OPTIMIZATION OF CARDIAC PACING OUTCOMES
BY USE OF MULTIPOINT™ PACING CARDIAC RESYNCHRONIZATION THERAPY (CRT)
COMPARED WITH CONVENTIONAL CRT

Prof. Ian Wilcox, MBBS BMedSci
Ph.D. MAICD FRACP FCSANZ FCCP

Prof. Michael Vallely, MBBS (Sydney)
Ph.D. (Sydney Uni) FRACS

Dr. Michele McGrady, MBBS
(Sydney) Ph.D. (Monash) FRACP

MULTIPOINT™ PACING CASE STUDY
HEMODYNAMIC CHANGES IN A PATIENT UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY
INTRODUCTION
While the 2009 introduction of quadripolar lead technology led to improved acute hemodynamic response to CRT, non- or low-responder rates still remain a challenge. By providing an additional left ventricular (LV) stimulation vector, MultiPoint™ Pacing can improve resynchronization and hemodynamic outcomes. While the patient in this case had a good clinical response to conventional LV single-site CRT in terms of QRS interval reduction and increased ejection fraction, a switch to MultiPoint™ Pacing improved these outcomes further.

PATIENT HISTORY
- 85-year-old female
- History of coronary artery disease (CAD)
- QRS duration = 180 ms
- Left bundle branch block (LBBB)
- Baseline ejection fraction (EF) = 36%
- Heart rate (HR) range 38-89 bpm on Holter monitoring
The patient had moderate LV systolic dysfunction with regional variation in contraction probably not entirely attributable to LBBB, but consistent with CAD.

Baseline ECG
Sinus rhythm, no stimulation QRS = 180 ms, 25 mm/s

Response to conventional LV single-site pacing

<table>
<thead>
<tr>
<th>Pacing site</th>
<th>QRS duration (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right ventricle (RV) paced</td>
<td>168</td>
</tr>
<tr>
<td>D1 LV pacing only</td>
<td>180</td>
</tr>
<tr>
<td>P4 LV pacing only</td>
<td>191</td>
</tr>
<tr>
<td>Simultaneous biventricular pacing at P4</td>
<td>144</td>
</tr>
</tbody>
</table>

MULTIPOINT™ PACING THERAPY
The patient was implanted with a Quadra Assura MP™ CRT-D and Quartet™ LV lead (Abbott).

PROGRAMMING
The anatomical method, i.e. selection of the two farthest poles with no phrenic nerve stimulation (PNS) and satisfactory thresholds, was used in this patient. Two methods were used to determine LV1 and LV2:
1. Latest activation = LV1, and earliest activation = LV2
2. Earliest activation = LV1, and latest activation = LV2

MultiPoint™ Pacing programming (anatomical method)

<table>
<thead>
<tr>
<th>Program</th>
<th>LV1 (latest)</th>
<th>LV2 (earliest)</th>
<th>LV1 – LV2</th>
<th>QRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prog. 1</td>
<td>P4 to RVC</td>
<td>D1 to RVC</td>
<td>5ms</td>
<td>25ms</td>
</tr>
<tr>
<td>Prog. 2</td>
<td>D1 to RVC</td>
<td>P4 to RVC</td>
<td>5ms</td>
<td>25ms</td>
</tr>
</tbody>
</table>

Program 1: QRS = 121 ms
**IMPROVED HEMODYNAMIC OUTCOMES WITH MULTIPOINT™ PACING THERAPY**

Each MultiPoint™ Pacing configuration (vectors and timing) provided improved electrical synchronization (assessed by QRS width) versus RV only, LV only and simultaneous RV–LV stimulation.

In this case, programming using the shortest delay between LV1 and LV2 (5ms) produced incremental benefit for the patient compared with traditional CRT.

**VENTRICULAR REMODELING FOLLOWING IMPLANTATION**

The patient returned for echo optimization of CRT at 3 months following implantation and activation of MultiPoint™ Pacing. At this visit her intrinsic (unpaced) EF was found to have increased from pre-implantation baseline value (36%) to 39%, suggesting that some remodeling may have already taken place.

<table>
<thead>
<tr>
<th></th>
<th>Ejection fraction (%)</th>
<th>Percentage increase (%) compared with baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Intrinsic (unpaced)</td>
<td>39</td>
<td>8</td>
</tr>
<tr>
<td>at 3 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional CRT</td>
<td>49</td>
<td>36</td>
</tr>
<tr>
<td>MultiPoint™ pacing</td>
<td>62</td>
<td>72</td>
</tr>
</tbody>
</table>

**CONCLUSION**

Developments in MultiPoint™ Pacing programming have provided multiple options, not currently available with traditional CRT, which potentially may improve patient outcomes. This case study demonstrates that MultiPoint™ Pacing may potentially offer a significantly improved acute hemodynamic response to CRT, compared with traditional single-site LV pacing.


