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Cardiac resynchronization therapy programming to improve electrical synchrony: adjusting the atrioventricular conduction delay

Authors:
V Essebag¹, PY Lima¹, A Alturki¹, M Bernier¹, T Hadjis¹, J Joza¹, ¹McGill University Health Centre, Cardiology - Montreal - Canada,

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Background: Optimal programming of cardiac resynchronization therapy has not yet been fully elucidated. In particular, a significant proportion of patients who receive CRT do not improve and are deemed non-responders. A decrease in QRS duration (QRSd) after CRT is a predictor of clinical response. A novel algorithm (SyncAV) has been developed to improve electrical synchrony by fusion of the triple wavefronts: intrinsic, RV-paced, and LV-paced.

Purpose: To assess the difference in QRSd in patients with a previously implanted CRT who subsequently receive SyncAV pacing compared to existing CRT pacing.

Methods: Consecutive patients at a single tertiary care center with a previously implanted CRT device with SyncAV algorithm (programmable negative AV hysteresis) were evaluated. Only patients able to be programmed to the SyncAV algorithm (i.e. in sinus rhythm with intrinsic AV conduction) were included in this analysis. QRSd was measured during 1) intrinsic conduction, 2) existing CRT pacing as chronically programmed by treating physician prior to SyncAV optimization, 3) using the device-based QuickOpt™ algorithm for optimization of AV and VV delays and 4) manual ECG-based optimized SyncAV programming. Change in QRSd was assessed and compared to intrinsic conduction and between the different modes of programming.

Results: Of 62 consecutive potentially eligible patients who underwent assessment, 34 patients who were able to undergo SyncAV programming were included. The mean age was 74±9 years, 41% were female and 59% had ischemic cardiomyopathy. The mean intrinsic conduction QRSd was 163±24 ms and the mean existing CRT pacing QRSd was 152±25 ms. Using the QuickOpt™ algorithm the mean QRSd was 160±25 ms and using manual ECG-based optimized SyncAV programming the mean QRSd was 138±23.

In comparison to intrinsic conduction the change in QRS was -11±19, -4±25 and -24±17 using existing CRT pacing, QuickOpt™ algorithm and manual ECG-based optimized SyncAV programming. Using SyncAV optimization resulted in significant reduction in QRSd compared to existing CRT pacing (P=0.02) and the QuickOpt™ algorithm (P<0.001). There was no difference between the latter two.

Conclusions: Manual ECG-based atrioventricular delay optimization using SyncAV significantly improved electrical synchrony in patients with a previously implanted CRT. Further studies are required to delineate the clinical and hemodynamic effects of using SyncAV in patients with chronically implanted CRT devices.