**CRT17**

**ACUTE EFFECTS OF CARDIAC RESYNCHRONIZATION THERAPY ON SYSTOLIC CARDIAC FUNCTION IN PATIENTS WITH CONGESTIVE HEART FAILURE**

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Cardiac resynchronization therapy (CRT) is a new therapy that improves hemodynamics and symptoms in patients with advanced heart failure by restoring more synchronized contraction patterns.

**Purpose of the study** is to evaluate the acute effects of CRT on left ventricular systolic function with the current echocardiographic indices.

**Methods:** Fourteen patients with advanced heart failure (NYHA class II–III), EF < 35%, QRS 165 ±15 msec, were studied before and 24 hours after implantation of a CRT system. The echocardiographic parameters included: 1) LVEF determined by m-Mode and Simpson’s method, 2) stroke volume (SV), 3) estimation of mean rate of LV systolic pressure rise LV dp/dt, and 4) mean systolic annular velocities (Sm-nitral annular velocity) assessed by Tissue Doppler Imaging (TDI). We calculated and compared all parameters before and after the day after implantation. Statistical analysis was performed with the Wilcoxon Matched Pairs Test.

**Results:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ON</th>
<th>OFF</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teichholz EF (%)</td>
<td>24.7±2.7</td>
<td>22.5±2</td>
<td>0.51</td>
</tr>
<tr>
<td>Simpson’s EF (%)</td>
<td>24.7±2.8</td>
<td>22.8±2.6</td>
<td>0.32</td>
</tr>
<tr>
<td>Teichholz SV (ml)</td>
<td>22.7±2.3</td>
<td>20.5±1.6</td>
<td>0.21</td>
</tr>
<tr>
<td>Simpson’s SV (ml)</td>
<td>43.4±8.3</td>
<td>43.5±6.9</td>
<td>0.85</td>
</tr>
<tr>
<td>dp/dt</td>
<td>941±103</td>
<td>412±90</td>
<td>0.002</td>
</tr>
<tr>
<td>Sm annular velocity (cm/sec)</td>
<td>2.78±0.4</td>
<td>2.62±0.2</td>
<td>0.79</td>
</tr>
</tbody>
</table>

**Conclusion:** Dp/dt improved significantly, indicating a more sensitive marker of left ventricular systolic performance that is influenced immediately after turning to CRT pacing mode.

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**CRT18**

**UPGRADE TO BIVENTRICULAR PACING IN PATIENTS WITH CONVENTIONAL PACEMAKERS AND HEART FAILURE. A DOUBLE-BLIND, RANDOMISED CROSS-OVER STUDY**

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**Purpose of the study:** To investigate whether patients with previously implanted conventional pacemakers and severe heart failure benefit from an upgrade to a bi-ventricular system.

**Methods Used:** Study inclusion criteria were NYHA class III–IV, dominating paced rhythm, and no left bundle branch block in the pre-pacing ECG. Ten patients with pacemakers (4 VVIR due to slow atrial fibrillation; 6 DDDR of which 4 were due to high degree AV-block and two to sinus node disease) were upgraded to a biventricular system. The median time in pacing before the upgrade was 5.7 years. Assessments of 6-minute walk test, symptom score, Brain Natriuretic Peptide (Pro-BNP), and echocardiography were made preoperatively. After a run-in period of one month in BVP following the upgrade, the patients were randomised to a two-month period in either BVP or RVP, followed by two months in the other mode, in a double blind crossover fashion. After each period, the preoperative measurements were repeated. After study completion, patients were asked to select their preferred period.

**Summary of the Results:** The median 6-minute walking distance was significantly longer in BVP (400 m) vs RVP (315 m), p = 0.02. The symptom score was also significantly better with BVP (p < 0.005). Median Pro-BNP was significantly lower in BVP than in RVP, 3030 vs. 5064 ng/l (p < 0.005). Six patients demanded an early cross-over in RVP but none in BVP (p = 0.015) and all patients except one expressed a preference for BVP. Echo parameters, however, did not show any significant differences between BVP and RVP.

