Seeing is believing: A call for routine early postoperative hemodynamic transesophageal echocardiography monitoring after left ventricular assist device implantation?

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Central Message

Hemodynamic TEE can be a powerful monitoring tool after LVAD implantation, providing unique information that can yield to earlier targeted intervention when traditional hemodynamic data are unreliable.

See Article page 1071.

The treatment strategies for stage D heart failure continue to evolve, and the role of mechanical circulatory support as a bridge to transplant or destination therapy is here to stay. Over the past decade, more than 22,000 patients have been entered into the Interagency Registry for Mechanically Assisted Circulatory Support database from more than 180 hospitals, and the majority of left ventricular assist device (LVAD) implants (>17,000) are continuous-flow devices.¹

Because of the growth of this patient population and the limited supply of heart transplants, the needs for mechanical support continue to increase and LVADs are being offered to sicker patients. Postimplant renal failure and right heart failure continue to be the Achilles' heel of LVAD therapy in the immediate postoperative period and have a direct impact on mortality.¹ In addition to adequate patient selection and optimization, diligent and proactive perioperative management is crucial to recognize these complications early and institute therapies that can potentially improve outcome.

The current monitoring standard in the intensive care unit after LVAD implantation is based on clinical hemodynamic variables and LVAD parameters. The use of transesophageal echocardiography (TEE) as a continuous hemodynamic monitor (hemodynamic transesophageal echocardiography [hTEE]) as an adjuvant to conventional monitoring in these patients would be ideal because it can provide specific information, such as evidence of "suck-down" events, septal position, and right ventricular size and function that would affect the management approach. This ideal has been hampered by the availability of a probe that can safely stay in the patient for the crucial perioperative period without causing harm. Over the past decade, a new ultrasound platform (Zura, ImaCor, Uniondale, NY) and a miniaturized disposable monoplane TEE probe (ClariTEE, ImaCor, Uniondale, NY) have been developed and shown promise as an adjuvant to conventional monitoring in

critically ill patients. A few small studies have demonstrated the usefulness of this technology after LVAD insertion, particularly in sicker recipients of LVADs, with an impact on decision-making and frequently changing intensive care unit management.²

In this issue of the *Journal*, Bahatyrevich and colleagues³ examine the use of hTEE in a cohort of LVAD recipients. This was a retrospective evaluation of 93 patients who underwent continuous-flow LVAD implantation, of whom 30 received hTEE as part of the postoperative care and were monitored routinely every 1 to 3 hours until extubation. The main difference in this particular study is that the group who received hTEE was not sicker than the conventional monitoring group. The study had a robust and logic algorithm of management depending on conventional monitoring versus hTEE. Among the hTEE group, there was disagreement between conventional monitors and hTEE findings in 26 patients (87%). Moreover, in 22 patients (73%), at least 1 hTEE study found an abnormality when conventional monitoring was showing normal parameters. The difference in management approach was remarkable, including more need to address LVAD speed, volume, and inotropes in the hTEE group compared with the conventional management group. Despite these real benefits, there was no impact in hospital or intensive care unit length of stay, and although there was

a statistical difference in 30-day survival, the conventional therapy group included sicker patients (transition from extracorporeal membrane oxygenation = 8 vs 0), which makes it impossible to attribute the better survival to hTEE.

These findings do pose the question: If hTEE can help us see what conventional monitoring cannot, should we raise the standard for postoperative monitoring in LVAD recipients by adding this technology? The answer is, no so fast. Despite emerging evidence of the benefits of its use and a clear safety profile, there is not enough evidence for routine use of hTEE. There are also important considerations, including the cost of an entire new ultrasound platform and the TEE probes, as well as the necessary personnel or training to make accurate diagnoses that yield the right therapeutic decision. Moreover, many LVAD implantations are uneventful and have a smooth postoperative course with early extubation. Understanding the benefit of hTEE, this technology should be welcome

and available, but to use it on “as-needed basis,” such as when there is a frequent intraoperative “suck-down” events with or without intraoperative right ventricular dysfunction or open chest due to right ventricular failure or instability. To date, we need more cost analysis and larger randomized controlled studies to understand the cost/benefit ratio of “seeing” what we need to see in the early postoperative period after LVAD insertion.

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