Imaging Pulmonary Hypertension

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Pulmonary Arterial Hypertension (PAH)

Focus on clinical care and unsuspected PAH
How good are echocardiography and MRI?
What’s going on in the real world?
Is there something we can use every day?
Mean PA pressure > 25mm Hg at rest
Tricuspid regurg. Doppler velocity > 2.5 m/s
Systolic PA pressure > \( \frac{1}{2} \) systemic pressure
Evaluation

Catheter angiography is the gold standard, and is often necessary.
Echocardiography and MR both show highly significant correlation with angiography. Neither correlates very well.
Correlation

R = 0

R = 0.5
Correlation

R = 0

R = 0.5

p < 0.01
Correlation

$R = 0.5$

$p < 0.01$

$R = 0.7$

$p < 0.001$
Echocardiography vs. Catheterization

R = 0.7

- Cath + Echo -
- Cath + Echo +
- Cath - Echo -
- Cath - Echo +

PA Pressure: Cath

PA Pressure: Echo
Echocardiography

Likely to remain the initial evaluation for suspected PAH
Not very accurate in estimating PA pressure

“Doppler Echocardiography Inaccurately Estimates Right Ventricular Pressure in Children with Elevated Right Heart Pressure”

MRI

Provides the best overall evaluation of the heart and pulmonary vessels in patients with suspected PAH
Will not replace echo as initial study
Not accurate enough to replace catheter angiographic measurement of PA pressure
Pulmonary Artery to Aorta Ratio

Measure aortic and pulmonary artery diameter at the origin of the right PA

Ratio of PA : Ao >1 raises concern for PAH
“A CT sign of chronic pulmonary arterial hypertension: the ratio of main pulmonary artery to aortic diameter.”


Six of thirty thoracic imagers chose this article as the most influential article ever published in this journal.
“Diameters of normal thoracic vascular structures in pediatric patients”

Table 3: The distribution of patients according to gender and age

<table>
<thead>
<tr>
<th>Groups</th>
<th>Age (months)</th>
<th>Mean age (years)</th>
<th>Female (n)</th>
<th>Male (n)</th>
<th>Total subjects (n)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>0–12</td>
<td>0.7</td>
<td>7</td>
<td>20</td>
<td>27</td>
<td>20.3</td>
</tr>
<tr>
<td>Group 2</td>
<td>12–36</td>
<td>2.3</td>
<td>10</td>
<td>19</td>
<td>29</td>
<td>21.8</td>
</tr>
<tr>
<td>Group 3</td>
<td>37–72</td>
<td>5.1</td>
<td>3</td>
<td>12</td>
<td>15</td>
<td>11.3</td>
</tr>
<tr>
<td>Group 4</td>
<td>73–120</td>
<td>8.3</td>
<td>5</td>
<td>20</td>
<td>25</td>
<td>18.8</td>
</tr>
<tr>
<td>Group 5</td>
<td>121–192</td>
<td>13.5</td>
<td>17</td>
<td>20</td>
<td>37</td>
<td>27.8</td>
</tr>
<tr>
<td>Total 0–192</td>
<td>6.5</td>
<td>42</td>
<td>91</td>
<td>133</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: The mean diameter (in millimeters) of the vessels and the T vertebra in each group

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>Group 5</th>
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</thead>
<tbody>
<tr>
<td>AA</td>
<td>12.4 ± 2.4</td>
<td>15.1 ± 1.9</td>
<td>18.5 ± 2.9</td>
<td>20.9 ± 3.8</td>
<td>25.1 ± 2.7</td>
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<tr>
<td>DA</td>
<td>9.8 ± 1.5</td>
<td>11.1 ± 2.1</td>
<td>13.6 ± 2.4</td>
<td>15.3 ± 2.6</td>
<td>17.9 ± 2.4</td>
</tr>
<tr>
<td>MPA</td>
<td>11.6 ± 1.7</td>
<td>14.8 ± 2.9</td>
<td>16.0 ± 2.9</td>
<td>18.8 ± 2.6</td>
<td>22.0 ± 3.0</td>
</tr>
<tr>
<td>RPA</td>
<td>7.6 ± 1.1</td>
<td>10.1 ± 1.4</td>
<td>11.3 ± 2.4</td>
<td>12.9 ± 1.8</td>
<td>15.2 ± 1.9</td>
</tr>
<tr>
<td>LPA</td>
<td>8.1 ± 2.3</td>
<td>9.6 ± 1.4</td>
<td>11.5 ± 2.4</td>
<td>12.7 ± 1.6</td>
<td>14.4 ± 1.8</td>
</tr>
<tr>
<td>T</td>
<td>11.3 ± 1.7</td>
<td>13.8 ± 1.9</td>
<td>16.4 ± 2.5</td>
<td>18.7 ± 2.4</td>
<td>21.2 ± 2.3</td>
</tr>
</tbody>
</table>

CT of the chest in the evaluation of idiopathic pulmonary arterial hypertension in children


The central pulmonary arteries were enlarged in 15 of 17
“A CT sign of chronic pulmonary arterial hypertension: the ratio of main pulmonary artery to aortic diameter.”


Positive predictive value 70%
Negative predictive value 52%
Thank You

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