Advances in cardiac surgery have led to an increased survival of patients with congenital heart disease (CHD). The current inclusion criteria for CRT in adult populations may not be directly applied to pediatric patients because they are a very heterogeneous group.

Background: CRT can improve the clinical outcome of patients with left ventricular (LV) dysfunction induced by chronic right ventricular (RV) pacing.

METHODS

We retrospectively reviewed all data about 20 consecutive CHD and pediatric patients (12 male and 8 female) who underwent biventricular pacing between 2006 and 2012 in our institution. Average age at implantation 9 years (from 1 to 28).

For individualized VV interval optimization 3DE full-volume datasets of the left ventricle were obtained and analyzed to derive a systolic dyssynchrony index (SDI). Simultaneous study of the 'ENTIRE VENTRICLE' (longitudinal, radial and circumferential contraction) to identify GLOBAL DYSSYNCHRONY during the SAME BEAT heart.

SYSTOLIC DYSSYNERGY INDEX: dispersion of the time needed to reach the minimum volume for each of the 16 segments:
- normal: SDI < 5.5% (+ or - 1.8)
- mild LV dysfunction: SDI > 5.5% and <= 8.0%
- moderate LV dysfunction: SDI > 8.0% and <= 11.0%
- severe LV dysfunction: SDI > 11.0%

SDI has shown to be a parameter to predict the response to CRT in the acute and sub-acute phase better than EF.

The implantation approach for CRT was transvenous in 5 patients (25%), epicardial in 13 patients (65%) and hybrid in 2 patients (10%).

All patients required chronic RV pacing for advanced or complete AV block (CAVB).

7 patients showed also CHD.

Response to CRT therapy was predefined as a minimum 5% proportional increase in EF over baseline measurements.

Routine baseline 2DE and 3DE, were performed in all patients according to institutional guidelines.

The device was programmed for the VV interval with the highest EF.

Follow-up was at 1 month, and then every 6 months.

All patients were considered responders, but a 27 years old patient died suddenly after 1 year of CRT (EF increase 10%).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre-CRT</th>
<th>1 year</th>
<th>2 years</th>
<th>3 years</th>
<th>4-5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>QRS, ms</td>
<td>150 (120-160)</td>
<td>120 (90-140)</td>
<td>110 (80-120)</td>
<td>110 (90-120)</td>
<td>105 (90-115)</td>
</tr>
<tr>
<td>z</td>
<td>4.7 (3.1-5.4)</td>
<td>1.4 (0.7-2.7)</td>
<td>0.8 (-0.7 - 1.8)</td>
<td>0.5 (-0.4 - 0.8)</td>
<td>0.5 (-0.2-1.0)</td>
</tr>
<tr>
<td>EF, %</td>
<td>39 (30-50)</td>
<td>51 (46-58)</td>
<td>52 (48-60)</td>
<td>54 (50-60)</td>
<td>58 (52-60)</td>
</tr>
<tr>
<td>SDI, %</td>
<td>-</td>
<td>6.3 (3.6-13.8)</td>
<td>3.5 (2.4-7.1)</td>
<td>4.0 (2.9-6.3)</td>
<td>2.8 (2.1-3.7)</td>
</tr>
</tbody>
</table>

CONCLUSIONS

In young patients with CAVB and CRT, 3DE/ECG individualized optimization of V-V intervals showed at short/medium-term follow-up, a:
- significant improvement of LV dimensions,
- systolic function,
- synchrony,
- and NYHA class.