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IMPLANT FINDINGS AND OPTIMIZATION CONSIDERATIONS

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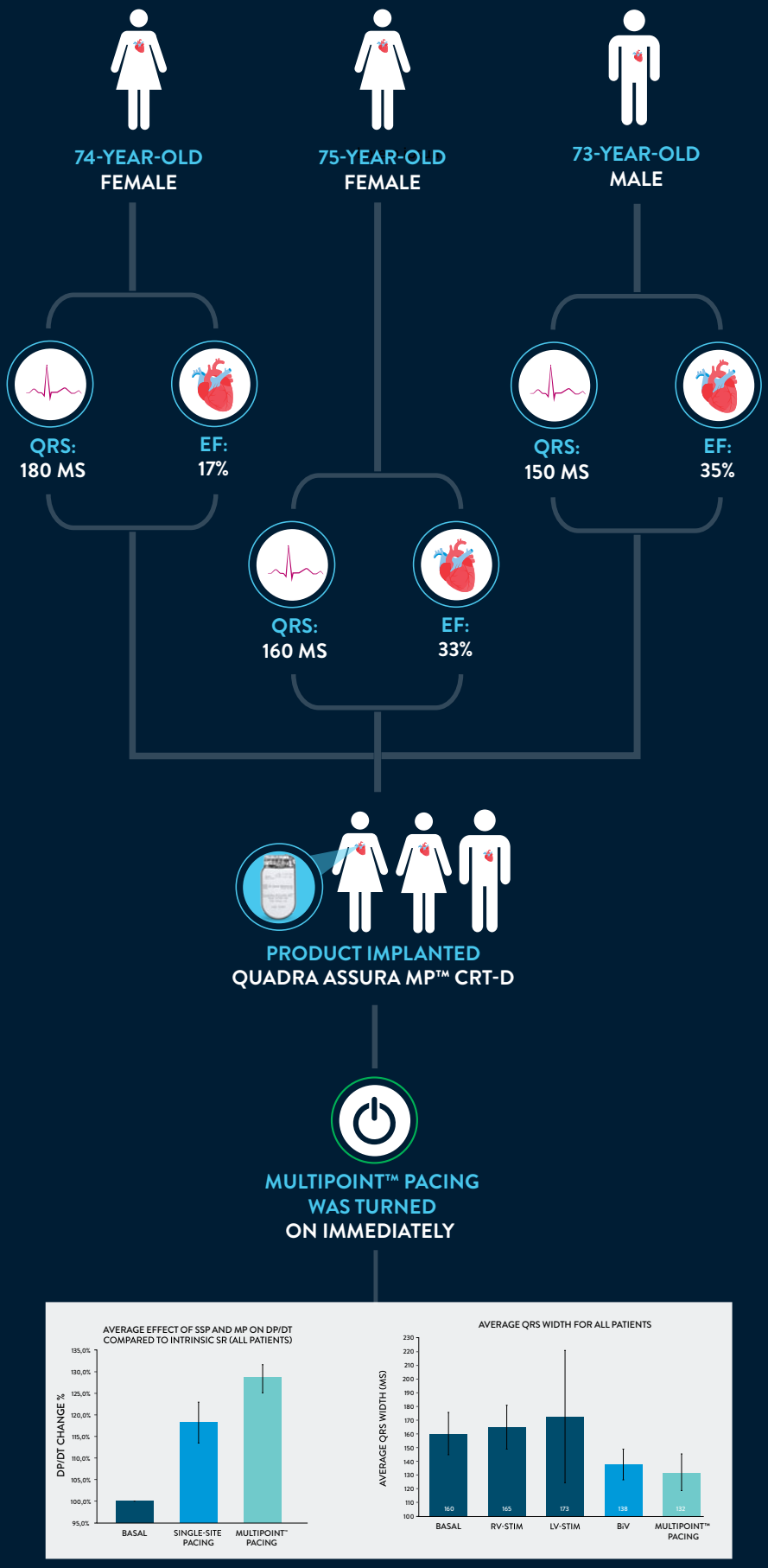
MULTIPOINT™ PACING CASE STUDY

ELECTRICAL CHANGES IN A PATIENT UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY



INTRODUCTION

In recent years, cardiac resynchronization therapy (CRT) has seen many changes. One of the most interesting occurred in 2009 with the introduction of the quadripolar technology for left ventricular leads, which reduced the occurrence of common therapy problems such as phrenic nerve stimulation and high thresholds to a historic minimum.[1] Even though quadripolar leads allow a more individualized CRT optimization, response to CRT is inadequate and unpredictable.[2] A new technology in pacing for quadripolar systems now allows an additional stimulation vector (MultiPoint™ Pacing) added to the standard quadripolar left ventricular single-site pacing. This results in a double LV-stimulation per cardiac cycle. The two stimulation vectors can be chosen from the 10 vectors available in the quadripolar systems. Presented here are three cases of a recent MultiPoint Pacing implantation with an acute hemodynamic assessment of contractility via intracardiac LV dP/dt_{max} measurement.

