

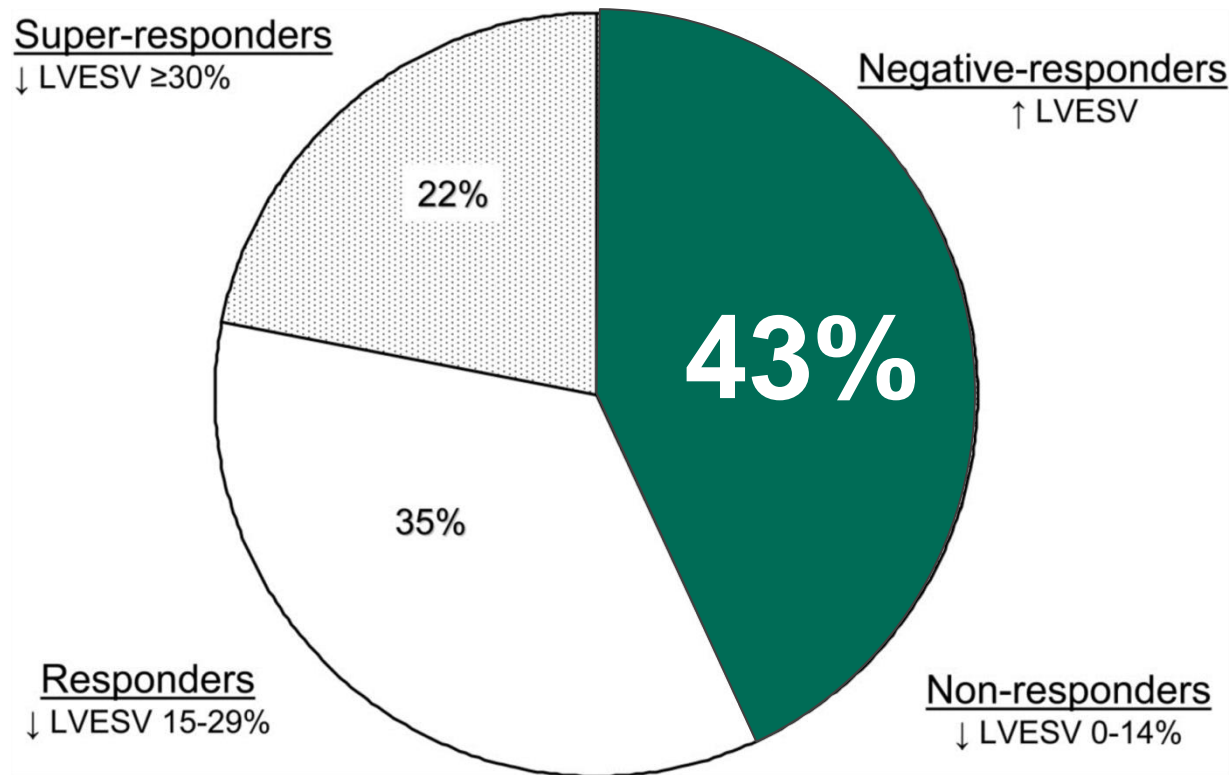
# MultiPoint™ LV Pacing



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HP Clairval, Marseille***

**Rhythm congress 2015**

# CRT Challenge: Non-responders



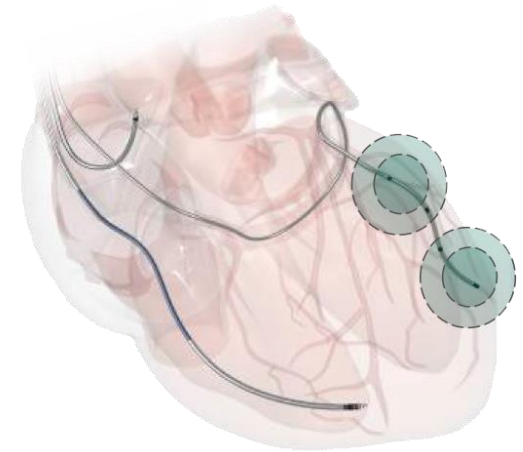
**43% of CRT patients classified as non-responders or negative-responders by LVE SV after 6 months (N=302)**

# Addressing CRT Non-responders with MultiPoint™ Pacing (MPP)

MPP addresses the challenge of CRT non-responders by:

