Commentary: Better pumps, better patients, better physicians? Future developments in left ventricular assist device therapy

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Especially in technology, we need revolutionary change, not incremental change.

—Larry Page

Shaffer and colleagues1 review recent progress in durable left ventricular assist device (LVAD) devices and outline the current challenges to moving the technology forward. In this timely article, Shaffer and colleagues1 summarize the current benchmarks from published clinical trials, present the growing evidence supporting innovative surgical techniques, and identify nearing device innovations in LVAD therapy. The review encapsulates the advances that have occurred in all aspects of LVAD therapy—pump technology, patient factors, and management—in addition to reviewing the evidence for the currently available continuous flow LVADs, setting the context for the next phase of developments.

Advances aimed at the intersection of pump technology, physician management, and patient factors have driven the field of mechanical circulatory support forward, not solely pump technology. The large number of physicians arguing the merits of better pumps versus better patients at professional meetings every year underscore this point. Advances are occurring every day, slowly moving the field forward; new pumps arrive about once a decade.

The authors outline these incremental changes in all domains of mechanical circulatory support. Better pumps? The HM3 (Abbott, Chicago, Ill) has reported the lowest complication rates in a published clinical trial with 2-year survival nearing 83%.2 At the same time, the LATERAL trial using HVAD (Medtronic, Minneapolis, Minn) via a thoracotomy approach in a nonrandomized population achieved 87% 2-year survival.3 Overall real-world 2-year survival from the 2019 Interagency Registry for Mechanically Assisted Circulatory Support report was lower than both at 73%.4 Such progress reflects not only advances in pump technology but also management and surgical technique. Better physicians? Surgeons need to pay attention: Like prior minimally invasive innovations in cardiac surgery, the data suggest benefits to less-invasive LVAD implantation and possibly off-pump implantation in select patients. Patient survival using these techniques with the currently available pumps are achieving exceptional survival rates for longer durations.

These developments are also accruing economic benefits. With the advances in pumps, techniques, and management, patients have fewer complications and longer survival. This is driving down the cost of LVAD therapy significantly with measures now approaching or meeting current definitions of cost-effectiveness.5,6 Advances in policy reflect these clinical advances as well. United Network for Organ Sharing heart allocation now reflects the improved survival on the waitlist for LVAD patients and the Centers for Medicare and Medicaid Services plans to remove the distinction between the indications of destination therapy and bridge to transplant.

The current platform of mechanical circulatory support is maturing in all aspects of the field. With totally implantable LVADs around the corner, we may be on the precipice of revolutionary change. With current pumps approaching...
transplant-level survival, and total implantable systems poised to enter clinical trials, is now the time for a clinical trial comparing LVAD and heart transplantation?

References

Commentary: Managing the native heart in patients supported with durable left ventricular assist devices

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In the current issue of the Journal, Schaffer and colleagues1 provide a review entitled “Future Developments in LVAD Therapy.” The authors describe the clinical progress in durable left ventricular assist devices (LVADs), which has in large part resulted from the use of newer centrifugal designs. Unfortunately, device-related infections remain an important adverse event for patients supported on these durable LVADs. The authors suggest that a totally implantable system will be an important solution to this complication. Indeed, multiple companies are working on designs that would use transcutaneous powering and avoid a percutaneous driveline. Such designs would eliminate power cord and more serious device infections, which afflict up to one-third of patients with durable LVAD.

While infectious complications following LVAD support remain an important consideration, a review of the causes of death in the ENDURANCE and MOMENTUM trials shows that heart-or circulatory-related mortalities remain the most important cause of death.2,3 These cardiac-related deaths include ventricular dysrhythmias and most importantly right heart failure and complications of right heart failure. Compared with the HeartMate II device, neither the HVAD nor the HeartMate 3 achieved improvement in the adverse event of right heart failure. As many as one-third of patients continued to experience right heart failure, necessitating prolonged intravenous inotropic therapy. The magnitude of the problem may be even greater, since these trials excluded patients who had preoperative characteristics predictive of right heart failure.