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A foreign body in the mediastinum as a cause of chronic cough in a 10-year-old child with asthma.

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On behalf of the authors - Aneta Krogulska (corresponding author)

Running head: Chronic cough as a mask of the mediastinal foreign body

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Abstract

Chronic cough is a common problem faced by paediatricians, with a reported prevalence of 20% among preschoolers. It is also the most frequent symptom of asthma. Many causes of chronic cough may also be possible causes of asthma exacerbations. We describe a 10-year-old boy with asthma, which was admitted to the hospital with a persistent dry cough for five months. Initially, he was treated as an exacerbation of asthma; however, a subsequent chest X-ray identified a wire during the next hospitalization. Although the wire was not found during bronchoscopy, a CT scan located the wire in the mediastinum. The patient required urgent thoracic surgery, ending with the extraction of a 3 cm-long metallic wire. The history revealed that he had choked on a pizza shortly before the onset of coughing: it is most likely that the foreign body had been aspirated, and that it may have originated from a metal brush used to clean the oven. However, it is difficult to determine whether the wire was originally aspirated into the airways or into the gastrointestinal tract; from the latter, it would have perforated either the bronchus or oesophagus and migrated to the mediastinum. The symptoms associated with aspiration or ingestion of a foreign body in the upper aerodigestive tract can simulate other paediatric diseases, such as asthma, and delay the correct diagnosis. Our findings demonstrate that chronic cough in children with asthma is not always a result of exacerbation. Precise interviewing and correct interpretation of basic diagnostic testing may be key for setting an accurate diagnosis.

Keywords: chronic cough, foreign bodies, mediastinum, asthma, child

Introduction

Chronic coughing is a common problem faced by paediatricians, with a reported prevalence of 20% among preschoolers [1]. It is also the most frequent symptom of asthma, and its occurrence in patients with asthma is typically regarded as an exacerbation of the illness. Coughing is usually resolved by standard asthma treatments; however, if no improvement is observed, other causes should be investigated, such as lack of compliance, poor inhalation technique, severe course of asthma, treatment-resistant asthma, comorbid conditions, and exposure to sensitising allergens, mould, pollution or tobacco smoke [2]. Once all these factors are excluded, the diagnosis of asthma should be verified. Many causes of chronic cough may also be possible causes of asthma exacerbation: respiratory infections, allergic and non-allergic diseases of the upper respiratory tract, gastroesophageal reflux disease, foreign body aspiration, cystic fibrosis, primary ciliary dyskinesia, immunodeficiency, bronchiectasis, defects of the respiratory system, defects of the heart and blood vessels, mediastinal tumours, interstitial and granulomatous diseases of the lungs, drug-induced cough, tuberculosis, endocrine diseases and psychogenic cough [1,3-9]. This report describes the difficulties encountered in the differential diagnosis of chronic cough in a patient with asthma.

Case study

A 10-year-old boy with asthma was referred to the Department of Paediatrics, Allergology and Gastroenterology due to chronic cough. The patient had been diagnosed with asthma at the age of four years. Since that time, he had been periodically treated with inhaled corticosteroids (ICS), salbutamol and ongoing montelukast application. A specific immunoglobulin E (sIgE) assessment identified allergy to house dust mites, dog fur and pollen. Since five years of age, the boy had received sublingual immunotherapy for house

dust mites (Staloral 300) with good effect. The last exacerbation occurred during his seventh year.

The cough was dry and had occurred during the day and night, every day for the previous five months; however, no fever or any other obvious symptoms of infection had been observed. Before this visit, the inhalation and compliance technique had been checked, asthma treatment had been intensified, an antitussive drug was included, and antibiotic therapy was used twice (amoxicillin with clavulanate, clarithromycin) but no improvement was observed. In the month preceding the visit to our clinic, the boy had been diagnosed in a hospital abroad. No abnormalities in morphology or inflammatory markers were revealed in laboratory tests, and chest x-ray, spirometry and FENO results were normal. No unusual findings were revealed by gastroscopy performed in response to the cough and reported loss of appetite.

A history revealed also that shortly before the initial onset of the cough, a choking incident had occurred while eating a pizza. After this incident, the boy reported discomfort in the chest and the feeling of a foreign body at the height of the larynx. No abnormalities were revealed during a consultation with a laryngologist. Soon after, the boy reported a fear of food. For this reason, and also because of a recent traumatic experience (the death of a loved one), he attended a consultation with a psychiatrist; fluvoxamine was included in the therapeutic regimen but was found to have no effect on the cough.