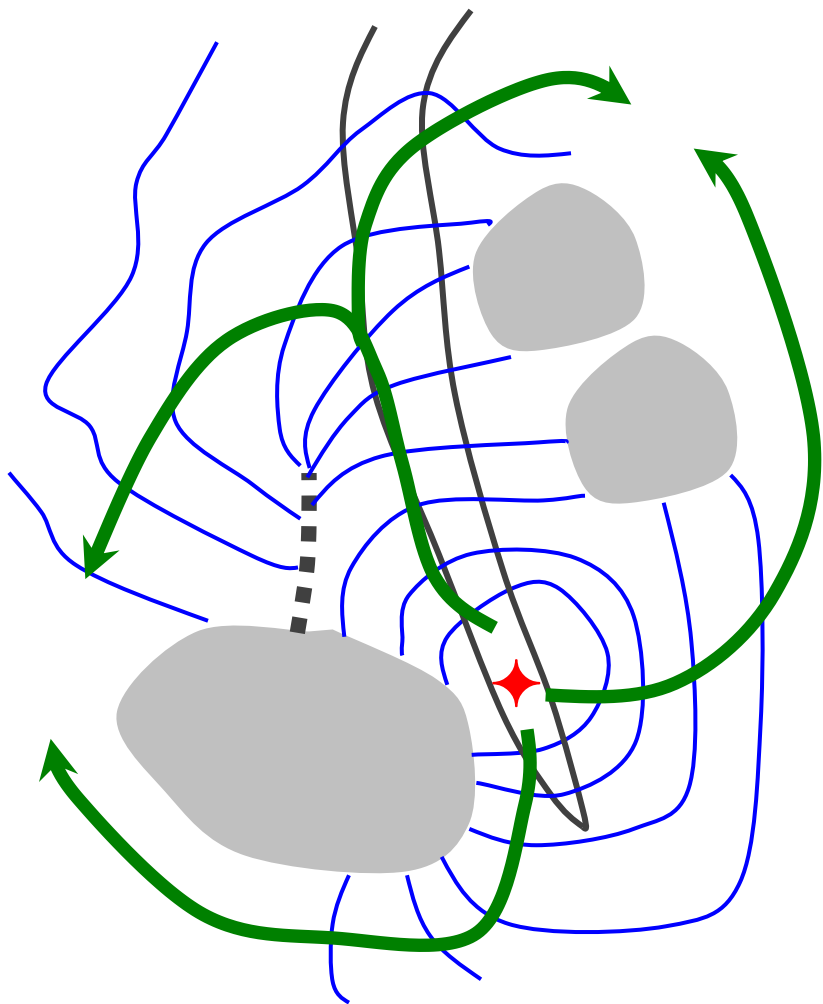
- Providing a method to capture a larger area
- Improving transventricular activation time<sup>1</sup>
- Improving hemodynamics<sup>2</sup>
- Delivering resynchronization throughout the LV<sup>3</sup>
- Allowing for pace timing adjusted to patient needs<sup>3</sup>