**Conclusion:** Pacemaker patients with heart failure and dominating paced heart rhythm benefit substantially from an upgrade to biventricular pacing.

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**CRT19**

**BIVENTRICULAR PACING WITH LEFT TO RIGHT VENTRICLE PACING DELAY: THE ACUTE HEMODYNAMIC EFFECT**

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Newer pacemakers designed for CRT have the possibility to program a delay between paced ventricles (VV delay). There is some evidence that VV delay optimization in biventricular pacing (BiVp) may bring an additional hemodynamic benefit of CRT. Most of the CRT studies conducted so far were performed with no VV delay programming possibility.

**The aim of the study** was to compare the acute hemodynamic effects of BiV pacing using different times of right ventricle (RV) after left ventricle (LV) delay.

**Methods:** The study group consisted of 71 patients (59M, 12F; mean age 67.2 ± 7y) with permanently implanted BiVp system with the possibility to set the VV delay. RV lead: 49 pts - RVA, 22 pts RVOT. Measurements were performed by means of impedance cardiography (BioZ.com). Stroke Volume (SV), Velocity index (VI), Acceleration Index (ACTI) as well Ejection Time (LVET) and Pre-ejection period (PPEP) were determined. The measurements in 3 min periods were collected and averaged, after the adaptation periods of 3 min throughout different VV delay pacing modes (0/4 ms, 15/16 ms, 30/32 ms, 50/52 ms, 72/75 ms, depending on the pacemaker).

**Results:** Mean SV values increased as VV delay was prolonged, from the lowest at 0 ms VV delay to the highest at 75 ms VV delay (62.4; 62.7; 62.9; 64.9; 65.6 ml respectively; ANOVA p < 0.001). Different responses were observed in individual patients, however 75 ms delay was the best setting in 36.6% and 0 ms the worst in 31.0% of pts. The mean intrapatient difference between BiVp with no delay and the best one was 6.9 ml (%10) (p < 0.001).

**Conclusions:** Sequential BiVp compared to BiVp with no VV delay brings the additional hemodynamic improvement in acute setting. In the majority of patients the VV delay of 75 ms is the most beneficial and no delay is the least beneficial. Because of inter-patient differences, the VV delay should be optimized in every case of BiVp.

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**CRT20**

**IS THE OPTIMIZED INTERVENTRICULAR STIMULATION INTERVAL RATE DEPENDENT IN PATIENTS WITH CHRONIC ATRIAL FIBRILLATION?**

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Background: The optimal programmed interventricular (V-V) pacing interval may be influenced by the stimulation rate in cardiac resynchronization therapy. Methods: We studied the hemodynamic effect of V-V timing of a biventricular pacing system at 3 different heart rates in 9 patients (3 females, age 71.3 ± 8.6 years) with heart failure, who were in chronic atrial fibrillation (AF) at the time of implant. The pacing rate was varied from 70 to 90 and 110 ppm. At each rate the optimal V-V interval was determined by invasive measurement of LV dp/dt max derived from left ventricular intracavitary pressure recorded with a 0.014” pressure tipped guide wire. The V-V interval was varied in 9 steps of 20 ms from +80 ms (LV first) to −80 ms (RV first).

**Results:** The average LV dp/dt max at the optimized V-V interval was 959±200, 959±183, and 1001±184 mmHg s at pacing rates of 70, 90 and 110 ppm (<0.02).

The percentage increase of LV dp/dt max was 16.2±7.5%, 25.2±12.3% and 30.9±13.3% for these stimulation rates respectively. The variation in LV dp/dt max (difference from the highest value as function of the V-V interval at a given pacing rate) at pacing rates of respectively 70, 90 and 110 ppm was 12.7±6.6%, 10.6±6.2% and 13.4±6.2% of the corresponding maximum value at the different pacing rates.

**Conclusion:** The LV dp/dt max increases significantly with increasing stimulation rates. There is a trend that the optimal V-V interval is shorter for higher stimulation rates but the differences are not significant. Also, the stimulation rate did not influence the variability of LV dp/dt max between different settings of the V-V interval.