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Single- and Multi-Site Pacing Strategies for Optimal Cardiac Resynchronization Therapy: Impact on Device Longevity and Therapy Cost

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Introduction: Multiple left ventricular pacing strategies have been suggested for improving response to cardiac resynchronization therapy (CRT). However, these programming strategies can be obtained by accepting configurations with high pacing threshold and accelerated battery drain. We assessed the feasibility of predefined pacing programming protocols and we evaluated their impact on device longevity and their cost-impact.

Methods: We estimated battery longevity in 167 CRT-D (RESONATE, Boston Scientific) patients based on measured pacing parameters and according to multiple programming strategies: single-site pacing associated with lowest threshold, non-apical location, longest interventricular delay, pacing from two electrodes. To determine the economic impact of each programming strategy, we applied the results of a published model-based cost analysis to a 15-year time-horizon.

Results: Selecting the electrode with the lowest threshold resulted in a median device longevity of 11.5 years. Non-apical pacing and interventricular delay maximization were feasible in most patients (99% non-apical pacing, 65% RV-to-LV interval >80ms), and were obtained at the price of a few months of battery life. Device longevity of >10 years was preserved in 87% of cases of non-apical pacing and in 77% on pacing at the longest interventricular delay. The mean reduction in battery life when the second electrode was activated was 1.5 years. Single-site pacing strategies increased the therapy cost by 4-6%, and multi-site pacing by 12-13%, in comparison with the best-case scenario.

Conclusions: Modern CRT-D systems ensure effective pacing and allow multiple optimization strategies for maximizing service life or for enhancing effectiveness. Single- or multi-site pacing strategies can be implemented without compromising device service life and at an acceptable increase in therapy cost.

Abstract Figure. Image1

Estimated longevity and percentage increase in therapy cost with respect to the best-case scenario with different single- and multi-site LV pacing programming strategies.