A physical examination performed on admission to our department identified funnel chest, isolated wheezing and rhonchi indicated by auscultation over the left side of lungs, paravertebrally. During hospitalization, a paroxysmal, dry, tiring cough was observed. Laboratory tests revealed a leucocyte count of 9.25 K/ul (neutrophils 30.4%, lymphocytes 41.9%, monocytes 11.2%, eosinophils 16.2%, basophiles 0.3%), CRP 2.19 mg/l. The types of

sensitization applied are presented in Table 1. In the chest radiograph, a linear shadow approximately 27 mm in length was observed along the left bronchus (Fig. 1); this was also visible in the earlier image taken during the previous hospital visit. The presence of a foreign body in the bronchus or the oesophagus was suspected.

A bronchoscopy was performed. No foreign body was detected in the bronchus itself; however, an inflammatory granule was removed from the left bronchial lumen. Antibiotic therapy was therefore administered. Chest CT revealed the presence of a linear foreign body in the mediastinum lying tangentially to the lower surface of the left bronchus; as a result, the bronchus was narrowed to 4 mm (Fig. 2, Fig. 3).

Written informed consent was obtained from the patient and his mother for the publication of this case report and any accompanying images.

Results

The boy was therefore diagnosed with the presence of a foreign body in the mediastinum and transferred to the Department of Paediatric Surgery. A left-sided thoracotomy was performed to remove the foreign body, which was found to be a 3 cm-long metallic wire. During the operation, it was found that the wire was situated tangentially to the lower surface of the left bronchus. After the operation, the cough subsided. The boy was discharged home in good condition.

Discussion

The ingestion or aspiration of foreign bodies is a common problem in the paediatric population, representing the fourth most common cause of accidental death among children aged under three years [10-12]. Our report describes the unusual case of a boy presenting with asthma, but also displaying a chronic cough which was not caused by exacerbation of asthma, but the presence of a foreign body, in the form of a wire, in the mediastinum. Based

on the history, which revealed he had choked on a pizza shortly before the onset of coughing, it is most likely that the foreign body had been aspirated, and that it may have originated from a metal brush used to clean the oven. However, it is difficult to determine whether the wire was originally aspirated into the airways or into the gastrointestinal tract, from where it then perforated either the bronchus or oesophagus and migrated to the mediastinum.

Foreign bodies in the airways

Foreign bodies are most commonly aspirated into the respiratory tract by small children and are usually fragments of toys or food [12,13]. Usually they enter the trachea or bronchi through the mouth or nose, leading to the development of clinical symptoms of varying intensity. It is initially characterised by a period of sudden, short fit of coughing or repeated attacks. This is followed by a oligosymptomatic period lasting a few days. Later, acute bacterial inflammatory complications of the bronchi and lungs are typically observed. Almost 80% of these children are admitted to hospital due to acute symptoms within 24 hours following the aspiration incident [14,15]. Only 15% are correctly diagnosed within the first seven days after choking [10]. The period from initial aspiration to diagnosis can range from four to 12 months [16-19]. It is possible that the presence of foreign bodies in the trachea or bronchi may not elicit any symptoms, especially in children, and some foreign bodies, such as needles, pins or wires, can remain undetected in the bronchi for long periods. Although the most common symptom is coughing, recorded in 74% of children diagnosed with aspiration of a foreign body [14,15], the symptoms associated with aspiration or ingestion can simulate other paediatric diseases such as asthma, croup or pneumonia; this can delay the correct diagnosis [10]. It is possible that the present diagnosis may have been established earlier if the boy had not previously been diagnosed with asthma.

In the present case, assuming that the wire had been aspirated into the respiratory system, the observed symptoms were typical, i.e. chronic coughing. Aspirated foreign bodies tend to be located in the right bronchus rather than the left [14,15], and they may also migrate, especially during coughing. It is impossible to tell whether the wire causing the inflammation (seen as granulation tissue present during bronchoscopy) gradually entered the mediastinum by penetrating the wall of the left bronchus. No acute symptoms were observed that could indicate perforation. It may have been a slow process related to the production of granulation tissue, which would have protected the patient from serious consequences.

