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OVERVIEW OF THE CURRENT BENEFITS AND RISKS OF CONTINUOUS-FLOW LEFT VENTRICULAR ASSIST DEVICES

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The Houston Methodist Hospital has been on the forefront of mechanical circulatory support (MCS) for more than 50 years. Under the leadership of Drs. Michael DeBakey and George Noon, many crucial innovations in the field of MCS have originated in this very institution, culminating in the implementation of continuous-flow left ventricular assist devices (CF-LVADs) for long-term support in 1998. Thanks to this newer technology, the clinical application has rapidly expanded, allowing more patients to return to their community on LVAD support and regain quality of life and satisfying levels of activity. In fact, the numbers of long-term LVAD patients living in the community have grown so much that new structures and programs are being created to care for them at home. As a result, the role of the cardiologist has become more central, and the therapy has transformed from an acute life-saving intervention to a long-term management intervention aimed at improving the patient's quality of life and overall well-being. Clearly, LVAD therapy has become a valuable tool in the spectrum of an integrated advanced heart failure program.

Some of the most exciting advances in the field of MCS are the clinical adoption of these smaller and more durable CF-LVADs and also the growing concept of destination long-term therapy. Based on the most recent report of the Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS), more than 12,000 patients have been entered into the INTERMACS database using data from more than 140 centers.[1] This equates to a significant increase in the number of centers approved to offer and provide CF-LVADs to patients with end-stage heart failure. Currently, CF-LVADs account for 100% of patients receiving destination therapy and represent almost all of the MCS devices being used in patients.[1] Adoption of this technology is attributed to the observed significant improvement in quality of life out to 24 months post-implant and survival; actuarial survival at 1 and 2 years has reached 80% and 70%, respectively. In addition to these benefits, the total burden of adverse events appears to have slightly decreased in the current era of CF-LVAD therapy (2011 to 2013). However, long-term event-free survival defined as percent freedom from first occurrence of infection, bleeding, device malfunction, stroke, and death measured at 12 months remains high.[2]

In this issue of the *Methodist DeBakey Cardiovascular Journal*, we examine clinically important pre- and post-LVAD topics. The first two manuscripts address clinical challenges in two different patient profiles relating to high-risk preimplant features. Walid Abu Saleh, Brian Bruckner, and colleagues highlight the implications of and short-term treatment options for a patient with an INTERMACS 1 profile (crashing and burning on standard medical therapy). Sherry Grogan and colleagues present a case study to illustrate the challenges of weighing psychosocial risk factors when long-term destination therapy is anticipated.

The second set of articles in this issue provides readers with an update on the most clinically relevant postimplant challenges faced by heart failure specialists caring for patients on CF-LVADs. Recent reports highlight that despite significant improvements in the field of MCS, the incidence of right ventricular failure in the modern CF-LVAD era can be as high as 37%.[3,4] In addition, gastrointestinal bleeding while on CF-LVAD support can lead to postimplant readmission and has an overall incidence of approximately 20%.[5] Also, although the smaller CF-LVADs have been associated with a reduced burden of device-related infection, infections still occur at or around the driveline exit site, and complicated device-related infections are one of the leading causes of readmissions in patients supported by CF-LVADs.[6] To address these challenges, Ashrith Guha and colleagues offer an up-to-date review on the prediction, pathophysiology, and management of right ventricular failure after CF-LVAD placement and provide a multidisciplinary management algorithm to address gastrointestinal bleeding in this patient population, while Barry Trachtenberg and colleagues provide an in-depth review on prevention, diagnosis, and management of device-related infections.

Destination therapy now accounts for more than 40% of all implant strategies and equates to longer-term support for many patients. The reality for many implanting LVAD centers around the country is that patients strongly desire to return to their community, and many report difficulties with frequent surveillance outpatient follow-up. Given the paucity of protocols and algorithms to direct cardiologists and primary care physicians in the care of patients on CF-LVADs, we provide our institutional perspective on "shared care" and define goals and objectives that guide the routine exam in this unique patient population.

In the final set of articles on CF-LVADs, Arvind Bhimaraj and colleagues provide an enlightened perspective on continuous-flow physiology and the long-term effect on end-organ function including the renal, neurologic, and endothelial systems. And finally, Drs. Bhimaraj and Loebe sit down with George Noon to discuss his early experience with and significant role in the development of continuous flow left ventricular assist devices.

References

1. Kirklin JK, Naftel DC, Pagani FD, Kormos RL, Stevenson LW, Blume ED, et al. Sixth INTERMACS annual report: a 10,000-patient database. J Heart Lung Transplant. 2014 Jun;33(6):555-64.

2. Kirklin JK, Naftel DC, Kormos RL, Stevenson LW, Pagani FD, Miller MA, et al. Fifth INTERMACS annual report: risk factor analysis from more than 6,000 mechanical circulatory support patients. J Heart Lung Transplant. 2013 Feb;32(2):141-56.
3. Atluri P, Goldstone AB, Fairman AS, MacArthur JW, Shudo Y, Cohen JE, et al. Predicting right ventricular failure in the modern, continuous flow left ventricular assist device era. Ann Thorac Surg. 2013 Sep;96(3):857-63; discussion 863-4.
4. Kormos RL, Teuteberg JJ, Pagani FD, Russell SD, John R, Miller LW, et al. Right ventricular failure in patients with the HeartMate II continuous-flow left ventricular assist device: incidence, risk factors, and effect on outcomes. J Thorac Cardiovasc Surg. 2010 May;139(5):1316-24.
5. Aggarwal A, Pant R, Kumar S, Sharma P, Gallagher C, Tatooles AJ, et al. Incidence and management of gastrointestinal bleeding with continuous flow assist devices. Ann Thorac Surg. 2012;93:1534-40.
6. Patel CB, Cowger JA, Zuckermann A. A contemporary review of mechanical circulatory support. J Heart Lung Transplant. 2014 Jul;33(7):667-74.