Letters

TO THE EDITOR

Is Pump the Answer to Heart Failure With Preserved Ejection Fraction?

We read with interest the paper by Burkoff et al. (1) proposing mechanical assist solution for heart failure with preserved ejection fraction (HFpEF). Treatment of HFpEF is particularly difficult due to multiple cardiac and extra cardiac influences on symptomatology and disease process (2). The multifaceted nature of this problem also makes patient selection for mechanical assist devices challenging. Although there have been proposals to classify HFpEF into different phenotypes for targeted therapy, a mechanical solution is very attractive as it will address the central hemodynamic abnormality of left atrial hypertension and dysfunction which in turn may reduce pulmonary hypertension, autonomic dysfunction, and impaired ventriculo-arterial uncoupling seen in HFpEF (2).

In a simulated model of left atrial cannulation, the investigators describe a simulated left atrial model of unloading which assumes a constant end systolic pressure volume relationship in the left atrium. Whereas this is true for the left ventricle in HFpEF, it is not clear that unloaded left atrium would follow that paradigm. We know from patients with left ventricular assist devices that left atrial size improves with unloading; however, studies evaluating left atrial function after left ventricular assist device implantation are lacking. It is possible the atrium attains complete functional recovery like it does after mitral valve surgery and maze procedure for atrial fibrillation. Recovery of left atrial function after left ventricular assist device implantation are lacking. It is possible the atrium attains complete functional recovery like it does after mitral valve surgery and maze procedure for atrial fibrillation. Recovery of left atrial function will change the end systolic pressure volume relationship as it does with complete left ventricular recovery. This assumption is different from that made by the investigators. In our experience with temporary support with left atrial cannulation (TandemHeart, CardiacAssist, Inc., Pittsburgh, Pennsylvania), we have observed that smaller left atrial size leads to suction events and thrombotic complications in these patients. We believe return of native atrial function could contribute to these adverse events.

The investigators also propose INTERMACS (Interagency Registry for Mechanically Assisted Circulatory Support) – like classification for patients with HFpEF. The investigators acknowledge that it is difficult to correlate symptoms and functional status with hemodynamic compromise because of large contributions of extra cardiac manifestations such as anemia, obesity, sleep apnea, and chronic kidney disease to the symptomatology in HFpEF. Also, prognostication predominantly on the basis of functional status is not well established in common forms of HFpEF.

The addition of objective parameters could be considered while creating an INTERMACS-like classification for HFpEF. Two objective parameters that may improve risk stratification in this population are the degree of left atrial dysfunction and severity of pulmonary hypertension. Multiple studies in different cohorts of patients have found that left atrial emptying function and active booster function, but not commonly used left atrial volume index, were independent predictors of mortality and morbidity (3). Recently in a CMR-based study LA-EF was shown to be predictive of event free survival in patients with heart failure. We believe addition of left atrial parameters will aid in better selection of patients for such a pump as they act as valuable surrogates of the primary driver of hemodynamic abnormality and morbidity in HFpEF (4).

Secondly the presence of pulmonary hypertension has been shown to be consistently associated with worse prognosis in patients with HFpEF. Including pulmonary hypertension would help further risk stratify these patients and provide an objective measure which is not included in traditional risk stratification models of heart failure (5). Finally, we would like to congratulate the authors in providing this conceptual frame work and we hope application of these concepts translates into a clinical trial to address this vexing problem.

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Please note: Dr. Estep is a consultant to Thoratec Corporation, and Maquet. Dr. Guha has reported that he has no relationships relevant to the contents of this paper to disclose.
REFERENCES


REPLY: Is Pump the Answer to Heart Failure With Preserved Ejection Fraction?

We thank Drs. Guha and Estep very much for their endorsement of our concept to explore the use of mechanical circulatory support (MCS) as a treatment for heart failure with preserved ejection fraction (HFpEF) (1). As ours is a concept paper, its publication was largely intended to initiate discussions on the multitude of issues that will be encountered during the development of this approach, including issues related to device optimization and patient selection. We agree with Drs. Guha and Estep’s suggestion to include objective parameters, such as the degrees of left atrial (LA) dysfunction and pulmonary hypertension, into risk stratification scores to help identify patients with HFpEF who are potentially appropriate for MCS therapy.

Regarding Drs. Guha and Estep’s second point, LA enlargement is a hallmark of HFpEF, regardless of etiology, making LA sourcing of blood for MCS as employed by the CircuLite system (HeartWare, Framingham, Massachusetts) a seemingly ideal approach. As they appropriately noted, it is possible that chronic unloading of the LA may result in reverse LA remodeling with reduction of LA size, leading to conditions vulnerable to suction events and thrombus formation. However, LA size reduction was not noted as a significant problem in our experience of using the CircuLite system with properly placed inflow cannula tip for MCS in patients with reduced ejection fraction heart failure (HFrEF) (2). Nevertheless, our ongoing bench and animal studies to improve the system include efforts to further optimize inflow cannula tip design and position to minimize occurrences of LA suction. Incorporation of a suction algorithm will further help mitigate such issues.

As more is known about mechanisms underlying HFpEF in specific subgroups the more likely it will be that efforts to develop medical therapies for HFpEF will be successful. However, as for HFrEF, it is also likely that medical therapies will delay, not prevent disease progression or cure the disease. For those patients, we believe the development of an MCS option may prove beneficial. We hope that in addition to Drs. Guha and Estep, others will join the discussion early and help in this effort so that we can arrive at a solution in a timely manner.

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REFERENCES