**MPP may be beneficial in further increasing the number of patients that respond to CRT<sup>4</sup>**

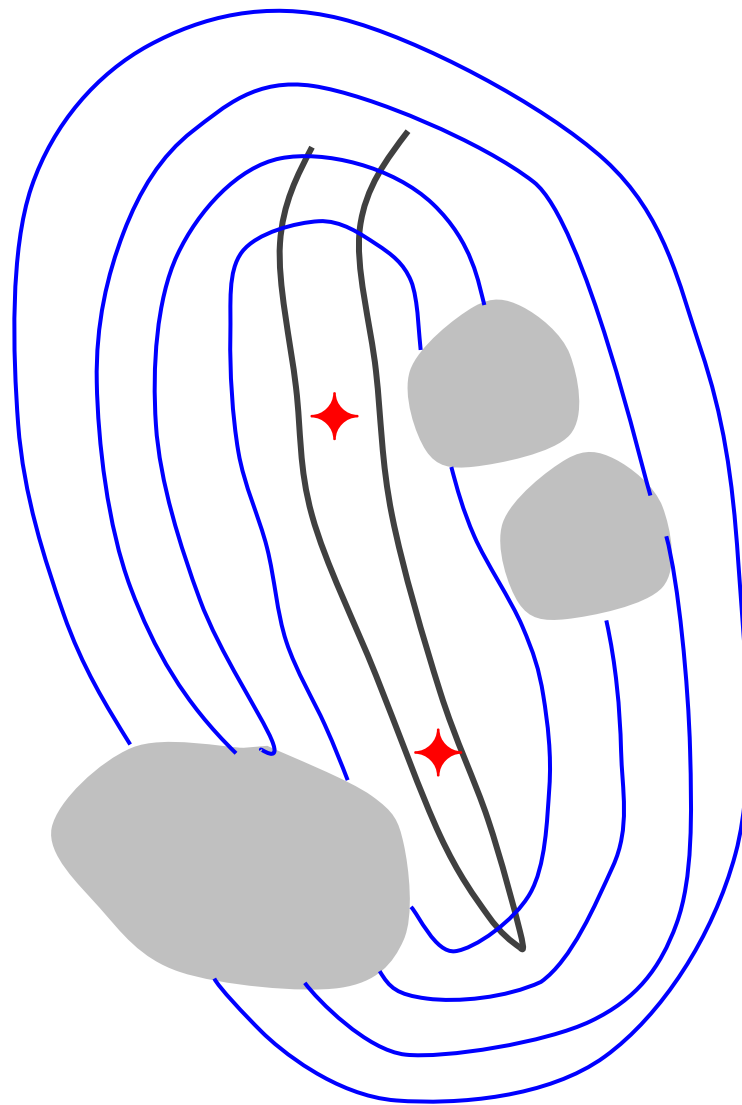


1. Theis C. et al. JCE 2009.
2. Thibault et al. Europace 2013.
3. Rinaldi et al. JCF 2013.
4. Pappone et al. HFSA 2013.

## Conventional BiV

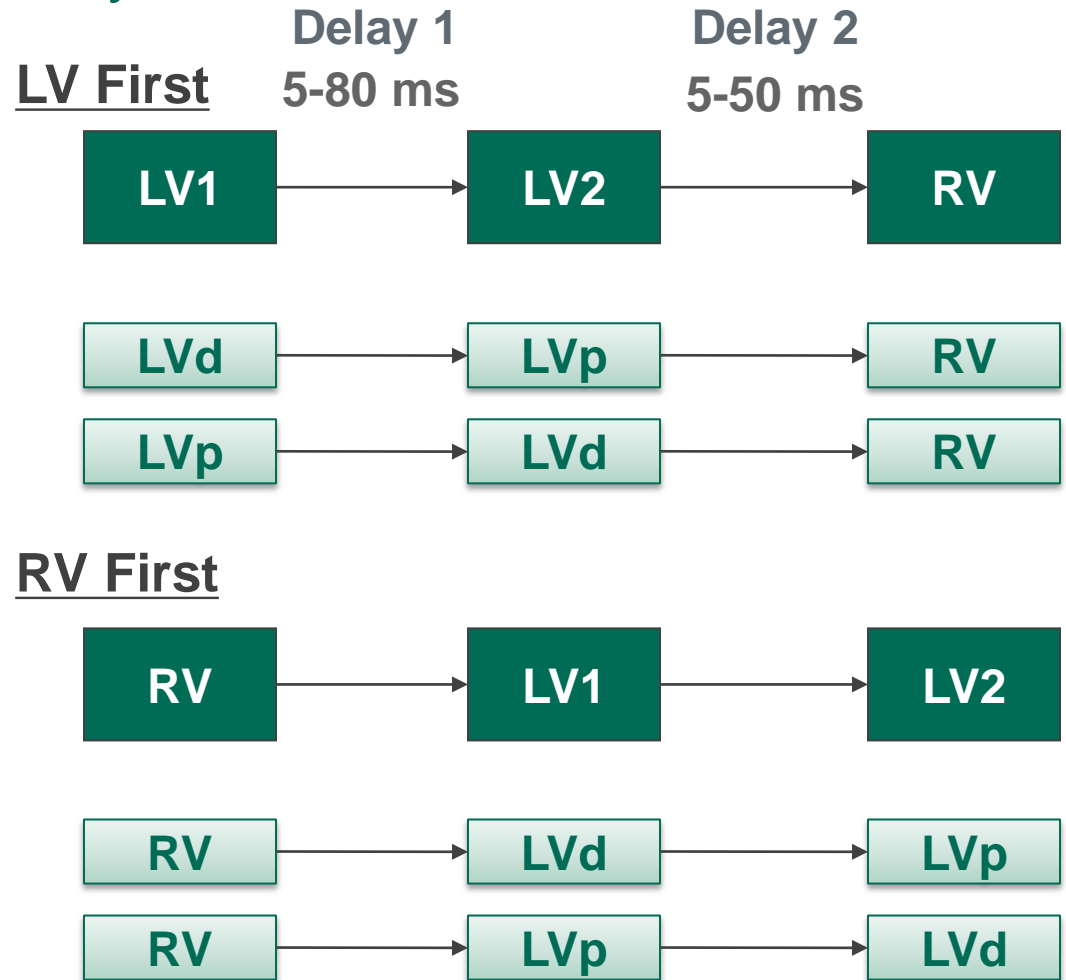
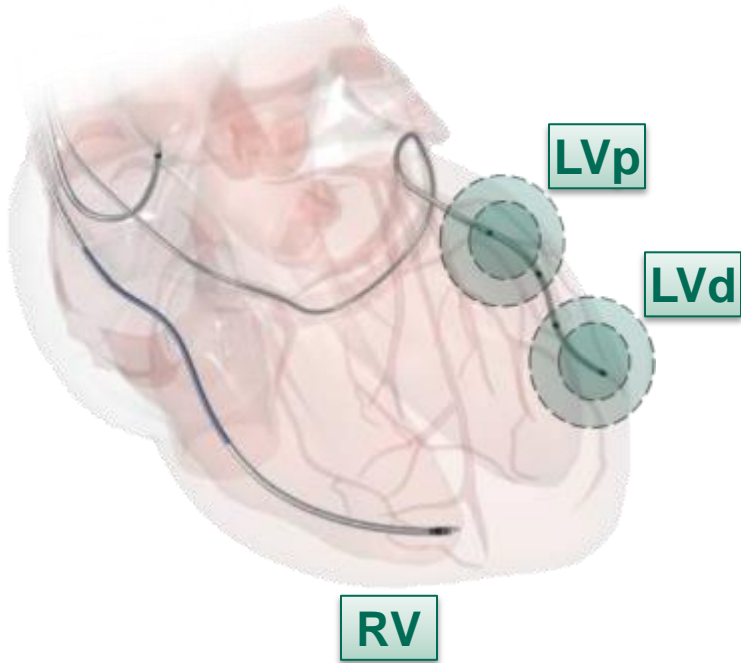


