# IMPROVING THE HEMODYNAMIC RESPONSE TO CARDIAC RESYNCHRONIZATION THERAPY WHILE ELIMINATING PHRENIC NERVE STIMULATION IN A PATIENT WITH NON-ISCHEMIC CARDIOMYOPATHY

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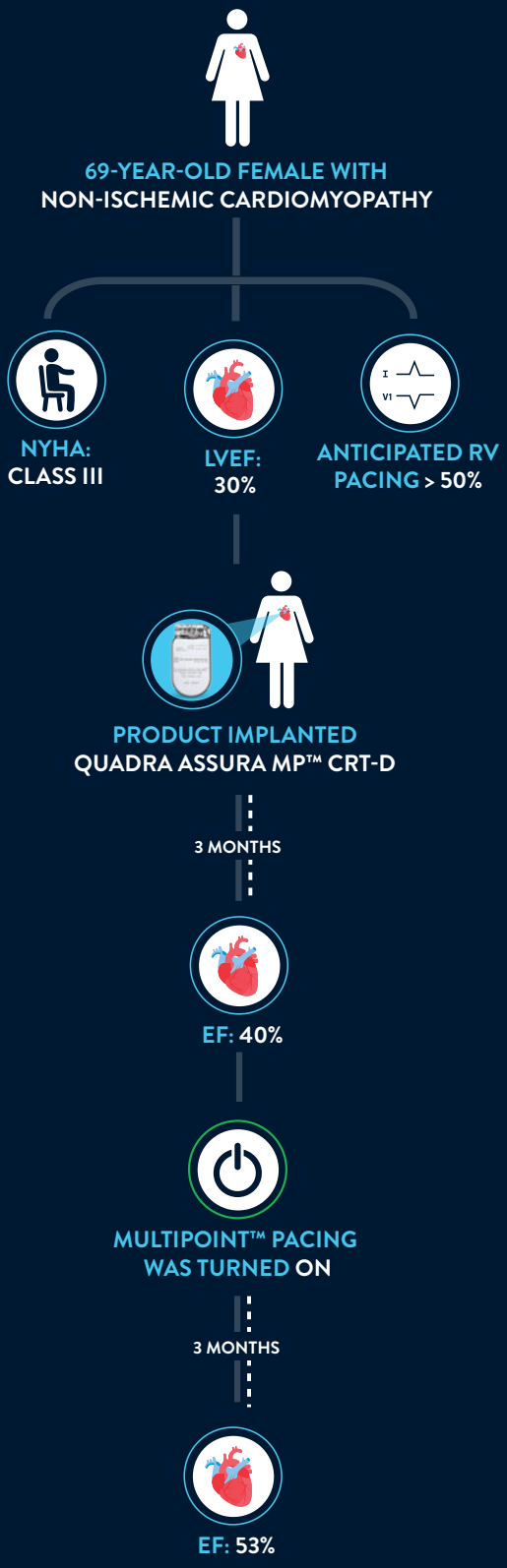
**MULTIPOINT™ PACING CASE STUDY**

**HEMODYNAMIC** CHANGES IN A PATIENT UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY



## SUPPORTING EVIDENCE

Approximately 30% of patients do not respond to traditional cardiac resynchronization therapy (CRT).[1] Abbott CRT devices featuring quadripolar pacing and MultiPoint™ Pacing have been designed for efficient CRT optimization. Physicians can implant the left ventricular lead in the most stable position without making trade-offs in electrical performance and make non-invasive lead revisions to meet the changing needs of patients with heart failure. A growing body of clinical evidence shows that MultiPoint™ Pacing can enhance the response to CRT for heart failure patients whose devices are appropriately programmed.[2-4] This case reports on the application of MultiPoint™ Pacing to improve the hemodynamic response to CRT in a patient with non-ischemic cardiomyopathy.