METHODS

All patients were implanted with a quadripolar CRT-D (Quadra Assura MP™ CRT-D, Abbott) with MultiPoint pacing capability. After the implantation of the CRT-D was finished, a pressure wire (PressureWire™ FFR measurement system, Abbott) was placed in the LV cavity over a standard multipurpose catheter. The dP/dt_{max} was assessed using the PhysioMon™ software (Abbott). The patients did not receive any sedative or analgesic agents and the measurement was performed with emphasis on a quiet and undisturbed environment to limit external influences on the dP/dt_{max}. A baseline unpaced ECG in sinus rhythm (SR) was recorded. To allow comparison between different patients, a protocol was developed to standardize programming and measurements. The AV-time was optimized using an ECG-based method.[3] For the conventional BiV stimulation, the VV-delay was programmed to simultaneous. The delay of the two MultiPoint pacing pulses (LV1/LV2/RV) was set to 5 ms between LV1 and LV2 and 15 ms between LV2 and RV. All stimulation vectors (Baseline, BiV and MultiPoint pacing) were tested in a random order protocol.

Each vector was evaluated in the same way. The output was programmed 2 V above the measured threshold. At least 15 sec of a stable rhythm were recorded. Premature ventricular complexes (PVCs) were manually identified and excluded from the analysis. For every configuration, a 12-lead ECG was recorded.

Table 1

	Patient 1	Patient 2	Patient 3
Gender	Female	Female	Male
Age	74	75	73
Etiology	DCM	DCM	CAD
QRS-width (ms)	180	160	150
QRS Morphology	LBBB	LBBB	LBBB
EF (%)	17	33	35
AV-Time (ms)	180	160	170
Atrial rhythm	SR	SR	paroxysmal AF/SR at implant

PATIENT HISTORY

All patients were on stable medication for heart failure. Patient characteristics are stated in Table 1.

IMPLEMENTATION AND LEAD PLACEMENT

Implantation of the device and the leads with standard techniques was successful with good threshold and impedances. The LV lead was implanted in a lateral/posterolateral position (see Figures 1 to 3).

Figure 1: Patient 1 (LAO 45°)

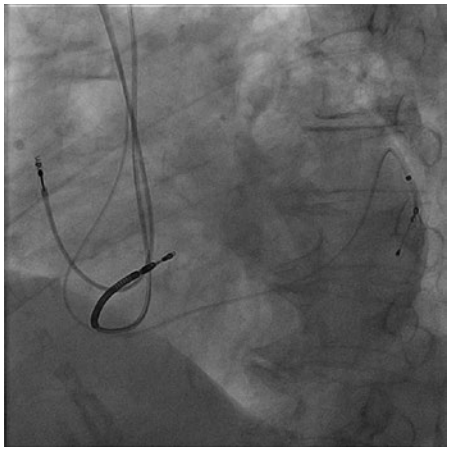


Figure 2: Patient 2 (LAO 40°)

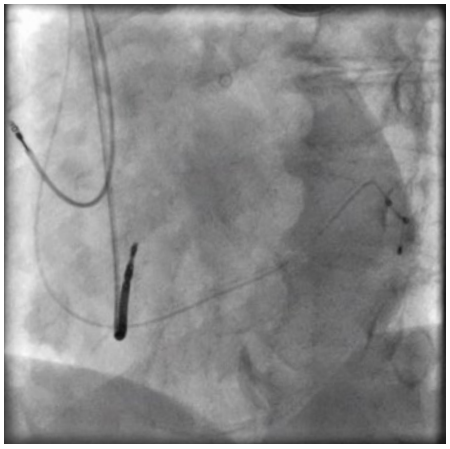
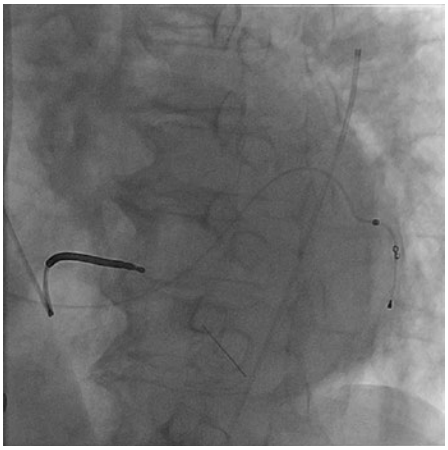


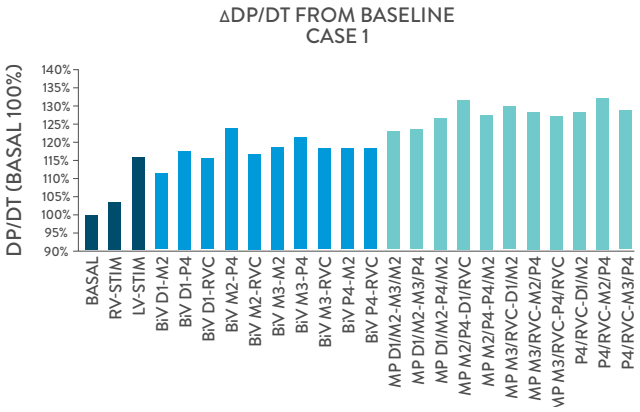
Figure 3: Patient 3 (LAO 41°)