## Multipoint Pacing



# MultiPoint™ Pacing (MPP) Flexible Programming Options

## Pacing Sequences and Delays



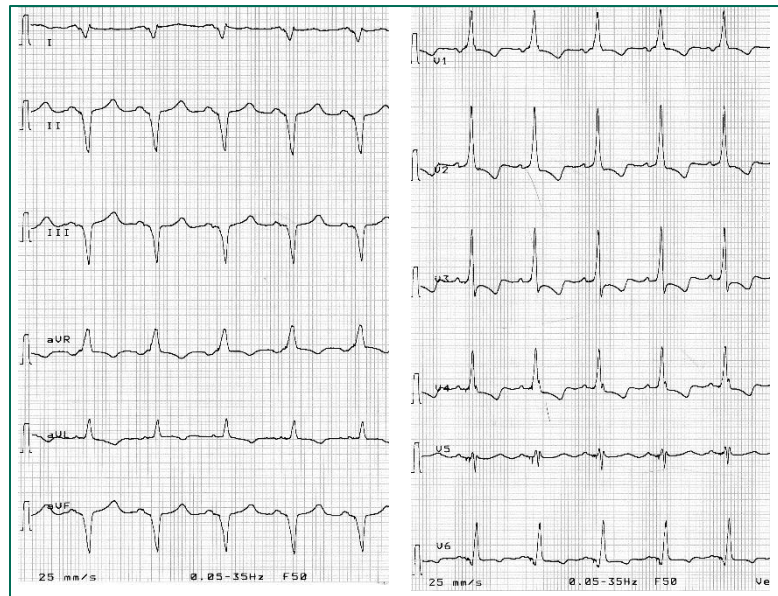


**Patient from last Friday!  
(1 month FU)**

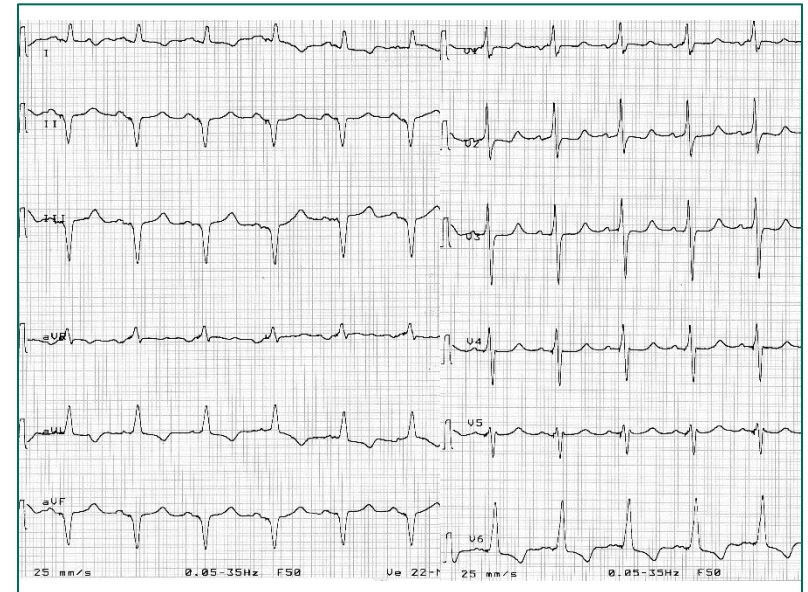
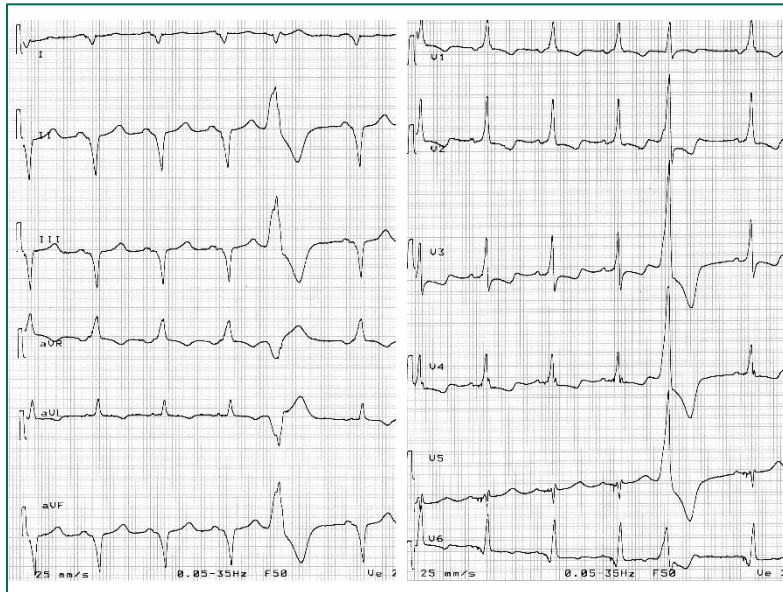
**NHYA III->II**

