Subpleural Lung Cysts in Down Syndrome: Prevalence and Association with Coexisting Diagnoses

Biko DM1, Schwartz M2, Anupindi SA3, Altes TA2,3

1Pennsylvania Hospital, Philadelphia, PA. 2The Children’s Hospital of Philadelphia, Philadelphia, PA. 3University of Virginia Medical Center, Charlottesville, VA

Purpose

- Determine the prevalence of subpleural cysts in children with Down syndrome.
- Determine the association with premature, congenital heart disease (CHD), congenital membrane reseption (CMR), and chronic ventilator support.

Background

- Subpleural cysts are small cystic dilatations along the subpleural surface of the lung.
- First association of Down syndrome reported in 1984 in two infants who were found to have cystic lung disease on autopsy.

Materials and Methods

- Retrospective review of the CT examinations of the chest of 25 children with Down syndrome to determine the presence, location, and distribution of cysts.
- Review of charts to determine coexistent diagnosis and past treatments.

Results

- 9 of 25 children imaged had subpleural cysts (36%).
- Youngest patient found to have cysts 3 months old.
- Location of cysts
  - Subpleural cysts located in anteromedial portion of lung in 14 children.
  - 4 of 9 children had cysts within the lung periphery and along the fissures (44%).
  - 2 of 9 had cysts along bronchovascular bundles (22%).
  - One child had cysts only in the periphery of the left hemithorax with pleural thickening (11%).

- Associations with coexistent diagnoses and past treatments
  - Both children with prematurity had subpleural cysts (P=0.049).
  - No children with a history of ECMO therapy had subpleural cysts (8 of 2).
  - All children with a history of ventilator support had a history of congenital heart disease, otherwise this variable could not be analyzed independently.

- Table 1: Demographics and clinical data in the nine children with subpleural cysts.

<table>
<thead>
<tr>
<th>Age</th>
<th>Location of cysts</th>
<th>Subpleural diagnosis/history</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>6 months</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>18 years</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>7 months</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>9 years</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>6 months</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>9 years</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>8 years</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
<tr>
<td>12 years</td>
<td>Anterior subpleural only</td>
<td>Congenital heart disease, chronic ventilator support</td>
</tr>
</tbody>
</table>

- Table 2: Prevalence of subpleural cysts in relation to clinical history and coexistent diagnoses in our 23 patients.

<table>
<thead>
<tr>
<th>Cyst Type</th>
<th>No. of children</th>
<th>Percentage with cysts</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital heart disease</td>
<td>19</td>
<td>42</td>
<td>0.2</td>
</tr>
<tr>
<td>Prematurity</td>
<td>2</td>
<td>100</td>
<td>0.049</td>
</tr>
<tr>
<td>ECMO therapy</td>
<td>2</td>
<td>100</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Discussions

- Subpleural cysts are not unique to but are suggestive of Down Syndrome.
- Only 2 children without Down syndrome were found to have subpleural cysts in the review of the CT database of approximately 4,000 children.
- One of these 2 children also had congenital heart disease.
- Previously reported prevalence found on an autopsy series was 28%.
- We found prevalence of 36% in our study.
- Etiology of cysts
- Although known, thought to be related to pulmonary hypoplasia which is a feature of Down syndrome.
- Children with Down syndrome have diminished number of bronchioles, smaller alveolar surface area, and enlarged vessels and alveolar ducts.
- Postulated that reduced production of air spaces occurs early in postnatal life.
- Absence of cysts in stillborn in autopsy series.
- The finding of subpleural cysts in Down syndrome should be distinguished from intrapulmonary cystic lung disease, peripheral focal emphysema, and pneumatocele.
- Associations with comorbidities:
  - Although a statistically significant association between congenital heart disease and subpleural cysts was previously reported, we did not detect a significant association possibly due to our small sample size.
  - We found a history of prematurity to be significantly associated with subpleural cysts.
- Our results should be interpreted with caution due to:
  - Relatively low number of children in the study.
  - Limited image resolution due to technique and breathing motion.
  - Most of the children included in the study had significant respiratory or cardiovascular comorbid disease.

Conclusions

- Subpleural cysts within the lungs are a common finding in chest CT in children with Down syndrome. They are most commonly located within the anteromedial portion of the lung. Although the etiology remains unclear, it is hypothesized that they are secondary to lung hypoplasia which is a known feature of Down syndrome. It is important not to confuse this entity with lung diseases such as lymphangiomyomatosis, cystic bronchiectasis, or peripheral bullae.

References