## PATIENT HISTORY

- 69-year-old female
- Non-ischemic cardiomyopathy
- Dual chamber pacemaker implanted previously due to intermittent heart block in February 2016; right ventricular (RV) pacing > 50%
- Patient experienced worsening symptoms of heart failure in September 2016:
  – Left ventricular ejection fraction (LVEF): 30%
  – New York Heart Association Class III heart failure

## CASE EXPERIENCE

### Implantation

- Quadra Assura MP™ CRT-D device with a Quartet™ LV lead (Abbott) was implanted after explanation of a dual-chamber pacemaker.
- The previously implanted right atrial pace/sense lead demonstrated adequate diagnostics and was retained.
- The right ventricular pace/sense lead was extracted and replaced with a Durata™ defibrillation lead (Abbott).

## RESPONSE TO CRT: INITIAL PROGRAMMING AND OPTIMIZATION WITH MULTIPOINT™ PACING

### Baseline

The CRT-D device was initially programmed to standard biventricular pacing utilizing the M3-RV coil vector with a threshold of 1.5V @ 0.4 ms in order to establish a baseline response. Other parameters are shown in Table 1.

**Table 1.** Baseline CRT Parameters

| Parameter | Value |
|---|---|
| Mode | DDR: 60/120 ppm |
| Paced AV delay | 150 ms |
| Sensed AV delay | 100 ms |
| V-V timing via QuickOpt™ timing cycle optimization | LV → RV<br>35 ms |

## 3-MONTH FOLLOW-UP

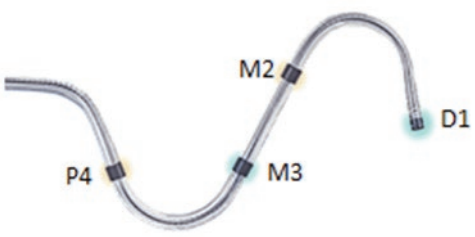
**MULTIPOINT™ PACING PROGRAMMED ON**

- The patient's LVEF improved to 40% on echocardiography prior to her 3-month follow-up with no heart failure symptoms at a clinic visit in December 2016.
- MultiPoint™ Pacing was programmed ON at this point in an effort to gain further improvements. The vectors shown in Table 2 and Figure 2 were chosen due to low thresholds and to provide a 30 mm separation between the cathodes. The interventricular delay between LV1 and LV2 was set at 5 ms and V-V timing was shortened to 30 ms as recommended with QuickOpt™ timing cycle optimization.
- The patient experienced intermittent phrenic nerve stimulation one week later. This was resolved with revised programming: the LV2 vector was changed from D1-RV coil to D1-P4 with a threshold of 1.5@ 0.4 ms; there was no phrenic stimulation at maximum output.

**Table 2.** Biventricular CRT Vectors at 3-Month Follow-up

| LV Pulse | Pacing Vector | Threshold |
|---|---|---|
| LV1 | M3-RV coil | 1.5 V @ 0.4 ms |
| LV2 | D1-RV coil | 1.0 V @ 0.4 ms |

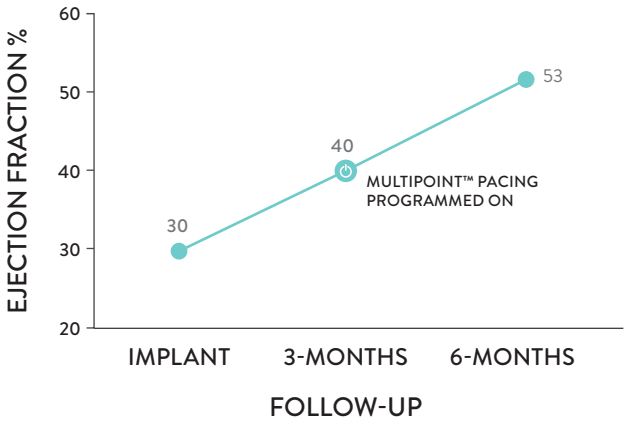
**Figure 1.** MultiPoint™ pacing vectors programmed ON at 3-month follow-up.



## 6-MONTH FOLLOW-UP

- The patient's LVEF improved further to 53% at 6-month follow-up, Table 3.
- The patient had no heart failure related hospital admissions at 6-month follow-up.

**Table 3.** Left Ventricular Ejection Fraction with and without MultiPoint™ Pacing




## CONCLUSIONS

MultiPoint™ Pacing provided the flexibility needed to potentially optimize biventricular pacing and manage phrenic nerve stimulation non-invasively. The patient's improved response to CRT was enhanced as demonstrated by incremental improvements in LVEF after MultiPoint™ Pacing was initialized.

