OPTIMIZATION OF CARDIAC PACING OUTCOMES

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

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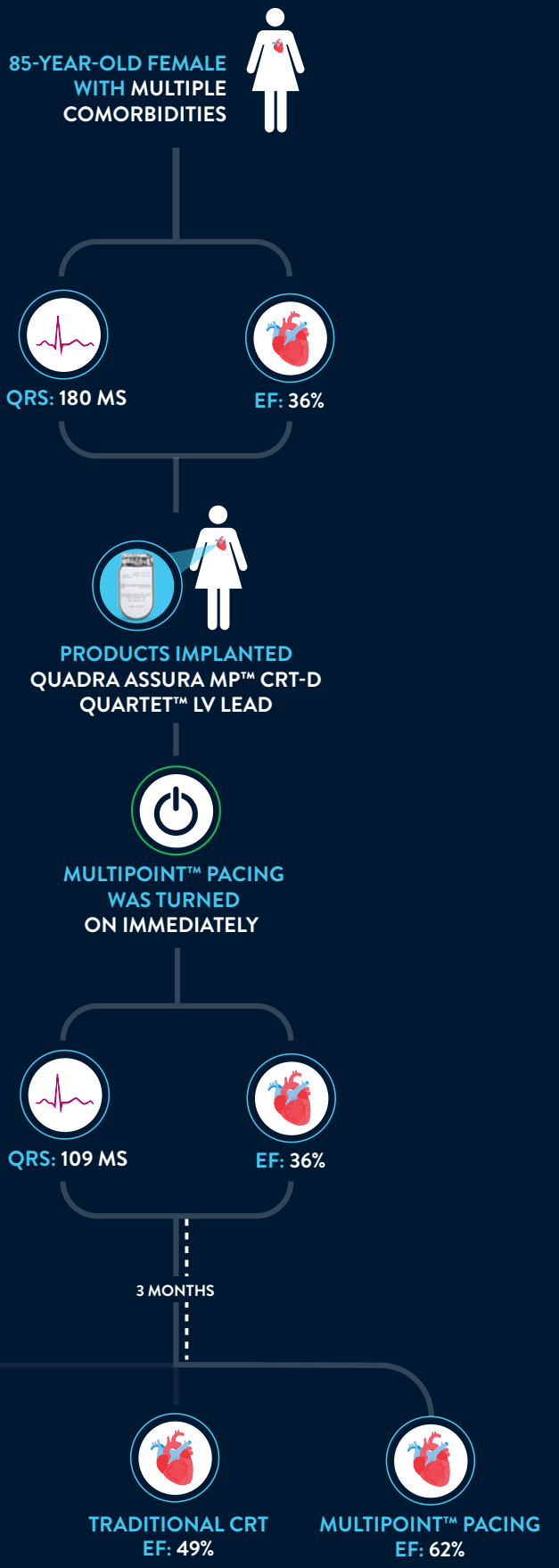
MULTIPOINT™ PACING CASE STUDY

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,[1,2] 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.[3-5] 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.

