Abstract: P2742

Right ventricular stroke volume during dobutamine stress magnetic resonance compared to lung perfusion and peak oxygen uptake after arterial switch operation for transposition of the great arteries

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Congenital Heart Disease: CMR

Citation:

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Objectives:
Abnormal pulmonary perfusion due to stenosis of the central pulmonary arteries is common after neonatal arterial switch operation (ASO) for transposition of the great arteries (TGA). We conducted a monocentric prospective study in young adults after neonatal ASO for TGA to evaluate the effects of abnormal pulmonary perfusion on the increase of the right ventricular stroke volume (RVSV) during dobutamine stress magnetic resonance (DSMR) and on cardiopulmonary exercise capacity.

Methods:
68 unselected patients (age 18-29 years) underwent CMR at rest and under dobutamine stress (10 to 40 µg/kg/min). RVSV, pulmonary blood flow distribution (PBFD) and peak flow velocity were derived from phase contrast mapping in the main, right and left pulmonary artery (PA) at rest and each stress level. A cardiopulmonary exercise test (CPET) was performed at the same day. All patients reached maximal exercise effort according to heart rate and respiratory exchange rate.

Results:
PBFD at rest:
9/68 patients (13 %, ASO-S) had abnormal pulmonary perfusion at rest, defined as PBFD >2:1 (right/left or left/right) and/or relevant stenosis of the main PA (Vmax >2.5 m/s). 59/68 patients (87 %, ASO-N) had normal pulmonary perfusion.

PBFD under DSMR:
(1) In the whole patient group, there was no increase of PBFD under stress compared to PBFD at rest. On an individual patient level, no relevant worsening of abnormal PBFD was found.
(2) Under low dose dobutamine, ASO-S had a significantly lower RVSV-increase (RVSVstress/RVSVrest) compared to ASO-N (see figure).
However, under high dose dobutamine, this effect was no longer significant (see figure).
(3) The RVSV-increase under low and high dose dobutamine did not correlate with peak oxygen uptake during CPET, neither in the total group nor in the subgroups (see table). Peak oxygen uptake was not significantly different between ASO-N and ASO-S (p=0.72).

Conclusion:
(1) Patients with relevant stenosis of main PA and/or abnormal peripheral blood flow distribution (ASO-S) exhibit a reduced RVSV-increase under low dose dobutamine compared to patients without stenosis (ASO-N). This effect was not present under high dose dobutamine stress.
(2) These findings did not correlate with peak oxygen uptake during CPET, an objective parameter of
cardiopulmonary exercise capacity.

(3) Therefore, a conservative proceeding rather than surgery or catheter intervention should be considered, especially in asymptomatic adult patients.

<table>
<thead>
<tr>
<th></th>
<th>ASO-total low dobu</th>
<th>ASO-total high dobu</th>
<th>ASO-S low dobu</th>
<th>ASO-S high dobu</th>
<th>ASO-N low dobu</th>
<th>ASO-N high dobu</th>
</tr>
</thead>
<tbody>
<tr>
<td>RVSV increase / peak VO2%</td>
<td>-0.02</td>
<td>-0.05</td>
<td>0.01</td>
<td>-0.22</td>
<td>-0.05</td>
<td>-0.04</td>
</tr>
<tr>
<td>Pearson correlation coefficient</td>
<td>0.90</td>
<td>0.71</td>
<td>0.98</td>
<td>0.56</td>
<td>0.71</td>
<td>0.78</td>
</tr>
<tr>
<td>p-value</td>
<td>0.90</td>
<td>0.71</td>
<td>0.98</td>
<td>0.56</td>
<td>0.71</td>
<td>0.78</td>
</tr>
</tbody>
</table>

\[ \frac{RVSV_{\text{stress}}}{RVSV_{\text{rest}}} \] [Mean±STD]

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\[ P < 0.001 \]

\[ P = 0.08 \]