

The Role of Heart Failure Pharmacotherapy After Left Ventricular Assist Device Support



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KEYWORDS

- Left ventricular assist device • Mechanical circulatory support • Heart failure • Medical therapy
- Review

KEY POINTS

- Left ventricular assist device (LVAD) implantation is becoming more common for the management of end-stage heart failure.
- Very few evidence-based studies on optimal medical therapy post-LVAD exist, and treatment often varies across institutions.
- In select patient populations, aggressive heart failure medical therapy after LVAD implantation may reduce cardiac remodeling, improve biventricular function, and possibly promote left ventricular recovery.
- Future investigations are needed to confirm which patients will benefit from aggressive medical therapy after LVAD implantation.

INTRODUCTION

Mechanical circulatory support has been in existence since the 1960s. Since approval by the Food and Drug Administration of a pneumatically driven left ventricular assist device (LVAD) as bridge to transplant in 1994 and as destination therapy in 2002, and with newer continuous-flow and centrifugal devices, LVADs have become an increasingly frequent treatment option for patients with end-stage heart failure. As of early 2013, The Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) has 7900 LVADs in their registry, of which approximately 6000 were implanted since 2010.¹

Given this rapidly expanding treatment option, our understanding of how to best manage LVAD patients pharmacologically is also evolving. In general, pharmacotherapy after LVAD support is directed at the following goals: (1) antithrombotic agents to prevent LVAD pump and aortic root thrombosis; (2) antihypertensives to control systemic blood pressure and left ventricular (LV) afterload; (3) heart failure-specific therapies to reverse LV remodeling, support right ventricular (RV) function, and enhance biventricular recovery; (4) diuretics to prevent volume overload; and (5) antiarrhythmics to prevent or control arrhythmias.

Disclosure Statement: The authors have no relevant conflict of interests to disclose.

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Heart Failure Clin 10 (2014) 653–660

<http://dx.doi.org/10.1016/j.hfc.2014.07.008>

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At present, maintaining patients on evidence-based heart failure therapies after LVAD implantation varies across institutions. This variability probably depends on the goal of LVAD support, whether for destination therapy, bridge to transplant, or bridge to myocardial recovery. For example, in one study of 20 patients with LVADs as a bridge to transplant, only 5% were on β -blockers, 35% on angiotensin-converting enzyme inhibitors (ACEIs), and 20% on diuretics²; whereas in a second study of 28 patients, of whom 75% received LVAD as destination therapy, more than 50% of LVAD recipients were on β -blockers.³ The International Society for Heart and Lung Transplant (ISHLT) guidelines for mechanical circulatory support provide only brief recommendations on chronic heart failure therapy, all of which are derived from expert opinion.⁴ The goal of this article is to review the current literature and guidelines for heart failure-specific pharmacotherapy in the LVAD patient, and explore future treatment possibilities. **Table 1** summarizes these therapies by pharmacologic class and the recommendations

regarding their use in patients supported with an LVAD.

ANGIOTENSIN-CONVERTING ENZYME INHIBITORS/ANGIOTENSIN II RECEPTOR BLOCKERS

ACEIs and angiotensin II receptor blockers (ARBs) are well established in the medical management of patients with systolic heart failure.⁵ However, the current ISHLT guidelines for mechanical circulatory support recommend the use of ACEIs and ARBs only for management of hypertension and cardiovascular risk reduction in patients with diabetes and vascular disease (Class I, level of evidence C).⁴ Despite the limited recommendations, these medications may provide further benefit.

Although data are limited, patients can have improved LV contractile function after LVAD placement with the use of an ACEI or ARB. Klotz and colleagues⁶ evaluated the effects of concomitant angiotensin inhibition during pulsatile LVAD support by retrospectively comparing 7 patients

Table 1
Management of heart failure in the LVAD patient by pharmacologic class

Medication	Recommendation ^a /Goals	Class ^a	Level of Evidence ^a
ACEIs/ARBs	For hypertension	I	C
	For risk reduction in vascular disease and diabetes	I	C
	Protective effects from remodeling	—	—
Aldosterone antagonists	To limit need for potassium repletion	I	C
	Potential antifibrotic effects	I	C
β -blockers	For hypertension	I	C
	For rate control for tachyarrhythmias	I	C
	May be useful in the setting of current VT	IIa	C
Hydralazine	For hypertension	I	C
Nitrates	For hypertension	I	C
Clenbuterol	May help LV recovery for LVAD explantation	—	—
Digoxin	May be useful in the setting of atrial fibrillation with rapid ventricular response	II	C
	Could be useful to improve RV dysfunction	—	—
Diuretics	For management of volume overload	I	C
	For management of RV dysfunction	I	C
Inotropes	For management of RV dysfunction	I	C
PDE-5 inhibitors	May be useful for management of RV dysfunction in the setting of pulmonary arterial hypertension	IIb	C
Endothelin receptor antagonists	Can be considered for additional management of RV dysfunction in the setting of pulmonary arterial hypertension	—	—

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; LV, left ventricular; PDE-5, phosphodiesterase-5; RV, right ventricular; VT, ventricular tachycardia.

^a Based on the 2013 International Society for Heart and Lung Transplantation Guidelines for mechanical circulatory support: executive summary.⁴

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