biswal N. Respiratory Morbidity Following Foreign Body Aspiration Among South Indian Children: A Descriptive Study. *Cureus.* 2018;10(11):e3629.
- [3] Weissberg D, Schwartz I. Foreign Bodies in the Tracheobronchial Tree. *Chest.* 1984;91(5):730-3.
- [4] Sih T, Bunnag C, Ballali S, Lauriello M, Bellussi L. Nuts and seed: A natural yet dangerous foreign body. *Int J Pediatr Otorhinolaryngol.* 2012;76(SUPPL. 1):52-5.
- [5] Hewlett JC, Rickman OB, Lentz RJ, Prakash UB, Maldonado F. Foreign body aspiration in adult airways: Therapeutic approach. *J Thorac Dis.* 2017;9(9):3398-409.
- [6] Dikensoy O, Usalan C, Filiz A. Foreign body aspiration: Clinical utility of flexible bronchoscopy. *Postgrad Med J.* 2002;78(921):399-403.
- [7] Foltran F, Ballali S, Rodriguez H, Van As AB, Passali D, Gulati A, et al. Inhaled foreign bodies in children: A global perspective on their epidemiological, clinical, and preventive aspects. *Pediatr Pulmonol.* 2013;48(4):344-51.
- [8] Mallick S, Khan AR, Al-bassam A. Late Presentation of Tracheobronchial Foreign Body Aspiration in Children. *J Trop Pediatr.* 2005;51:145-8.
- [9] Hoeve LJ, Rombout J, Pot DJ. Foreign body aspiration in children. The diagnostic value of signs, symptoms and pre-operative examination. *Clin Otolaryngol Allied Sci.* 1993;18(1):55-7.
- [10] Gang W, Zhengxia P, Hongbo L, Yonggang L, Jiangtao D. Diagnosis and treatment of tracheobronchial foreign bodies in 1024 children. *J Pediatr Surg.* 2012;47(11):2004-10.
- [11] Iversen RH, Klug TE. Need for more clear parental recommendations regarding foreign body aspiration in children. *Dan Med J.* 2012;59(9):1-4.
- [12] Rodríguez H, Cuestas G, Botto H, Nieto M, Cocciaglia A, Passali D, et al. Complications in Children From Foreign Bodies in the Airway. *Acta Otorrinolaryngol.* 2016;67(2):93-101.
- [13] Kiyan G, Gocmen B, Tugtepe H, Karakoc F, Dagli E, Dagli TE. Foreign body aspiration in children: The value of diagnostic criteria. *Int J Pediatr Otorhinolaryngol.* 2009;73(7):963-7.