Commentary: Cardiogenic shock, temporary ventricular assist device support, and *then* total artificial heart: Avoiding the Lazarus implantation

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The article in this issue of the *Journal* by Alaeddine and colleagues² is an excellent demonstration of the use of the total artificial heart (TAH) as a bridge to transplantation for a challenging patient who is not a great candidate for ventricular assist device (VAD) therapy alone. Alaeddine and colleagues² have also validated the important strategy of using temporary VAD support in an unstable patient (Interagency Registry for Mechanically Assisted Circulatory Support status 1) for resuscitation and to make the patient a better TAH candidate. Often when a patient is determined to require heart transplant, VADs are the first bridging option. There are several patient cohorts in which VAD therapy is not optimal, however, such as those with unrelenting ventricular arrhythmias, large ventricular clot burden, restrictive physiology or cardiomyopathy, ventricular tumor burden, or biventricular failure.³ TAH devices have had an increasingly significant impact on the pediatric population during the last several years. In a study of a single institution's experience with the SynCardia TAH (SynCardia Systems, LLC, Tucson, Ariz), Copeland and colleagues⁴ demonstrated that the device is a successful alternative therapy for patients with refractory heart failure who are not ideal candidates for VAD support. The TAH does not really compete with VAD therapy; rather, it offers patient cohorts for whom we do not have good mechanical support options a propitious alternative.

Alaeddine and colleagues² described a patient who was impressively resuscitated with paracorporeal temporary VAD support inserted by a transapical technique. This is a fantastic choice, because it avoids a lengthier and more involved procedure with cardiopulmonary bypass (TAH implantation) in this patient with cardiogenic shock and end-organ compromise, both well-documented risk factors for

The Raising of Lazarus, Andrea Vaccaro (1604-1670).¹

Central Message

With the 50/50cc TAH, smaller patients who did not have good long-term mechanical circulatory support options now do. For some candidates, optimization with short-term support before TAH is prudent.

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early TAH mortality. Their use of temporary VAD support highlights the ability to improve a patient's condition rapidly so that the patient becomes an excellent TAH candidate.

Alaeddine and colleagues² also recognized the utility of a virtual implantation fit study for a more accurate estimate of the appropriate TAH size for the patient. Virtual reality and 3-dimensional modeling are now routinely used for placement of all intracorporeal VADs and TAHs, especially for younger and smaller patients and those with complex congenital defects.⁵

Overall, this report demonstrates the appropriate use of the 50/50cc SynCardia TAH in a young patient with a low body surface area, the utility of virtual modeling in surgical planning, and the excellent utility of short-term mechanical support in an unstable patient. Data has clearly demonstrated that implanting patients with the TAH or any durable VAD in cardiogenic shock is futile, and expecting a good outcome consistently from this strategy is like hoping for a miracle. We should instead be routinely using temporary VAD support to avoid a "Lazarus implantation."

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