**BNP 1500-> 330**

**EF 19% -> 32%**



**MPP**



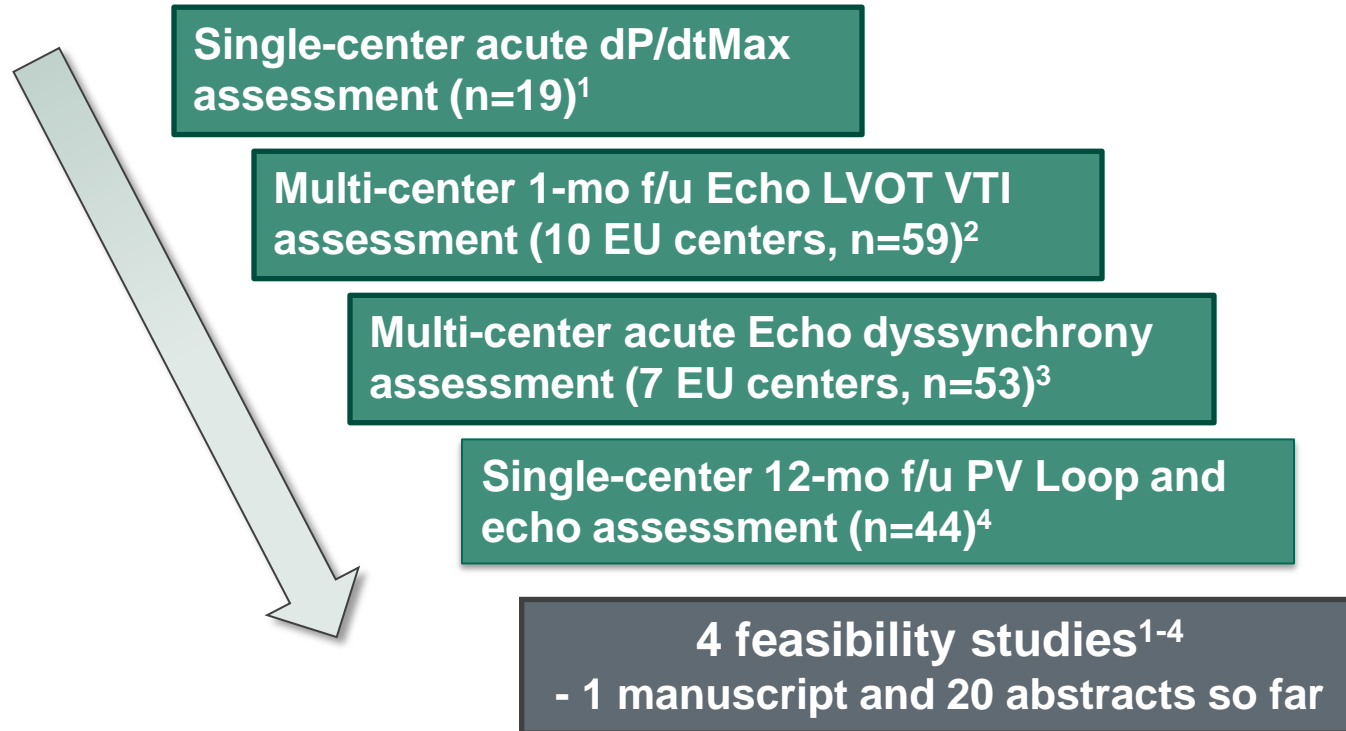
**Distal LV « the most apical »**

**Proximal LV « the most basal »**

# Clinical Evidence

# Clinical Experience MultiPoint™ Pacing

- 20 publications
- Demonstrated acute contractility, dyssynchrony improvement
- Started evaluation of long-term outcome: 1-mo, 3-mo, 12-mo



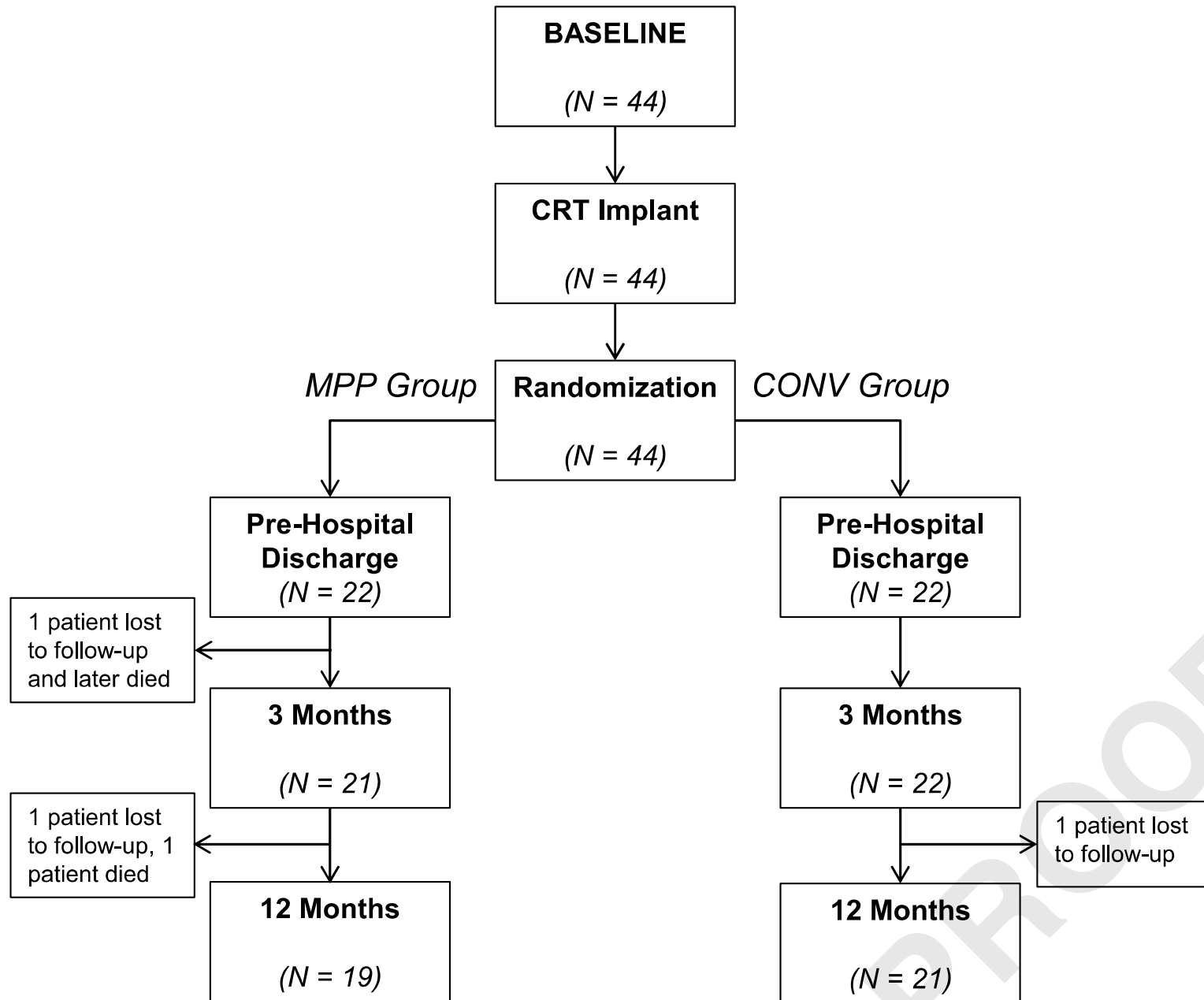
1. Thibault et al. Multisite Pacing with a Quadripolar Left Ventricular Lead Improves Acute Hemodynamics. Abstract HRS 2011.
2. Gutleben et al. Multisite Left Ventricular Pacing is Safe and Improves Cardiac Hemodynamic in Heart Failure Patients - Results from a 1-month Follow-up Study. abstract HRS 2012.
3. Rinaldi et al. Multisite left ventricular pacing improves acute mechanical dyssynchrony in heart failure patients. Abstract ACC 2012.
4. Pappone C., et al. Cardiac Resynchronization Therapy with Multisite Left Ventricular Pacing Improves Acute Hemodynamic Response Assessed with Pressure-Volume Loops HRS 2013 Poster session PO01-57.

