SEVERE RESPIRATORY DISTRESS EPISODES IN A 7 YEAR-OLD GIRL

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An online version of this case, including CME Assessment Test can be found at:
http://www.eaaci.net/site/content.php?l1=17&sel=400
On September 16th, Mary, a 7 year-old girl, was taken by her parents to the emergency department of “P&A Kyriakou” Children’s Hospital of Athens, after she had initially been evaluated from her pediatrician as having a moderate to severe respiratory distress episode with persistent wheezing and need for continuous bronchodilator therapy. Three days ago she had an episode characterized by nasal congestion, snoring, noisy breathing and/or wheezing, increased respiratory effort which gradually turned into dyspnea, tachypnea and respiratory distress two hours before.

CLINICAL EXAMINATION
The physical examination on admission to the emergencies revealed:
• Absence of any face or body structural abnormality
• normal weight and height gain and
• normal thoracic anteroposterior diameter

With the exception of respiratory rate, the vital signs were within normal range:
• Temperature 36,9°C
• Heart rate: 89/min
• Blood pressure: 132/67 mmHg
• Pulse oximetry (on air): 95%
• Her respiratory rate was 38/minute associated with
• Shortness of breath and
• Diffuse audible wheezes

Moreover she had:
• nasal congestion
• rhinoscopic evidence of mucosal inflammation but
• normal conjunctivae

Palpation for supratracheal lymphadenopathy or tracheal deviation was negative whereas and final auscultation revealed mild wheezing and mild prolonged expiratory phase with normal heart rate, S1, S1 sounds and without audible murmur.

Although there was an attempt to evaluate her respiratory function with spirometry, the child couldn’t cooperate.
Thus, only peak flow was performed with PEF: 300 lt/min (69% of predicted) without response after bronchodilators administration.

Continuous bronchodilator therapy and oral corticosteroids had been started at home. She was administered 16mg of methylprednisolone and 4 doses of Salbutamol (totally 400mcg). At hospital budesonide and an additional dose of salbutamol were immediately administered with jet nebulizer.

LABORATORY EVALUATION
Plain chest radiograph and whole blood count revealed no remarkable abnormalities.
Plain chest radiograph: normal bone structures and soft tissues, normal heart size and lungs with 9-rib expansion, and normal curved diaphragms bilaterally. There was no focal infiltrate or atelectasis. There was equal lung expansion.
Whole blood count
WBC: 13500/μlt
Neu: 79,6%
Lym: 16,2%
Mo: 4,1%
Eos: 0%

Previous laboratory examinations performed three years ago showed:
- normal sweat chloride test and
- normal immunoglobulin levels for her age

**PATIENT'S MEDICAL HISTORY**
No atopic dermatitis, food intolerance or drug related allergy was reported and also no atopic background or respiratory problems in her family. Her immunizations were up to date, by parental report. She was developmentally appropriate. There was maternal smoking history during pregnancy and lactation. The child was still exposed to environmental tobacco smoke.

At 2 years of age (winter 2000) the girl was hospitalized for first time due to a moderate to severe respiratory distressed episode. Laboratory examination (including antibodies against *Mycoplasma pneumoniae* and common viruses) revealed a typical bronchiolitis caused by *Respiratory Syncytial Virus*. This was her first wheezing episode.

Since then she had 2-3 such episodes every year, characterized by wheezing, breathlessness and cough, all associated with acute viral respiratory infections (never during the summer). She was hospitalized twice due to dyspnea and tachypnea, 10 and 18 months ago respectively. The first 48 hours of each episode she had nocturnal cough that occasionally awoke her. She reported no exercise-induced symptoms.

During the last year (2005) she had two such episodes. The first one was on March, characterized by the pediatrician as bronchitis – wheezing episode caused by viral respiratory infection. She was initially prescribed salbutamol and budesonide with a jet nebulizer. The symptoms improved within the first 30 minutes so the therapy was continued at home with salbutamol and fluticasone inhalers, given with Volumatic® mask for three weeks. Additionally, clarithromycin was administered for ten days. The symptoms resolved two weeks later.

At the same time the mother mentioned that her child told her she swallowed a small round particle from a hairclip a month ago. The mother did not witness the event, but also no history of choking was recalled from the father or relatives those last 30 days. Chest x-rays were also normal.

Noisy breathing and wheezing relapsed on April 2005 with a recurrent appearance. Characteristically, it is reported that symptoms varied with changes in body position, especially during bedtime.
Symptoms induced by changing body positions may indicate anatomical abnormalities such as tracheomalacia, bronchomalacia, or vascular rings.

