Managing Electrical and Mechanical Dyssynchrony by Cardiac Resynchronization Therapy in Chronic Drug Refractory Heart Failure

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The treatment of heart failure (HF) has improved as the understanding of the disease evolves. Despite advances in medical therapy for HF patients, morbidity and mortality remain high. The 1- to 2-year mortality rate is approximately 35% to 50% for advanced HF.

Approximately 15~40% of patients diagnosed with symptomatic HF have evidence of significant intraventricular conduction delay with QRS duration greater than 120 ms. It leads to dyssynchronous ventricular contraction, reduced stroke volume, mitral regurgitation, and further impairment of left ventricular systolic function. Cardiac resynchronization therapy (CRT) can improve atrioventricular, intraventricular, and interventricular synchrony by atrial synchronous biventricular pacing. The reported success rate is between 88-95%. Furthermore, ventricular tachyarrhythmias that often occur in HF patients can also be managed by the incorporation of CRT with implantable cardioverter-defibrillator. CRT with or without defibrillator back-up improves symptoms, exercise capacity, and survival in patients with advanced HF, intraventricular conduction delay, and left ventricular mechanical dyssynchrony. HF patients with a left ventricular ejection fraction $\leq$ 35% and a wide QRS complex (QRS duration $\geq$ 120 ms) who continue to have symptoms despite optimal medical therapy are candidates for CRT to improve both morbidity and mortality.

CRT in patients with left ventricular ejection fraction $\leq$ 35% who have classical bradycardia pacing indication and frequent dependence on right ventricular (RV) pacing is classified as Class II indication in the ACC/AHA/HRS 2008 guidelines; class IIa for NYHA functional Class III or IV HF patients and class IIb for NYHA functional Class I or II HF patients.

More recently, with the publication of the Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction (REVERSE), Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy (MADIT-CRT), and Resynchronization/Defibrillation for Ambulatory Heart Failure Trial (RAFT) studies, the benefits of CRT have been demonstrated in patients with LV dysfunction and mild heart failure calling into question the optimal timing for biventricular pacemaker implantation.