Foreign bodies in the digestive tract

Foreign bodies are twice as likely to be swallowed as aspirated. Sung et al. report that while 80-90% of ingested objects pass through the gastrointestinal tract inconsequentially, 10%-20% require nonoperative intervention, and less than 1% require surgery [20]. Although sharp objects can stick to any part of the digestive tract, usually to the upper part of the oesophagus, resulting in sensations of a foreign body, excessive salivation and difficulty in breathing. Indeed, our patient reported such discomfort in the chest and fear of eating. Assuming that the wire first entered the gastrointestinal tract before penetrating into the mediastinum and becoming positioned tangentially to the left bronchus, this would have occurred relatively early, as the predominant symptom was coughing, rather than gastrointestinal complaints. However, no changes were observed during gastroscopy, the course was mild and no symptoms indicating mediastinal involvement were recorded.

The frequency of oesophageal perforation occurring as a consequence of swallowing a foreign body is estimated to be range from 0.21%-2% [21,22]. An interesting case of perforation of the oesophagus in a six-year-old girl was described by Byaruhanga et al. [23]. At the age of four years, the child choked on a metallic body. Later no persistent symptoms

were observed. However, two years later, diagnostic procedures were initiated following 2-4 weeks of coughing and dysphagia. A subsequent barium swallow confirmed that it had perforated the oesophagus and entered the mediastinum.

In a systematic review of 168 adult patients with perforation of the oesophagus, Aronberg et al. stress that although none had a cough, oesophageal injury can be accompanied by acute and potentially life-threatening symptoms such as mediastinal infection, pneumothorax and damage to the major vessels [22]. It is not unknown for foreign bodies which were initially swallowed to later enter the mediastinum as a result of perforation of the oesophagus [22,24], this has also been observed in children [25]. Naidoo et al. describe the case of a pair of three- and six-year-old children, who swallowed foreign bodies which perforated the oesophagus, resulting in dysphagia, coughing and reluctance to eat [25]. Similar symptoms were observed in the present patient.

The basic tests used for the diagnosis of foreign bodies are X-ray and CT of the chest area. However, X-rays may often return false negative results due to variations in the radio-densities of different foreign bodies and the size and location of the object [14]. In our patient, the illness was diagnosed on the basis of chest x-ray.

Conclusion

Chronic coughing in children with asthma is not necessarily a result of exacerbation. Precise interviewing and correct interpretation of basic diagnostic testing may be key for setting an accurate diagnosis. The presence of recurrent non-specific symptoms observed together with chronic coughing or loss of appetite may indicate the presence of a foreign body in the upper aerodigestive tract.

Declaration of interest:

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Table 1. Type of sensitization in the presented boy at age four and age ten years.

Type of allergen	sIgE concentration [kU/L]	
	4-years-old	10-years-old
Birch pollen	3.1	2.9
Alder pollen	1.3	1.6
Hazel pollen	2.2	3.1
Grass pollen	1.2	1.2
Rye pollen	1.1	0.8
Mugwort pollen	0.99	1.3
<i>D. pteronyssinus</i>	44.5	52.6
<i>D. farinae</i>	24.8	26.3
Dog dander	3.5	3.1
Cat dander	0.5	0.35
<i>Aspergillus fumigatus</i>	0.26	0.34
<i>Cladosporium herbarum</i>	<0.15	<0.15
<i>Penicillium notatum</i>	0.24	0.28
<i>Alternaria alternata</i>	0.7	<0.15