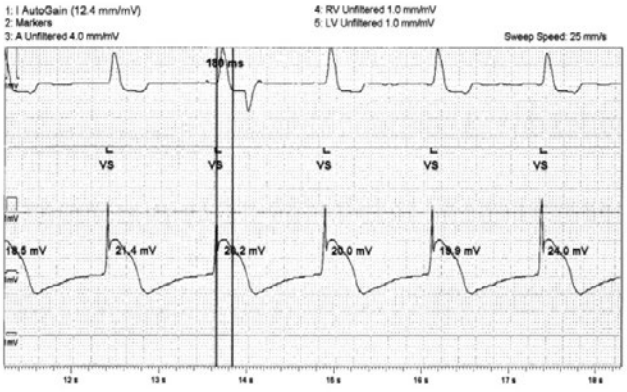
PATIENT HISTORY

- 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

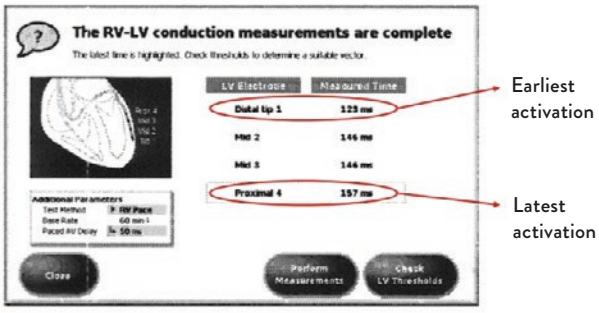
Sinus rhythm, no stimulation QRS = 180 ms, 25 mm/s



Response to conventional LV single-site pacing

Pacing site	QRS duration (ms)
Right ventricle (RV) paced	168
D1 LV pacing only	180
P4 LV pacing only	191
Simultaneous biventricular pacing at P4	144

Response to conventional LV single site pacing



MULTIPOINT™ PACING THERAPY

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

PROGRAMMING

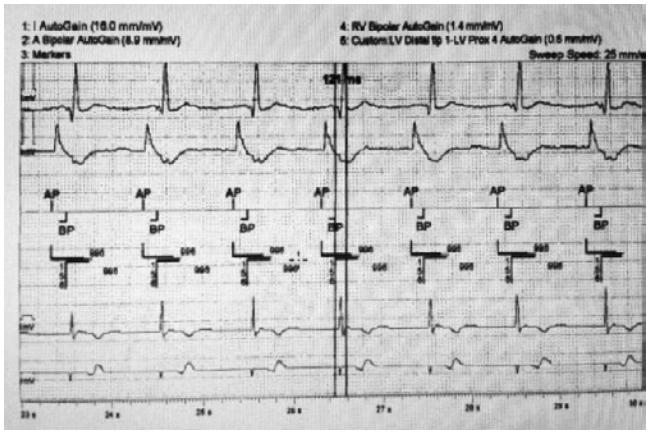
The anatomical method, i.e. selection of the two farthest poles with no phrenic nerve stimulation (PNS) and satisfactory thresholds, was used in this patient.
Two methods were used to determine LV1 and LV2:

1. Latest activation = LV1, and earliest activation = LV2
2. Earliest activation = LV1, and latest activation = LV2

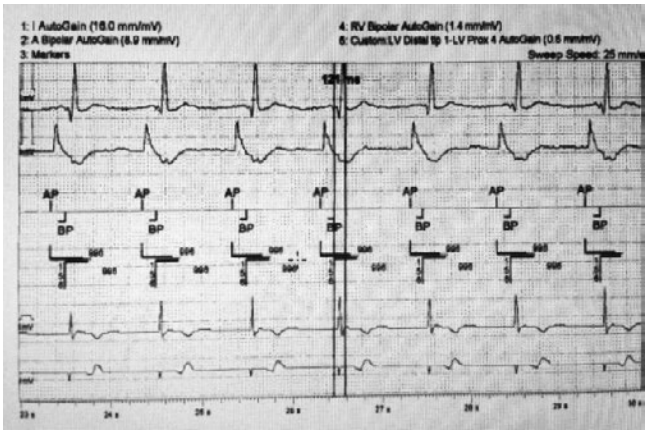
MultiPoint™ Pacing programming (anatomical method)

	LV1	LV2	LV1 – LV2	LV1 – LV2	QRS
Prog. 1	P4 to RVC (latest)	D1 to RVC (earliest)	5ms	25ms	121ms
Prog. 2	D1 to RVC (earliest)	P4 to RVC (latest)	5ms	25ms	109ms

Program 1: QRS = 121 ms



Program 2: QRS = 109 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.

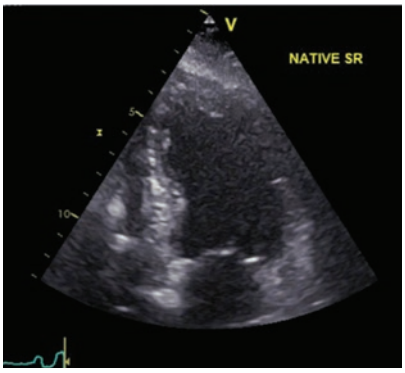
VENTRICULAR REMODELING FOLLOWING IMPLANTATION

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.

