Current Attitudes on Cardiac Devices in Heart Failure: A Review

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ABSTRACT

Purpose: Despite significant advances in optimizing drug therapy, heart failure–related mortality and morbidity remain high. There has been great progression with regard to device therapy in heart failure, and device use continues to increase. The aims of this review were to critically re-examine the evidence base and to highlight recent refinements in device therapy in heart failure.

Methods: Significant contemporary clinical trials and registries of device therapy in heart failure were examined and critically reviewed to draw conclusions on the clinical applications of implantable cardioverter-defibrillators, cardiac resynchronization therapy, remote monitoring of devices, and hemodynamic monitoring.

Findings: Advances regarding patient selection, technology, and implementation for the use of devices in heart failure have significantly improved outcomes.

Implications: This review article provides a contemporary guide to the current attitudes toward the use of devices in heart failure. Device therapy is an important adjuvant to optimal pharmacologic therapy. The role of devices continues to increase, and devices have a positive impact on patients' quality of life and survival. (*Clin Ther*. 2015;▮:▮▮▮–▮▮▮) Crown Copyright © 2015 Published by Elsevier HS Journals, Inc. All rights reserved.

Key words: cardiac device, cardiac resynchronization therapy, device monitoring, heart failure, hemodynamic monitoring, implantable cardioverter-defibrillator.

INTRODUCTION

Despite significant advances in optimizing drug therapy, heart failure–related mortality and morbidity remain high.[1] In its broadest sense, device therapy is implemented in a multitude of situations that vary from acute hemodynamic support with Impella devices (Abiomed, Danvers, Massachusetts) to the long-term use of left ventricular (LV) assist devices as a destination therapy. However, it is predominantly implantable cardioverter-defibrillators (ICDs) and cardiac resynchronization therapy (CRT) devices that have become mainstream therapy, supported by an increasing evidence base over nearly 3 decades. This review aims to re-examine the evidence base and to highlight recent refinements in patient selection, technology, and implementation.

MATERIALS AND METHODS

Significant contemporary clinical trials and registries of device therapy in heart failure were examined and critically reviewed to draw conclusions on clinical applications of ICDs, CRT, remote monitoring of devices, and hemodynamic monitoring.

RESULTS AND DISCUSSION

ICDs

MADIT (Multicenter Automatic Defibrillator Implantation Trial),[2] published in 1996, was the first trial to report a mortality benefit with ICD used for primary prevention in patients with coronary artery disease and LV systolic dysfunction. As in MUSTT (Multicenter Unsustained Tachycardia Trial),[3] published a few years later, enrolled patients had documented nonsustained tachycardia and inducible ventricular arrhythmia during an electrophysiologic study. Although MADIT reported a hazard ratio of 0.46 with the use of ICDs and MUSTT reported a relative risk reduction of 0.86, this risk-stratification algorithm was not considered cost-effective or

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Table I. Significant trials of implantable cardioverter-defibrillators.

Study Title	Year	Study Focus	Primary Outcome	Sample Size	Ischemic CM, %	EF, %	NYHA Class	Results	Impact on Care
MADIT[2]	1996	ICD vs OMT, NSVT, positive EPS	All-cause mortality	196	100	25	I–III	RRR 54%	ICD for primary prevention in high risk ischemic CM
MUSTT[3]	1999	Role of EPS in selecting therapy	Arrhythmic death of cardiac arrest	704	100	30	I–III	RRR 27%; ARR 6%	Mortality benefit of ICD vs pharmacotherapy
MADIT-II[4]	2002	ICD vs OMT	All-cause mortality	1232	100	23	I–III	RRR 31%	ICD primary prevention in ischaemic CM without EPS
SCD-HeFT[5]	2005	ICD vs Amiodarone vs placebo	All-cause mortality	2521	52	25	II–III	RRR 23%, ARR 7.2% at 5 years	Mortality benefit of ICD in both ischaemic and nonischemic CM
PREPARE[6]	2008	ICD strategic programming vs standard programming	Incidence of shocks, arrhythmic syncope, untreated sustained symptomatic VT.VF	1389	70	27	I/II, 59%; II/IV, 41%	Reduction in shock therapy, 9% vs 17% ($P < 0.01$)	Strategic programming reduces shock therapy
MADIT-RIT[7]	2012	High rate vs delayed vs standard programming	Inappropriate therapy	1500	52	27	I/II	RRR 79% of inappropriate therapy; trend to reduction in all-cause mortality	Strategic programming reduces inappropriate therapy and trend to mortality benefit

ARR = absolute risk reduction; CM = cardiomyopathy; EF = ejection fraction; EPS = electrophysiological study; ICD = implantable cardioverter-defibrillator; MADIT = Multicenter Automatic Defibrillator Implantation Trial; MADIT-II = Multicenter Automatic Defibrillator Implantation Trial II; MADIT-RIT = Multicenter Automatic Defibrillator Implantation Trial—Reduce Inappropriate Therapy; MUSTT = Multicenter Unsustained Tachycardia Trial; NSVT = Non-sustained ventricular tachycardia; NYHA = New York Heart Association; OMT = optimal medical therapy; PREPARE = Primary Prevention Parameters Evaluation; RRR = relative risk reduction; SCD-HeFT = Sudden Cardiac Death in Heart Failure Trial; VF = ventricular function; VT = ventricular tachycardia.