Fluticasone and salmeterol fixed combination (Seretide® autohaler) was administered. Wheezing disappeared but noisy breathing sometimes still occurred. Additional examinations included specific IgE antibodies (Immuno CAP RAST test) and serum immunoglobulin levels:

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<table>
<thead>
<tr>
<th>Antibody</th>
<th>Value</th>
<th>Class</th>
<th>Normal Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dermatophagoides</td>
<td>0.93 U/ml</td>
<td>I</td>
<td>&lt;0.35 U/ml</td>
</tr>
<tr>
<td>Dermatophagoides</td>
<td>0.34 U/ml</td>
<td>II</td>
<td>0.35-0.70 U/ml</td>
</tr>
<tr>
<td>Olive</td>
<td>0.39 U/ml</td>
<td>I</td>
<td>0.35-0.70 U/ml</td>
</tr>
<tr>
<td>Cypress Italia</td>
<td>0.64 U/ml</td>
<td>II</td>
<td>0.70-3.50 U/ml</td>
</tr>
<tr>
<td>Parietaria J.</td>
<td>0.34 U/ml</td>
<td>I</td>
<td>0.70-3.50 U/ml</td>
</tr>
<tr>
<td>Dog Epithelium</td>
<td>0.52 U/ml</td>
<td>I</td>
<td>0.70-3.50 U/ml</td>
</tr>
<tr>
<td>Alternaria A.</td>
<td>1.02 U/ml</td>
<td>II</td>
<td>0.70-3.50 U/ml</td>
</tr>
</tbody>
</table>

IgE: 134 IU/ml (nl<50 UI/ml for children between 4-7 year old child) and normal (for her age) immunoglobulin IgA, IgG, IgM levels.

Symptoms deteriorated despite continuing asthma treatment, leading to administration of oral corticosteroids. The treatment was successful 48 hours later, but in every oral-corticosteroid tapering attempt, symptoms relapsed.

That was the situation until the end of August when for the first time her mother observed and videotaped grunting, loud inspiratory stridor and paradoxical breath movements such as intercostals, sternal and subxiphoid retractions. Click www.eaaci.net/videos/video.zip to see the relevant video.

These signs indicate intrathoracic obstruction but they could also both indicate intrabronchial or extrabronchial obstruction. The child was immediately hospitalized. During the first 48 hours she had a noteworthy variation in auscultation findings among different physicians or examination hours during the day, although she had no symptoms at all. A third chest x-ray was performed and also an otorhinolaryngological examination, both without pathological findings. The rigid bronchoscopy was the last diagnostic step which finally revealed the plastic particle (round with diameter about 10mm and thickness about 1mm) the child swallowed 7 months ago!

The foreign body was located in the trachea near the carina. Using the rigid bronchoscope the foreign body was removed successfully.
SHORT REVIEW AND COMMENTS

Epidemiology
Foreign body aspiration (FBA) is a common cause of morbidity and mortality in children, especially in those younger than two years of age. During 2000, ingestion or aspiration of a foreign body was responsible for 160 deaths and more than 17,000 casualties’ visits in children younger than 14 years in the United States. Death caused by suffocation following FBA is the fifth most common cause of unintentional-injury mortality in the United States, and the leading cause of unintentional-injury mortality in children younger than one year.[1] Approximately 80 percent of these episodes occur in children younger than three years, with the peak incidence between one and two years of age.[2-7]

Causes, location
The most common aspirated foreign bodies in children are peanuts (36 to 55%), other nuts, seeds (particularly watermelon seeds in Middle Eastern countries), food particles, and pieces of toys. [2-7] The majority of these aspirated foreign bodies are located in the bronchi. Laryngeal and tracheal foreign bodies are less common.[5, 7] Eren et al found in 1160 suspected FBA aspirations in children the follow locations:

- **Larynx**: 3%
- **Trachea/carina**: 13%
- **Right lung**: 60% (52% in the main bronchus, 6% the lower lobe bronchus, and <1% in the middle lobe bronchus)
- **Left lung**: 23% (18% in the main bronchus and 5% in the lower bronchus)
- **Bilateral**: 2%

The foreign body was successfully removed in 1068 children (92%).[5]

Clinical manifestations, diagnosis
The presentation of FBA depends on whether the event was witnessed by someone, the age of the child, the type of object aspirated, the elapsed time since the event, and the location of the object. Presentation and diagnosis within 24 hours of aspiration occurs in approximately 50 to 75 percent of cases. Thus history plays a very important role. A sudden choking episode suggests most of the times FBA but it may not be recalled during initial evaluation or hidden by older children due to fear. The remaining 25-50% may present with subtle or non-specific symptoms such as fever and other signs and symptoms of pneumonia that may improve with antibiotic therapy. As a result, they may come to medical attention only when they develop wheezing, chronic cough, respiratory distress or recurrent bronchitis or/and pneumonia. Unwitnessed aspiration, no acute choking episode or misinterpretation of symptoms resembling pneumonia, asthma, or bronchiolitis are the most important factors contributing to diagnostic delay.[8]

Differential diagnosis
In differential diagnosis the patient's age at the onset of wheezing, the type of wheezing (paroxysmal or intermittent vs persistent) and the course of onset (acute vs gradual) play substantial role. Persistent wheezing presenting very early in life suggests a congenital or structural abnormality. On the other hand, paroxysmal or intermittent wheezing is a characteristic finding in patients with
asthma, resulting from common triggers such as upper respiratory infections, weather changes, exercise, or allergens. Persistent wheezing with sudden onset is consistent with foreign body aspiration, whereas the slowly progressive onset of wheezing may be a sign of extra-bronchial compression by a growing mass or lymph node. The classic triad of wheeze, cough, and diminished breath sounds is presented in only 57%.[7]

