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updated information. The article by Quan and colleagues¹ is a novel, interesting, and valuable contribution to this field.

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**MINIMALLY INVASIVE
DURABLE
MECHANICAL
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SUPPORT: DON'T HIT
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DOWN**

Reply to the Editor:

In response to our recent case report on a patient who underwent percutaneous atrial septal closure concomitantly with left-ventricular assist device (LVAD) implantation via an upper hemisternotomy and left anterior minithoracotomy approach, Abad and colleagues¹ wrote on trends toward less-invasive procedures in cardiac surgery. It has already been demonstrated in many other areas of surgery that patients undergoing minimally invasive approaches often have equivalent or improved outcomes, particularly

in terms of postoperative length of stay and recovery.² Although multifactorial, some of these benefits may be attributable to a reduced physiologic hit. Specifically, a less-invasive approach may cause less physiologic stress and minimize the resultant inflammatory and cytokine response.³ This may be of particular benefit in patients who are at higher preoperative risk, such as those in cardiogenic shock.

In the realm of mechanical circulatory support, the institution of percutaneous extracorporeal membrane oxygenation and percutaneous temporary ventricular assist device (VAD) placement have allowed for an expedient and relatively facile approach to support patients in cardiogenic shock and aid in multisystem recovery. It is not uncommon for these patients to go on to require a durable VAD, either as destination therapy or as a bridge to heart transplantation. Our preferred approach for LVAD implantation has become the upper hemisternotomy and left anterior minithoracotomy (data forthcoming). We have found that this approach leads to improved patient outcomes, particularly in patients of higher acuity. This observation is in line with data reported by Wert and colleagues⁴ in Interagency Registry for Mechanically Assisted Circulatory Support 1 patients. Bejko and colleagues⁵ demonstrated that patients undergoing a minimally invasive approach for VAD implantation had a faster postoperative recovery in terms of the duration of mechanical ventilation, inotropic support, length of stay, and time to mobilization. A number of different minimally invasive approaches to LVAD are possible and have been summarized by Makdisi and Wang.⁶ The use of minimally invasive approaches in concert with transcatheter procedures to address concomitant issues, such as an atrial septal occluder in our patient to close an atrial septostomy, or a transapical aortic valve implantation in a patient with moderate aortic insufficiency as described by Schaefer and colleagues,⁷ can minimize the physiologic hit for these already critically ill patients.

By minimizing the hit, minimally invasive approaches in cardiac surgery, and in particular in mechanical circulatory support, may offer a more tolerable operation and result in improved outcomes in the most critically ill patients.

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