

# Cardiac Resynchronization and Defibrillation Therapies: Complementary Approaches to the Management of Heart Failure

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**D**uring the past 2 decades, randomized clinical trials investigating the treatment of congestive heart failure and methods to prevent sudden cardiac death have taken quite divergent pathways. Pharmacotherapy became the main attraction in the therapeutic armamentarium for congestive heart failure. In contrast, the implantable cardioverter defibrillator (ICD) clearly reigned supreme in the primary and secondary prevention of sudden cardiac death, and antiarrhythmic drugs either showed no benefit or even caused harm. The current treatment of patients with congestive heart failure has created a milieu of close communication and cooperation between heart failure specialists and electrophysiologists. Randomized clinical trials carried out by this newly formed alliance have identified a new treatment option for heart failure, cardiac resynchronization therapy (CRT). Initial studies demonstrated the benefits of CRT in certain groups of patients with congestive heart failure, and the most recent study has shown the survival benefit of adding an ICD to CRT (CRT-D). This exciting journey is chronicled in the following articles.

The pathophysiology of CRT is reviewed by Dr. David A. Kass of The Johns Hopkins Medical Institutions. Patients with substantial left ventricular dysfunction who have discoordinate wall motion as a consequence of intraventricular conduction delay have an increased risk of exacerbated pump failure. Resynchronizing the ventricular conduction results in improved heart failure symptoms. There is evidence that, over time, CRT may inhibit or even reverse ventricular dilatation and remodeling. Although QRS duration has been the primary method of identifying optimal candidates for CRT, more recent evidence suggests that direct measures of ventricular mechanical dyssynchrony may have

better predictive accuracy for success of CRT. More research is required in this area.

The complexities of the pathophysiology of heart failure are reviewed by Drs. Gary S. Francis and W.H. Wilson Tang of The Cleveland Clinic. A variety of heart disorders can lead to the common final pathway—congestive heart failure. The initial myocardial injury leads to several derangements and biologic changes. This succinct review provides the reader with the critical data needed to interpret not only how the heart fails but also, more importantly, why certain therapeutic approaches are able to interfere with this otherwise downward spiral of events and improve patient symptoms.

In the article by Dr. Leslie W. Miller of the University of Minnesota, the reader is exposed to the evolution of the multiple drug approach to the treatment of congestive heart failure. Currently

approved drugs as well as investigational agents that hold promise for the future are reviewed. Key randomized clinical trial data are also discussed, along with the limitations of current medical approaches to the treatment of heart failure.

In the articles written by Dr. William T. Abraham from The Ohio State University and Dr. Angel R. Leon from Emory University, the reader is acquainted with CRT clinical trials and an approach to follow-up of patients who receive CRT therapy. The trial data allow one to appreciate the type of patients that have been treated successfully with CRT and reasonable expectations and limitations of this therapy. The recent data demonstrating the survival advantage of using CRT-D are discussed. Information on the technique for implantation of biventricular devices, including appropriate programming, is noted, and appropriate follow-up strategies are given.

Typically, patients who are candidates for CRT are also at risk for sudden cardiac death. In my article, over 2 decades of research on the primary and secondary prevention trials of sudden cardiac death are analyzed. In essence, the failure of antiarrhythmic agents in the primary prevention of sudden cardiac death has been reversed by the success of the ICD in selected high-risk patients with coronary artery disease. Likewise, the ICD has demonstrated superiority in secondary prevention of sudden cardiac death in patients with ischemic and nonischemic heart disease. It is not surprising that the recent results of the COMPANION trial revealed a survival advantage of CRT-D over pharmacologic therapy. For all these reasons, I conclude that, in most situations, CRT-D rather than CRT with pacing only is the preferred therapy for patients with an indication for resynchronization therapy. ■