**Imaging Studies**
Plain radiographic evaluation of the chest may be helpful only in radio-opaque objects and is relevant to the degree of the airways obstruction. A normal chest radiograph does not rule out foreign body aspiration. Chest radiographs are usually normal in children with laryngotracheal foreign bodies.[5, 9]. Rigid bronchoscopy, is almost always successful in the diagnosis and removal of the foreign body (92%-99%) but there are few cases that can be treated only with thoracotomy.[5, 10]

**Treatment**
If a child presents with complete airway obstruction (unable to speak or cough), dislodgement using back blows and chest compressions in infants and the Heimlich manoeuvre in older children should be attempted. In contrast, these interventions should be avoided in children who are able to speak or cough since they may convert a partial to a complete obstruction.[7]

**Wheezing differential diagnosis**
Foreign body aspiration is included in the differential diagnosis of wheezing with a variety of congenital and acquired conditions.[11] Table 1 presents the alternative diagnosis of acute and recurrent or chronic wheezing.

**Table 1**

<table>
<thead>
<tr>
<th>A. Causes of Acute Wheezing in Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
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<tr>
<td>Infection</td>
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<tr>
<td>Bronchiolitis</td>
</tr>
<tr>
<td>Bronchitis</td>
</tr>
<tr>
<td>Laryngotracheobronchitis</td>
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<tr>
<td>Bacterial tracheitis</td>
</tr>
<tr>
<td>Epiglottitis</td>
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<tr>
<td>Peritonsillar abscess</td>
</tr>
<tr>
<td>Foreign body aspiration</td>
</tr>
<tr>
<td>Esophageal foreign body</td>
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<tr>
<td>Pneumothorax</td>
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</tbody>
</table>
B. CAUSES OF RECURRENT OR CHRONIC WHEEZING IN CHILDREN

<table>
<thead>
<tr>
<th>Structural abnormalities</th>
<th>Functional Abnormalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracheo-bronchomalacia</td>
<td>Asthma</td>
</tr>
<tr>
<td>Vascular compression / rings</td>
<td>Gastroesophageal reflux</td>
</tr>
<tr>
<td>Tracheal stenosis / webs</td>
<td>Recurrent aspiration</td>
</tr>
<tr>
<td>Cystic lesions / masses</td>
<td>Cystic fibrosis</td>
</tr>
<tr>
<td>Tumors</td>
<td>Immunodeficiency</td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>Primary ciliary dyskinesia</td>
</tr>
<tr>
<td>Adenotonsillar hypertrophy</td>
<td>Bronchopulmonary dysplasia</td>
</tr>
<tr>
<td>Cardiomegaly</td>
<td>Retained foreign body</td>
</tr>
<tr>
<td>Retrognathia (Pierre-Robin syndrome)</td>
<td>Bronchiolitis obliterans</td>
</tr>
<tr>
<td></td>
<td>Pulmonary edema</td>
</tr>
<tr>
<td></td>
<td>Vocal cord dysfunction</td>
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</tbody>
</table>
References


Summary

We describe a case of a 7-year-old girl with recurrent episodes of severe respiratory distress associated with wheezing and/or stridor for the past 7 months. The girl suffered from wheezing episodes and cough in association with acute viral upper respiratory infections for the last 3 years. These clinical manifestations usually coincided with the episodes of respiratory distress and delayed the diagnosis of a foreign body aspiration (FBA) for more than 7 months. Most important factors responsible for the diagnostic delay included the mild symptoms with which the unwitnessed aspiration of foreign body was associated, the aforementioned wheezing episodes and the misinterpretation of symptoms.

Keywords: foreign body aspiration, wheezing, respiratory distress, stridor, asthma, differential diagnosis
Assessment test

1. The most usual choking objects in young children are
   A. Pills
   B. Bottle cups
   C. Peanuts
   D. Hairpins

2. The most common location for aspirated foreign bodies is the
   A. trachea
   B. right lung
   C. left lung
   D. larynx

3. Which of the follow sentence is true?
   A. Persistent wheezing presenting very early in life suggests a foreign body aspiration
   B. Paroxysmal or intermittent wheezing is a characteristic finding in patients with asthma
   C. Persistent wheezing with sudden onset is consistent with congenital or structural abnormality
   D. Slowly progressive onset of wheezing may be a sign of intra-bronchial compression by a growing mass

4. The classic triad of wheeze, cough, and diminished breath sounds is present in:
   A. all patients with foreign body aspiration
   B. in asthma patients complicated with foreign body aspiration
   C. only half of the patients with foreign body aspiration
   D. patients with intrathoracic, intrabronchial obstruction
   E. patients with intrathoracic, extrabronchial obstruction

5. In children with laryntracheal foreign bodies, chest radiographs
   A. are usually normal
   B. are relevant to the degree of the airway obstruction
   C. are also helpful in radiolucent foreign bodies
   D. all the above