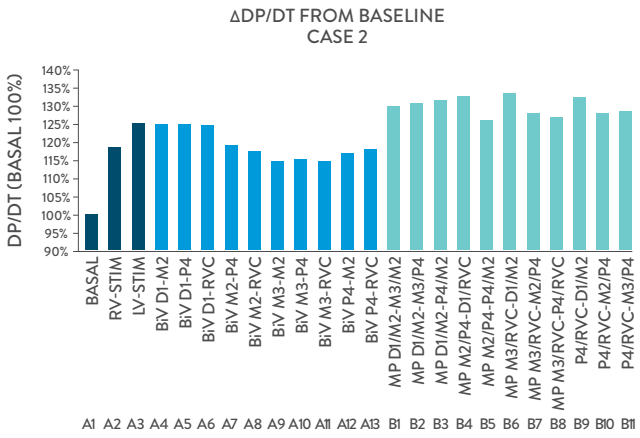
MEASUREMENTS AND MULTIPOINT™ PACING CONFIGURATION

Graphs 1 to 3 show the results that the LV dP/dt_{max} measurements yielded.

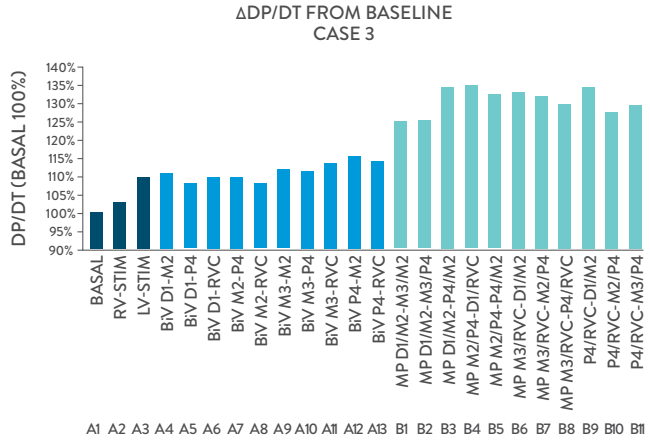
Graph 1



Graph 2

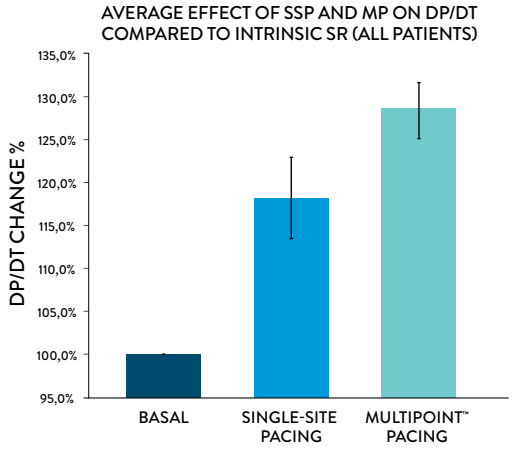


Graph 3

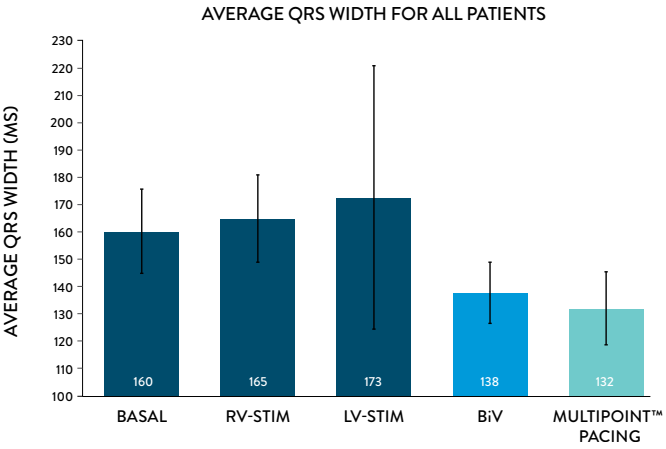


The average effect of BiV vs. MultiPoint pacing stimulation over all patients is summarized in Graph 4.

Graph 4



Graph 5



CONCLUSION

In patients with an indication for CRT, MultiPoint pacing reduces the average QRS width. In comparison with single-site pacing and standard biventricular pacing, MultiPoint pacing may potentially show an additional increase of acute LV dP/dt_{max} measurements. This indicates a positive effect on acute inotropic contraction and may potentially alleviate the rate of non-responders.

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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.

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