Retrospective Analysis: Incidental Findings On Preoperative Chest CT For Pectus Excavatum Repair
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Introduction

- The majority of patients who will have surgery for correction of pectus excavatum deformity (Nuss Procedure) will have a preoperative CT (Computed Tomography) scan to evaluate the chest wall deformity and HI (Haller Index).

- Haller Index = the ratio of transverse diameter of the inner chest wall to the minimum anteroposterior diameter between the sternum and vertebrae.

- Normal HI is near 2.5; HI in severe pectus excavatum is over 3.25.
Example of Haller Index calculation
HI = (226.82/60.48) = 3.75
In radiology, we strive to obtain useful clinical and diagnostic information using radiation doses according to the principle of “As Low As Reasonably Achievable (ALARA)”.

We performed a retrospective review of CT images obtained in patients undergoing surgical repair of pectus excavatum to quantify incidental findings associated with chest CTs performed for pectus excavatum repair.

In doing so, we hoped to see if the diagnostic information obtained from these CTs conformed to the principles of ALARA.
Materials And Methods

- We retrospectively reviewed CT images and reports from scans obtained at CHKD from 181 patients between 2007 and 2014.

- All incidental findings were classified according to location and clinical significance.

- Clinical significance was assigned to a 1-3 scale:
  - (1) incidental findings of unlikely significance requiring no follow up
  - (2) potentially significant findings that led to further workup
  - (3) significant findings that preclude surgery.
<table>
<thead>
<tr>
<th>Incidental findings</th>
<th>Clinical Significance score 1</th>
<th>Clinical Significance score 2</th>
<th>Clinical Significance score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Pulmonary nodules</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6 Mild compression of upper airway</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 Atelectasis</td>
<td>3</td>
<td>0</td>
<td>0</td>
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<tr>
<td>2 Air trapping</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Pneumatocele</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Mild bronchial wall thickening</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Mild emphysema</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Apical pleural thickening</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 Non-obstructing renal calculi</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1 Renal cyst</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Fatty liver</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Hyperdense renal pyramids</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Bilateral SVCs</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1 Borderline enlarged heart</td>
<td>1</td>
<td>0</td>
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<tr>
<td>1 Trace pneumomediastinum</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 Incomplete fusion T11 &amp; L1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 Asymmetric sternoclavicular joints</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 Hilar, retroperitoneal adenopathy &amp; splenomegaly</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Number of Incidental Findings Arranged by Organ System and Clinical Significance Score

- **Respiratory**: Score 1 (30), Score 2 (0)
- **Abdomen**: Score 1 (25), Score 2 (5)
- **Mediastinum**: Score 1 (15), Score 2 (0)
- **Osseous**: Score 1 (10), Score 2 (5)
- **Lymphatic**: Score 1 (0), Score 2 (0)
Results

- 79% (143/181) of the preoperative chest CTs reviewed for this study demonstrated no incidental findings.

- Of the remaining 38 chest CTs with incidental findings:
  - 34 were of doubtful significance and required no follow-up.
  - 4 led to further workup which demonstrated resolution on short interval follow up imaging or did not preclude surgery.
  - No CT demonstrated clinically significant findings that precluded surgical treatment.
Conclusions

- Pediatric incidental findings on preoperative chest CT for pectus excavatum repair are relatively uncommon and very rarely significant.
- The protocol for preoperative chest CT for pectus excavatum repair could be modified to a lower radiation dose.
- Scan parameters could be narrowed to exclude upper abdomen.
Conclusions

- Implications of modifying CT protocol to reduce radiation dose:
  - Slightly lower image quality
  - Adequate anatomical survey for assessment of Haller Index
  - Acceptable due to rarity of significant incidental findings
References