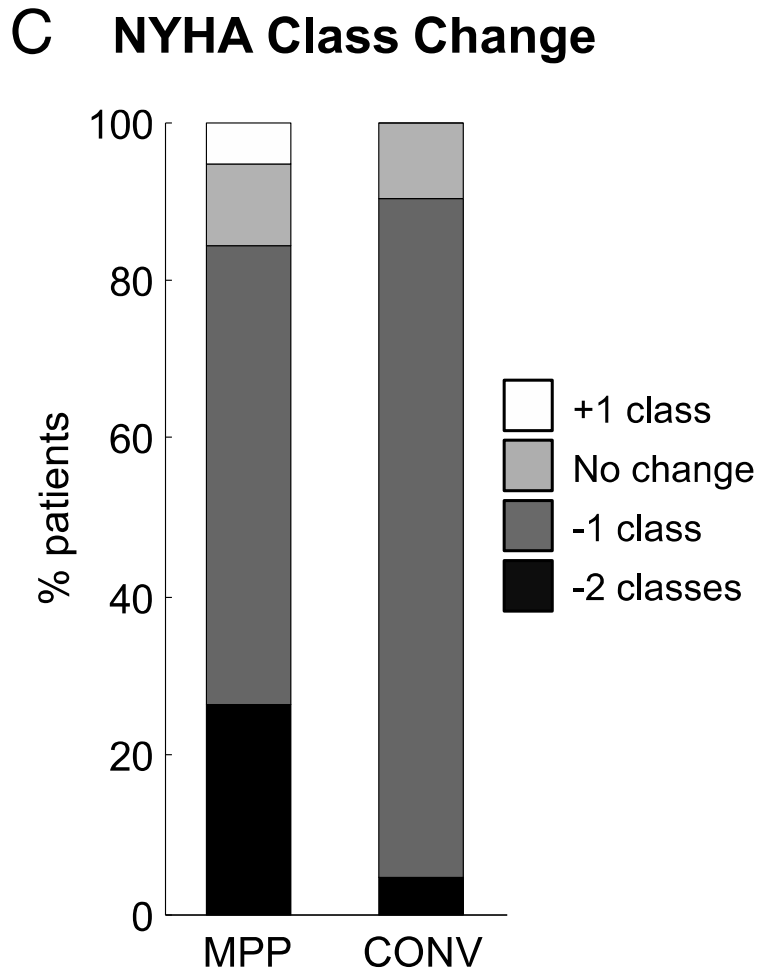
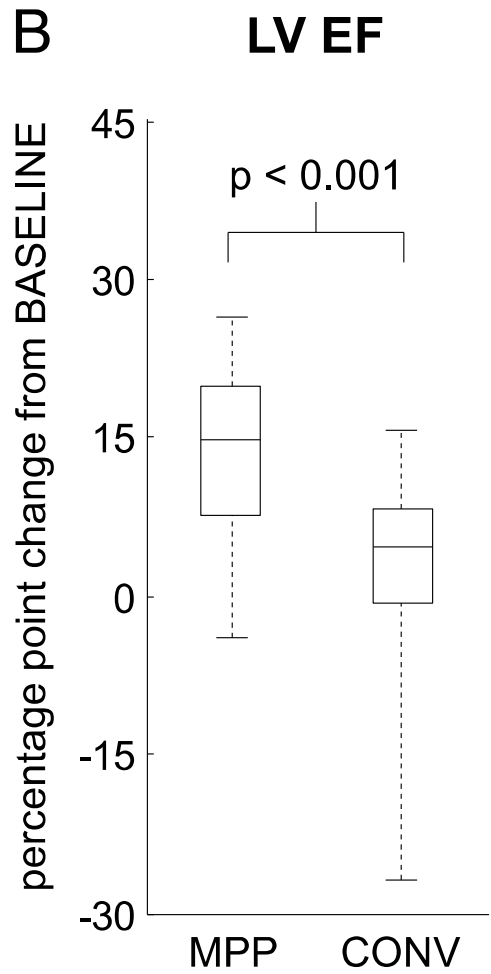
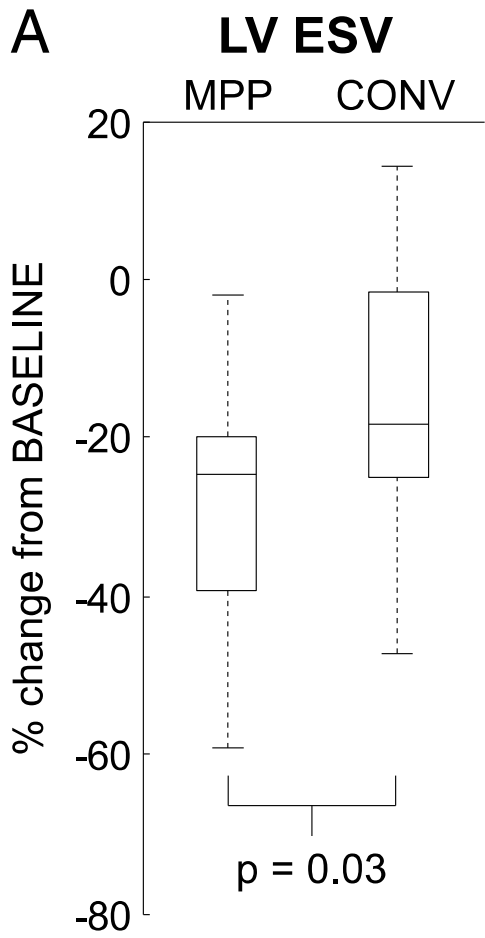


