Real-time stroke volume measurements for the optimization of cardiac resynchronization therapy parameters

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Aims: We investigated the utility of real-time stroke volume (SV) monitoring via the arterial pulse power technique to optimize cardiac resynchronization therapy (CRT) parameters at implant and prospectively evaluated the clinical and echocardiographic results.

Methods and results: Fifteen patients with ischaemic or non-ischaemic dilated cardiomyopathy, sinus rhythm, Class III congestive heart failure, and QRS >150 ms underwent baseline 2D echocardiogram (echo), 6 min walk distance, and quality of life (QOL) questionnaire within 1 week of implant. Following implant, 0.3 mmol lithium chloride was injected to calibrate SV via dilution curve. Atrioventricular (AV) delay (90, 120, 200 ms, baseline: atrial pacing only) and V-V delay (-80 to 80 ms in 20 ms increments) were varied every 60 s. The radial artery pulse power autocorrelation method (PulseCO algorithm, LiDCO, Ltd.) was used to monitor SV on a beat-to-beat basis (LiDCO, Ltd.). Optimal parameters were programmed and echo, 6 min walk, and QOL were repeated at 6-8 weeks post-implant. Nine patients had >5% increase in SV after optimization (Group A). Six patients had <5% improvement in SV (Group B). Compared with Group B, Group A had significant improvements in left ventricular ejection fraction (LVEF) (11.0 +/- 8.5 vs. 0.8 +/- 2.0%) and decrease in left ventricular end-diastolic dimension (LVEDD) (-0.6 +/- 0.4 vs. -0.2 +/- 0.2 cm) and 6 min walk (346 +/- 226 vs. 32 +/-271 ft, P < or = 0.05). Group A patients also tended to have greater improvement in the septal-to-posterior wall motion delay on M-mode echo (P = 0.07).

Conclusion: Real-time SV measurements can be used to optimize CRT at the time of implant. Improvement in SV correlates with improvement in LVEF, LVEDD, and 6 min walk, and improvement in echocardiographic dyssynchrony.