Cardiac resynchronization pacing without defibrillator capability: is this a viable option?

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Received 17 August 2005; accepted after revision 19 March 2006

Improved cardiac resynchronization by pacemakers (CRT-P) and implantable defibrillators (CRT-D) benefits cardiac function, reduces heart failure (HF) admissions, and diminishes mortality in patients with severe left ventricular (LV) dysfunction. In terms of mortality benefit, current evidence suggests that CRT-D may be better than CRT-P alone when a broad range of HF patients is considered. However, the differential benefit may be small in certain patients. In individuals with severe and worsening HF due to systolic LV dysfunction, HF complications other than ventricular tachyarrhythmias contribute importantly to both quality-of-life (QoL) and duration of survival; these patients may be served cost-effectively by CRT-P enhancing QoL. A clinical trial evaluating CRT-D vs. CRT-P in terms of QoL and survival in such patients would assist physicians and payers to understand better the relative roles of CRT-P and CRT-D in the care of the sickest HF patients.

KEYWORDS
Implantable defibrillators; Cardiac resynchronization; Heart failure; Quality-of-life

Biventricular pacemakers and pacemaker–defibrillator systems have been shown to improve cardiac function, diminish frequency of heart failure (HF) hospitalizations, enhance quality-of-life (QoL), and reduce mortality rates in patients with severe left ventricular (LV) dysfunction and intraventricular conduction disease who are already being administered maximally tolerated appropriate pharmacological treatment. The basis for these beneficial effects is multifactorial.¹⁻¹⁵ For biventricular pacemakers, the benefit is presumed to be primarily due to improved (albeit incomplete) synchronization of ventricular contraction in the diseased heart—thus the term ‘cardiac resynchronization therapy’ (CRT). In the case of biventricular implantable cardioverter-defibrillators (CRT-D devices) an additional anti-arrhythmic benefit is presumed, but its magnitude in this setting remains unclear.

Given the possibility of an increased mortality benefit associated with the presence of defibrillator capability in CRT-D vs. CRT pacemakers alone (CRT-P), physicians feel increasingly compelled to use CRT-D devices in LV dysfunction patients, despite the substantially greater cost. However, if convinced that CRT-P alone provided predictable anti-arrhythmic benefit (even if only in an identifiable subset of LV dysfunction patients) as suggested by both the COMPANION¹² and CARE+HF¹⁶ studies, physician decision-making would be simplified, and treatment costs could be substantially reduced.

Anti-arrhythmic potential of CRT

The basis for the clinical benefit of CRT devices in HF patients is not yet fully understood. Nevertheless, in general terms, CRT improves a range of measures of cardiac function in the setting of moderate-to-severe HF and a prolonged QRS duration. Thus, CRT is accompanied by an increase (albeit usually modest) of LV ejection fraction, a decrease in LV end-diastolic dimension, and diminution in the magnitude of mitral regurgitation in many patients.¹⁻⁶⁻⁷ Furthermore, to the extent that the more physiological pacing offered by CRT systems may reduce ventricular volumes and improve cardiac output, it is reasonable to believe that both wall stretch¹⁻¹⁷ and levels of circulating catecholamines will be diminished;¹⁸ as a partial consequence, tachyarrhythmia risk may be reduced. In this regard, in COMPANION¹² both CRT-P and CRT-D were comparable in terms of mortality benefit at least to the extent of study follow-up period [442 days for optimal pharmacological therapy (OPT), 495 days for CRT and 479 for CRT-D groups]. COMPANION was a prospective trial in which NYHA class 3 or 4 patients were randomized to OPT, OPT plus CRT-P, or OPT plus CRT-D groups. Compared with OPT alone, CRT-P and CRT-D (both in combination with OPT), reduced the mortality benefit by nearly one-third.¹²
In conclusion, current evidence suggests that CRT-D therapy may offer a greater magnitude mortality benefit than does CRT-P alone when viewed over a wide range of HF patients, and therefore CRT-D remains the appropriate choice in most cases. On the other hand, as suggested by the findings in COMPANION, the additional CRT-D mortality benefit compared with CRT-P may be relatively small, and may not apply equally to all types of patients. In particular, individuals with severe LV dysfunction and apparently worsening HF may be more prone to die from disease complications other than ventricular tachyarrhythmias (particularly electro-mechanical dissociation and bradyarrhythmias) that are not readily reversed by defibrillation. These latter patients may be more cost-effectively served by CRT-P primarily for QoL reasons, and perhaps only secondarily for any mortality benefit that CRT-P may provide. This approach would be especially reasonable in those individuals with existing conventional pacemakers already in place. Placement of a single additional lead may provide months, even if not years, of more comfortable life.

A prospective clinical trial or at least a follow-up registry in patients with seemingly progressive systolic HF, evaluating QoL indices, and survival outcomes would prove helpful in terms of assessing whether a CRT-P treatment strategy is indeed effective. Such a study would assist physicians to understand better the relative roles of CRT-P and CRT-D in patient care, and would facilitate decision-making by payers (government and private) who inevitably must prioritize the manner in which limited health care resources are to be expended.

References