1. Auricchio A, Prinzen FW. Non-responders to cardiac resynchronization therapy: the magnitude of the problem and the issues. *Circ J.* 2011;*75*:521-7.

2. Forleo GB, Santini L, Giammaria M, et al. Multipoint pacing via a quadripolar left-ventricular lead: preliminary results from the Italian registry on multipoint left-ventricular pacing in cardiac resynchronization therapy (IRON-MPP). *Europace*. 2017;*19*:1170-7.

3. Pappone C, Calovic Z, Vicedomini G, et al. Improving cardiac resynchronization therapy response with multipoint left ventricular pacing: Twelve-month follow-up study. *Heart Rhythm*. 2015;*12*:1250–8.

4. Thibault B, Dubuc M, Khairy P, et al. Acute haemodynamic comparison of multisite and biventricular pacing with a quadripolar left ventricular lead. *Europace*. 2013;*15*:984 -91.

## EMPOWERING THE TRANSFORMATION OF HEART FAILURE

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**Rx Only**
**Brief Summary:** Please review the Instructions for Use prior to using these devices for a complete listing of indications, contraindications, warnings, precautions, potential adverse events and directions for use.

**Quartet™ LV lead**
**Indications and Usage:** The Quartet lead has application as part of an Abbott Biventricular system.
**Contraindications:** The use of the Quartet lead is contraindicated in patients who:
• Are expected to be hypersensitive to a single dose of 1.0 mg of dexamethasone sodium phosphate.
• Are unable to undergo an emergency thoracotomy procedure.
• Have coronary venous vasculature that is inadequate for lead placement, as indicated by venogram.

**MultiPoint™ Pacing and SyncAV™ CRT Technology**
**Indications:** Abbott ICDs and CRT-Ds are intended to provide ventricular antitachycardia pacing and ventricular defibrillation for automated treatment of life-threatening ventricular arrhythmias. AF Suppression™ pacing is indicated for suppression of paroxysmal or persistent atrial fibrillation in patients with the above ICD indication and sinus node dysfunction. In patients indicated for an ICD, CRT-Ds are also intended: to provide a reduction of the symptoms of moderate to severe heart failure (NYHA Functional Class III or IV) in those patients who remain symptomatic despite stable, optimal medical therapy (as defined in the clinical trials section included in the Merlin™ PCS on-screen help) and have a left ventricular ejection fraction less than or equal to 35% and a prolonged QRS duration to maintain synchrony of the left and right ventricles in patients who have undergone an AV nodal ablation for chronic (permanent) atrial fibrillation and have NYHA Class II or III heart failure.
**Contraindications:** Contraindications for use of the pulse generator system include ventricular tachyarrhythmias resulting from transient or correctable factors such as drug toxicity, electrolyte imbalance, or acute myocardial infarction.
**Adverse Events:** Implantation of the pulse generator system, like that of any other device, involves risks, some possibly life-threatening. These include but are not limited to the following: acute hemorrhage/bleeding, air emboli, arrhythmia acceleration, cardiac or venous perforation, cardiogenic shock, cyst formation, erosion, exacerbation of heart failure, extrusion, fibrotic tissue growth, fluid accumulation, hematoma formation, histotoxic reactions, infection, keloid formation, myocardial irritability, nerve damage, pneumothorax, thromboemboli, venous occlusion. Other possible adverse effects include mortality due to: component failure, device programmer communication failure, lead abrasion, lead dislodgment or poor lead placement, lead fracture, inability to defibrillate, inhibited therapy for a ventricular tachycardia, interruption of function due to electrical or magnetic interference, shunting of energy from defibrillation paddles, system failure due to ionising radiation. Other possible adverse effects include mortality due to inappropriate delivery of therapy caused by: multiple counting of cardiac events including T waves, P waves, or supplemental pacemaker stimuli. Among the psychological effects of device implantation are imagined pulsing, dependency, fear of inappropriate pulsing, and fear of losing pulse capability.

Refer to the User's Manual for detailed indications, contraindications, warnings, precautions and potential adverse events.


27413-SJM-MLP-0118-0077(2) | Item approved for U.S. and OUS.

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