# Improving cardiac resynchronization therapy response with multipoint left ventricular pacing: Twelve-month follow-up study

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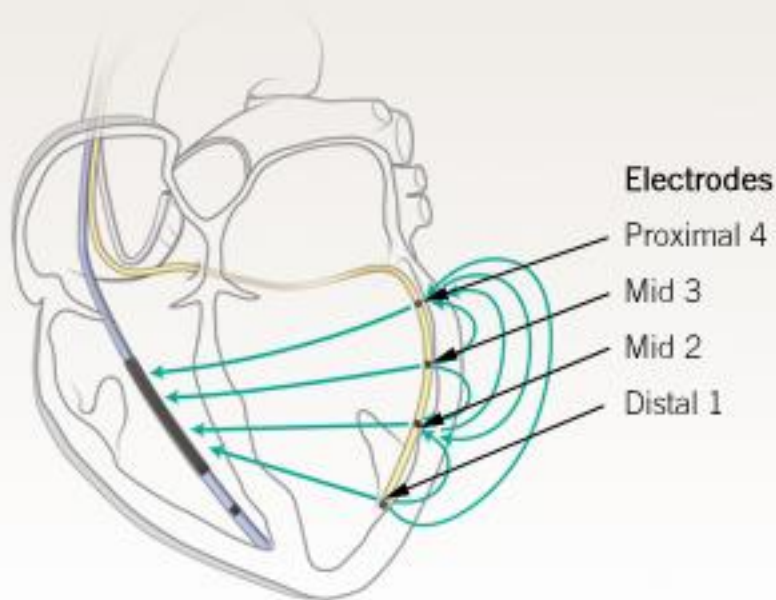




What's new?

## Revolutionizing CRT Pacing Options

4 electrodes and 10 pacing configurations offer more patient management options



Vector	Cathode to Anode
Vector 1	Distal 1 to Mid 2
Vector 2	Distal 1 to Proximal 4
Vector 3	Distal 1 to RV Coil
Vector 4	Mid 2 to Proximal 4
Vector 5	Mid 2 to RV Coil
Vector 6	Mid 3 to Mid 2
Vector 7	Mid 3 to Proximal 4
Vector 8	Mid 3 to RV Coil
Vector 9	Proximal 4 to Mid 2
Vector 10	Proximal 4 to RV Coil

# MPP Auto VectSelect

## Step 1: Choose “Perform MPP Auto VectSelect”

The screenshot displays the MPP Auto VectSelect software interface. At the top, there is a status bar with a question mark icon, a 'Tools' dropdown menu, and a heart rate display showing 70 bpm. Below this is a grid of ECG waveforms with markers labeled 'AS' and 'BP'. The 'AS' markers are red and positioned above the QRS complexes, while the 'BP' markers are black and positioned below the QRS complexes. The waveforms include A Sense Amp, V Sense Amp, and Discrimination traces. On the right side, there are icons for 'PDF' and 'PDF Only'.

The main control panel is divided into several sections. The top row contains tabs for 'Capture & Sense', 'Battery & Leads', 'Capacitor', 'Sensor', 'CRT Toolkit', 'Fibber & NIPS', and 'Temporary Pacing'. Below these tabs, there are three main sections:

- Auto VectSelect Quartet™ Test**: Measure capture thresholds automatically for multiple LV vectors based on RV-LV Conduction time or MultiPoint™ (MPP) electrode spacing. This section contains two buttons: 'Perform Auto VectSelect' and 'Perform MPP Auto VectSelect'. A green arrow points to the 'Perform MPP Auto VectSelect' button.
- VectSelect Quartet™ MultiVector Tools**: Tools to measure RV-LV conduction time or capture and phrenic nerve stimulation (PNS) thresholds for multiple vectors. This section contains one button: 'Access MultiVector Tools'.
- QuickOpt™ Timing Cycle Optimization**: QuickOpt™ Optimization collects rhythm measurements to propose optimal settings for the Delays parameters. The test will take about one minute to complete. This section contains one button: 'Perform QuickOpt™'.

At the bottom of the control panel, there is a box for 'Manual Testing & Results' with the text: 'Obtain measurements manually, and review results if available.' The 'QuickOpt' logo is also visible at the bottom center.

On the right side of the control panel, there is a vertical list of menu items: 'FastPath™ Summary', 'Episodes', 'Diagnostics', 'Tests', 'Parameters', 'Wrap-up™ Overview', and 'End Session'.