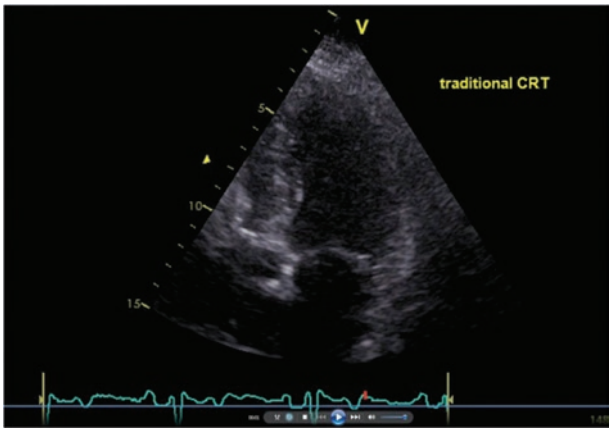
	Ejection fraction (%)	Percentage increase (%) compared with baseline
Baseline	36	
Intrinsic (unpaced) at 3 months	39	8
Traditional CRT	49	36
MultiPoint™ pacing	62	72

ECHO IMAGING

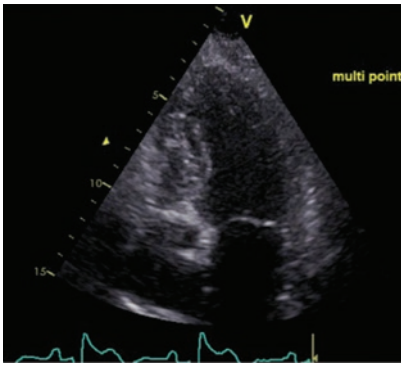
Baseline echo: QRS = 180 ms; EF = 36%



CRT echo: QRS = 140 ms; EF = 49%



MultiPoint™ Pacing CRT echo: QRS = 109 ms; EF = 62%



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.

1. Cabrera Bueno, F., Alzueta Rodríguez, J., Olagüe de Ros, J., Fernández-Lozano, I., García Guerrero, J. J., de la Concha, J. F., . . . Llorente Hernangómez E. (2013). Improvement in hemodynamic response using a quadripolar LV lead. *Pacing and Clinical Electrophysiology, 36(8)*, 963-969.

2. Shetty, A. K., Duckett, S. G., Bostock, J., Rosenthal, E., & Rinaldi, C. A. (2011). Use of a quadripolar left ventricular lead to achieve successful implantation in patients with previous failed attempts at cardiac resynchronization therapy. *Europace, 13*(7), 992-996.

3. Pappone, C., Ćalović Z., Vicedomini, G., Cuko, A., McSpadden, L. C., Ryu, K., . . . Santinelli, V. (2014). Multipoint LV pacing improves acute hemodynamic response assessed with pressure-volume loops in CRT patients. *Heart Rhythm, 11*(3), 394-401.

4. Rinaldi, C. A., Kranig, W., Leclercq, C., Kacet, S., Betts, T., Bordachar, P., . . . Naqvi, T. Z. (2013). Acute effects of multisite left ventricular pacing on mechanical dyssynchrony in patients receiving cardiac resynchronization therapy. *Journal of Cardiac Failure, 19*(11), 731-738.

5. Rinaldi, C. A., Leclercq, C., Kranig, W., Kacet, S., Betts, T., Bordachar, P., . . . Naqvi, T. Z. (2014). Improvement in acute contractility and hemodynamics with multipoint pacing via a left ventricular quadripolar pacing lead. *Journal of Interventional Cardiac Electrophysiology, 40*(1), 75-80.

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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.

29614-EM-MLP-0914-0001(3) | Item approved for U.S. and OUS.

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