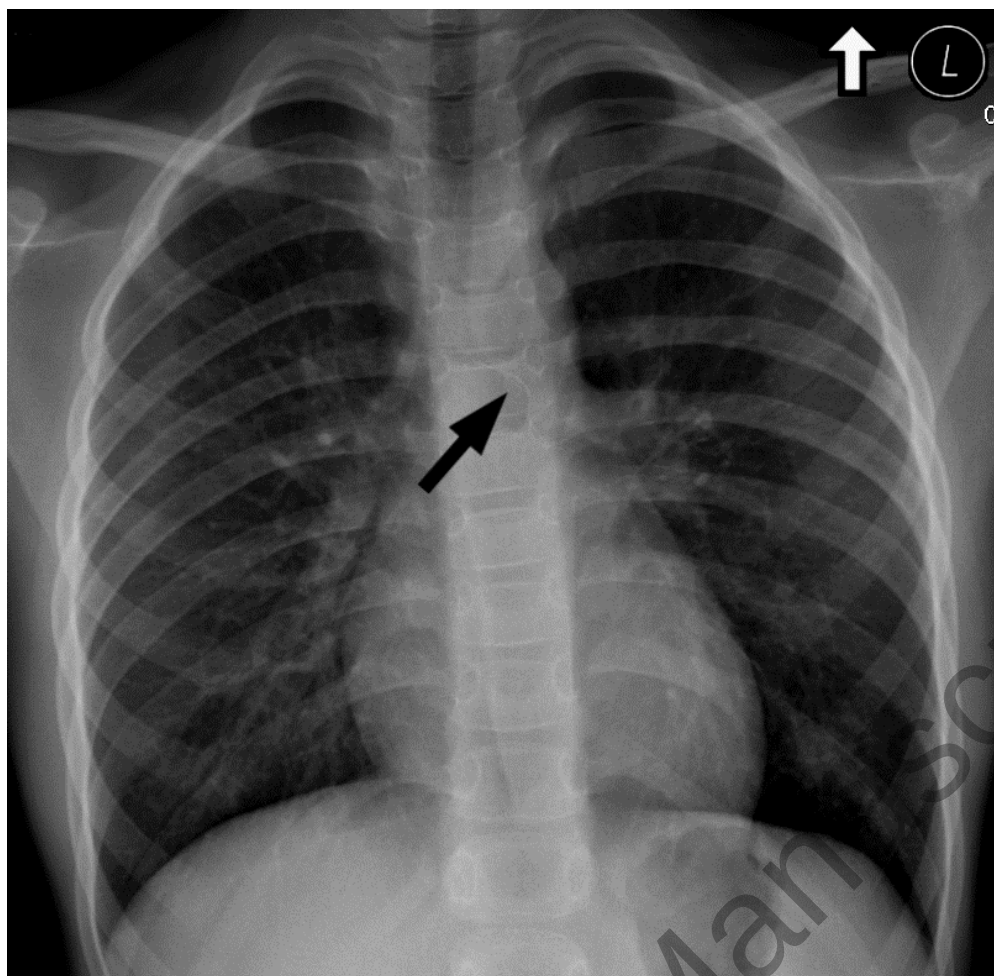


Figure 1. Chest X-ray presents a linear opacification projected on the body of Th6 vertebra (arrow).



Figure 2. CT confirmed the presence of a metallic wire in the mediastinum (arrow).

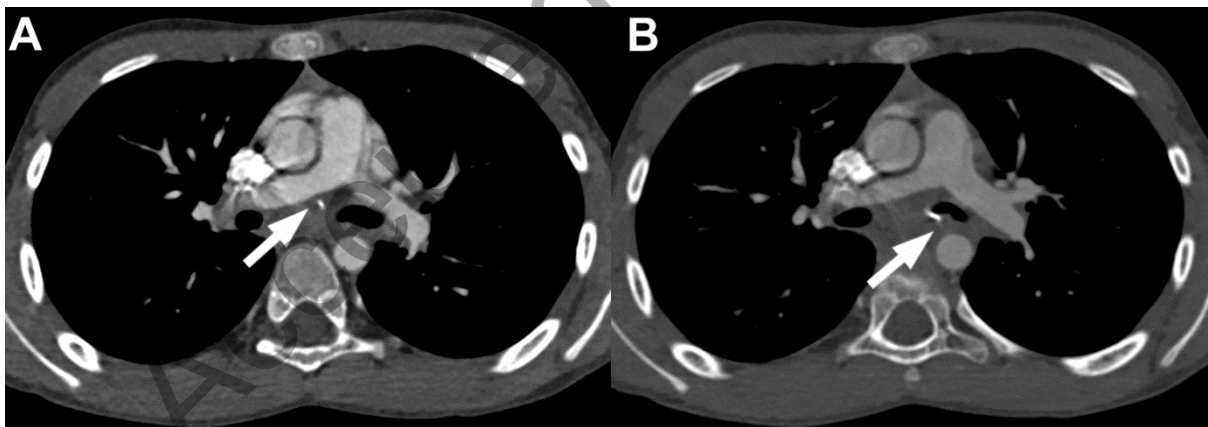


Figure 3. The wire was located close to the right pulmonary artery (A) and resulted in the left main bronchus wall thickening (B).