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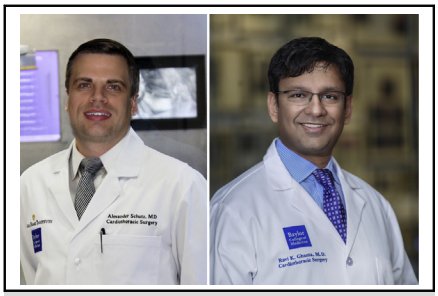
Commentary: Futility in the age of modern mechanical circulatory support

Alexander Schutz, MD,[a,b] and Ravi Ghanta, MD[a]



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CENTRAL MESSAGE

Mechanical circulatory support offers encouraging results in selected patients with cardiogenic shock. These benefits must be weighed against the prospect of futility in unsalvageable patients.

This review by Rao and Billia[1] provides insightful, modern criteria for offering mechanical circulatory support (MCS) to patients with acute decompensated heart failure. Patients requiring venoarterial support represent a frail cohort whose overall survival remains only approximately 50% by current Extracorporeal Life Support Organization reports. However, long-term survival may be favorable in carefully selected patients.[2] The authors concisely review preoperative screening, and they stress the importance of unmasking undiagnosed comorbidities before intervention. As the authors mention, scoring systems such as SAVE (survival after veno-arterial-ECMO)[3] and CardShock[4] are valuable tools that can facilitate patient selection. Also, it should be emphasized that, as providers, we must always remain attentive when delivering such costly, resource-intensive therapies. As intensive care survivorship continues to improve, the long-lasting effects of these interventions on patients' neurocognitive outcomes, not to mention the resultant risk of posttraumatic stress disorder, should also be considered when deliberating when to administer these therapies.[5]

The authors stress the importance of demonstrating futility within a 5- to 7-day window. Multiple studies support this assertion, showing that failure to wean[6] or lack of improvement in this time frame portends a poor prognosis. Another important aspect of care in patients requiring support outside of this 5- to 7-day window is how to maintain hemodynamically improving individuals effectively as they transition to recovery, transplant, or a durable MCS device. The risks associated with long-term extracorporeal membrane oxygenation and continuous therapeutic anticoagulation are well established. Extending the use of these devices for longer periods of time also increases the risk that potential transplant candidates will require increased blood-product exposure.

The selection process for short-term MCS continues to evolve for patients who have "declared themselves" potential survivors by the authors' specified criteria. The use of surgically implanted peripheral devices like the Impella 5.0 and Impella 5.5 has begun allowing surgeons to maintain mechanical support for extended periods[7] while mitigating the risk of hemolysis seen in earlier-generation devices. Using these peripheral MCS devices also allows patients to recover once they no longer need full extracorporeal membrane oxygenation support. Whether right ventricular support is needed should be carefully considered in these situations, particularly when evaluating patients for transplant versus durable left ventricular assist device implantation. Using the Impella RP or the Protek-Duo (which the authors used) may be considered. Even an axillary intra-aortic balloon pump[8] may provide adequate support, allowing patients to recover, extubate, ambulate, and successfully bridge to 1 of the 3 aforementioned survivable destination therapies.

From the [a]Divisions of General and Cardiothoracic Surgery, Michael E. DeBakey Department of Surgery, Baylor College Medicine; and [b]Department of Cardiovascular Surgery, Texas Heart Institute, Houston, Tex.

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Address for reprints: Ravi Ghanta, MD, One Baylor Plaza, MS 390, Houston, TX 77030 (E-mail: ravi.ghanta@bcm.edu).

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We share a similar philosophy regarding the selection of patients who may benefit from these interventions. Of note, one must also consider what course of action to take after successful decannulation if the patient later develops another significant hemodynamic decompensation. While these circumstances vary on a case-by-case basis, we often are conservative in offering these individuals further MCS intervention, as their ability to sustain meaningful recovery becomes more limited after a "second hit." The authors' attached vignette elegantly illustrates the integration of these criteria and concepts, providing optimal outcomes rather than futility in the continually evolving field of MCS and heart failure.

References

1. Rao V, Billia F. When NOT to use short-term mechanical circulatory support. *J Thorac Cardiovasc Surg Open*. 2020;3:106-10.
2. Cheng YT, Garan AR, Sanchez J, Kurlansky P, Ando M, Cevasco M, et al. Midterm outcomes of bridge-to-recovery patients after short-term mechanical circulatory support. *Ann Thorac Surg*. 2019;108:524-30.
3. Schmidt M, Burrell A, Roberts L, Bailey M, Sheldrake J, Rycus PT, et al. Predicting survival after ECMO for refractory cardiogenic shock: the survival after veno-arterial-ECMO (SAVE)-score. *Eur Heart J*. 2015;36:2246-56.
4. Harjola VP, Lassus J, Sionis A, Kober L, Tarvasmaki T, Spinar J, et al. Clinical picture and risk prediction of short-term mortality in cardiogenic shock. *Eur J Heart Fail*. 2015;17:501-9.
5. Sylvestre A, Adda M, Maltese F, Lannelongue A, Daviet F, Parzy G, et al. Long-term neurocognitive outcome is not worsened by of the use of venovenous ECMO in severe ARDS patients. *Ann Intensive Care*. 2019;9:82.
6. Smith M, Vukomanovic A, Brodie D, Thiagarajan R, Rycus P, Buscher H. Duration of veno-arterial extracorporeal life support (VA ECMO) and outcome: an analysis of the Extracorporeal Life Support Organization (ELSO) registry. *Crit Care*. 2017;21:45.
7. Chung JS, Emerson D, Ramzy D, Akhmerov A, Megna D, Esmailian F, et al. A new paradigm in mechanical circulatory support: 100-patient experience. *Ann Thorac Surg*. 2020;109:1370-7.
8. Naqvi SY, Salama IG, Yoruk A, Chen L. Ambulatory intra-aortic balloon pump in advanced heart failure. *Card Fail Rev*. 2018;4:43-5.