# RV-LV Conduction Test

## Step 2: Press “Perform Measurements”

The screenshot displays a medical device interface for an RV-LV Conduction Test. The top section shows a rhythm strip with a heart rate of 70 bpm. The strip includes markers for AS (A Sense) and BP (Bipolar) and displays A Sense Amp, V Sense Amp, and Discrimination waveforms. The bottom section features a pop-up window titled "Measure RV-LV conduction time" with the following content:

**Measure RV-LV conduction time**  
The latest time will be highlighted. You may then check thresholds to select a suitable vector.

**Additional Parameters**  
Test Method: RV Sense  
Base Rate: 65 bpm  
Sensed AV Delay: 300 ms

LV Electrode	Measured Time
Proximal 4	---
Mid 3	---
Mid 2	---
Distal tip 1	---

The interface also includes a sidebar with options like "Auto VectSelect Quartet™ Test", "VectSelect Quartet™ MultiVector Tools", "QuickOpt™ Timing Cycle Optimization", and "Manual Testing & Results". A green arrow points to the "Perform Measurements" button in the pop-up window.

# Capture Threshold Test

## Step 3: Press “Measure LV Thresholds”

The screenshot displays a medical device interface. At the top, there's a status bar with a heart rate of 70 bpm. Below it, an ECG trace shows several heartbeats with markers labeled 'AS' and 'BP'. The interface includes a 'Tools' menu, a 'Tachy Therapy is ENABLED' indicator, and a 'St. Jude Medical DEMO' label. A note states: 'Note: This is a demo application'. On the right, there are icons for zooming, a camera, and a PDF export button labeled 'PDF Only'.

The main window is titled 'Auto VectSelect Quartet™ Capture Test'. It features a diagram of an RV Coil with four electrodes labeled 'Prox 4', 'Mid 3', 'Mid 2', and 'Distal tip 1'. Below the diagram is a table of 'RV-LV Conduction Time':

Electrode	Conduction Time
Proximal 4	188 ms
Mid 3	186 ms
Mid 2	145 ms
Distal tip 1	156 ms

Below the table are 'Additional Parameters':

- Mode: DDD
- Base Rate: 65 bpm
- LV Pulse Width: 0.5 ms
- BIVCap™ Confirm
- Paced/Sensed AV Delay: 50/25 ms

The 'Vectors selected to test each electrode' section shows a grid of checkboxes:

Prox 4 - RV Coil	Mid 3 - RV Coil	Mid 2 - RV Coil	Distal tip 1 - RV Coil
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Prox 4 - Mid 2	<input type="checkbox"/> Mid 3 - Prox 4	<input type="checkbox"/> Mid 2 - Prox 4	<input type="checkbox"/> Distal tip 1 - Prox 4
	<input type="checkbox"/> Mid 3 - Mid 2		<input type="checkbox"/> Distal tip 1 - Mid 2 1.375 V @ 0.5 ms

At the bottom, there is an information icon and the text 'Estimated test time: 4 minutes'. A large green arrow points to a button labeled 'Measure LV Thresholds'.

The RV Coil vector for each electrode is automatically selected for testing (Cap Confirm test). User can edit vector selection.

# Capture Tests in progress

Shown below: User presses the “Skip Current Vector” button when test for M3 – RVC was

The screenshot displays a medical device interface with ECG waveforms and a control panel. The top right shows a heart rate of 70 bpm and a 'Test in progress...' indicator. The bottom panel, titled 'VectSelect Quartet™ MultiVector Tools', contains a 'Test Results' table and a 'Skip Current Vector' button.

Vector	Capture	PNS
Proximal 4 - RV Coil	n/a	---
Mid 3 - RV Coil	Skipped	---
Mid 3 - Proximal 4		---
Distal tip 1 - Mid 2	1.375 V @ 0.5 ms	---

The 'Skip Current Vector' button is highlighted with a yellow glow and a green arrow pointing to the 'Skipped' entry in the table.

User pressed the



button (ex. for PNS). It puts “Skipped” for that vector & test moves to the next vector

# Program MultiPoint™ Pacing

**Final Step:** Select “Widest Spacing” and “Program” Settings

**VectSelect Quartet™ MultiVector Tools**

**Test Results**

Vector	Capture	PNS
Proximal 4 - RV Coil	n/a	---
Mid 3 - RV Coil	1.75 V @ 0.5 ms	---
Mid 2 - RV Coil	1.5 V @ 0.5 ms	---
Distal tip 1 - RV Coil	1.25 V @ 0.5 ms	---
Distal tip 1 - Mid 2	1.375 V @ 0.5 ms	---

**Programming**

**Selection Method**

- Programmed
- Widest Spacing MultiPoint™ Pacing
- Earliest & Latest Activation MultiPoint™ Pacing

**Programmable Parameters**

LV1 Pulse Configuration: Distal tip 1 - RV Coil

LV1 Pulse Amp. & Width and Cap Confirm: 2.25 V @ 0.5 ms

LV2 Pulse Configuration: Mid 3 - RV Coil

LV2 Pulse Amp. & Width: 2.75 V @ 0.5 ms

Pacing Margin 1.0 V

**Buttons:** Print, Perform Manual Capture Test, Check PNS, Perform Auto Capture Test, Preview 10, Program

**Footnote:** Parameter selections based on available Test Results. Vectors with capture threshold > 3.5V or PNS are excluded.

**Annotations:** A green arrow labeled '1' points to the 'Widest Spacing' selection method. A green arrow labeled '2' points to the 'Program' button.

# Conclusion

- **Multipoint pacing has shown acute hemodynamic benefit (Increases dP/dT)**
- **Automatic device optimization programming**
- **First randomized study shows improvement of LV function over conventional BiV pacing**
- **Further larger studies are needed to confirm these results**