Cardiotrophin-1 is differentially induced in the myocardium of infants with congenital cardiac defects depending on hypoxemia

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BACKGROUND

CT-1 is upregulated by hypoxemia and hemodynamic overload and induces cardiac hypertrophy via the janus kinase / signal transducer and activator of transcription pathway.

SUBJECT

To test if cardiotrophin (CT)-1 is differentially induced in the myocardium of infants with congenital cardiac defects depending on hypoxemia.

METHODS

- Infants with Tetralogy of Fallot (TOF) or with large ventricular septal defect (VSD) undergoing corrective surgery were investigated.
- Expression of CT-1 was assessed at mRNA- and protein level in the right atrial and right ventricular myocardium.
- We measured the activation of the signal transducer and activator of transcription (STAT)-3 and vascular endothelial growth factor (VEGF)165.
- Degradation of cardiac troponin (cTn-I) served as a marker of myocardial damage.

RESULTS

- CT-1 was detected in all patients.
- Infants with TOF showed significantly higher protein levels of CT-1 than those with VSD.
- In all patients, levels of CT-1 negatively correlated with arterial oxygen saturation.
- Patients with TOF showed higher levels of phospho-STAT-3 and VEGF165 and higher levels of cTn-I.

Patients clinical data

<table>
<thead>
<tr>
<th></th>
<th>TOF group (n = 8)</th>
<th>VSD group (n = 6)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female / male)</td>
<td>2 / 6</td>
<td>5 / 3</td>
<td>NS</td>
</tr>
<tr>
<td>Age at operation (months)</td>
<td>3.8 ± 3.0</td>
<td>5.8 ± 4.3</td>
<td>NS</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>7.5 ± 3.4</td>
<td>6.1 ± 2.7</td>
<td>NS</td>
</tr>
<tr>
<td>Preoperative SaO2 (%)</td>
<td>87.4 ± 3.6</td>
<td>97.7 ± 1.0</td>
<td>0.001</td>
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</tbody>
</table>

Data are presented as the mean value ± SD. SaO2: transcutaneous arterial oxygen saturation; TOF: Tetralogy of Fallot; VSD: ventricular septal defect; NS: not significant.

CONCLUSION

CT-1 is differentially expressed in the myocardium of infants with heart defects:

- Higher CT-1 expression in patients with TOF is associated with activation of the Jak/STAT pathway and higher cTn-I degradation.
- CT-1 might mediate myocardial hypertrophy and myocardial dysfunction in infants with congenital cardiac defects, particularly in those with hypoxemia.