Cardiac resynchronization therapy

Cardiac resynchronization therapy (CRT) is a relatively new but established therapy for patients with symptomatic heart failure resulting from systolic dysfunction. CRT is achieved by simultaneously pacing both the left and right ventricles. Theoretically, biventricular pacing resynchronizes the timing of global left ventricular depolarization and as a result improves mechanical contractility and mitral regurgitation. Several recently published clinical trials demonstrated clinical improvement when selected patients with systolic ventricular dysfunction and heart failure were treated with CRT.1–6

Conduction delay, as manifested by a prolonged QRS complex duration, is common among patients with systolic dysfunction and heart failure and is associated with an increased prevalence of mechanical dyssynchrony, as opposed to patients with a narrow QRS complex. Cardiac dyssynchrony results in a decrease in stroke volume, facilitation of mitral regurgitation, increased wall stress, and delayed relaxation. The primary objective of CRT is restoration of a more normal ventricular activation pattern. Secondarily, CRT allows optimization of the atrioventricular interval for patients in sinus rhythm.7,8

CRT has been shown to improve functional status as demonstrated by the improve in 6-minute walk test, increase in peak oxygen uptake, decrease in the New York Heart Association (NYHA) classification system, decrease in hospitalization for decompensated heart failure, and improve in health-related quality of life as assessed by the Minnesota Living with Heart Failure questionnaire. As with most therapeutic interventions, not all patients improve with CRT. Although improvements in survival have not been demonstrated with CRT alone, a recent meta-analysis suggested a trend toward improvement.9 The largest and most recent randomized trial of CRT demonstrated a significant reduction in the combined end point of all-cause mortality and hospitalization.6

On the basis of the inclusion criteria and the results of many studies, a high level of evidence supports CRT in patients with systolic dysfunction and heart failure resulting from either ischemic or nonischemic cardiomyopathy who have a left ventricular ejection fraction (LVEF) 0.35, are in NYHA functional class III or IV, are on maximal medical therapy, have a QRS complex duration >120 ms, and are in sinus rhythm.1–6 Some trials suggest that CRT may be of benefit for other clinical scenarios in addition to this patient profile. Two randomized multicenter trials assessed the benefit of CRT in patients with NYHA functional class II symptoms despite medical therapy, a depressed LVEF, a wide QRS duration, and an indication for implantable defibrillator therapy.5,10 In these studies, CRT demonstrated functional improvement as well as left ventricular remodeling.

The role of CRT in other groups of patients with heart failure resulting from systolic dysfunction, including patients with atrial fibrillation or a wide QRS morphology on the basis of right ventricular pacing, is unclear. Preliminary data from a large study and results from a few small studies suggest that in patients with atrial fibrillation and complete atrioventricular block, CRT may provide functional improvement when compared with right ventricular pacing.11–14 Among patients with a cardiomyopathy, sinus rhythm, and an indication for an implantable defibrillator but not permanent pacing, right ventricular pacing precipitates and has a negative impact on heart failure.15 The results of this study15 suggest that right ventricular pacing is not optimal in this group of patients and that biventricular pacing may be better; however, there are no prospective data to support this approach. The published randomized CRT studies have used QRS complex duration as a surrogate marker for dyssynchrony.1–6 In the future, we may be able to identify patients with ventricular dyssynchrony and who will respond to CRT with the use of tissue Doppler or other echocardiographic or visualization techniques.15

The results of numerous randomized clinical trials provide the necessary data to identify appropriate patients for CRT. Optimal candidates for CRT have a dilated cardiomyopathy on an ischemic or nonischemic basis, an LVEF 0.35, a QRS complex >120 ms, and sinus rhythm, and are NYHA functional class III or IV despite maximal medical therapy for heart failure. In general, these patients are treated with a CRT device that also has defibrillation capabilities. A variety of unresolved issues include the role of CRT for patients with NYHA functional class II symptoms or with atrial fibrillation, prospective identification of responders to CRT, and the role of CRT in other categories of patients. In our setting we implant CRT for above-mentioned indications. The main hurdles in our setting are cost of the device, longevity of the patients and availability of the device. This is only one aspect of the treatment of heart failure but definitely a promising solution for refractory heart failure patients.

1. Prof. Md. Abu Siddique PhD
Professor of Cardiology
Bangabandhu Sheikh Mujib Medical University
Shahbag, Dhaka.
E-mail: drabusiddique@yahoo.com

2. Dr. Mohammad Salman MD
Department of Cardiology
Bangabandhu Sheikh Mujib Medical University
Shahbag, Dhaka.

References


