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Commentary: Bridge to bridge: No longer a bridge too far for successful cardiac transplant

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Cardiogenic shock (CS) is a condition characterized by impaired cardiac output and end-organ hypoperfusion that results in significant morbidity and mortality. It remains the leading cause of death after acute myocardial infarction and despite improvements in CS management, mortality remains high, at 30% to 50% in contemporary registries.¹ Treatment strategies include improving cardiac performance by administration of vasoactive medications, but often these are insufficient and mechanical circulatory support (MCS) is required to improve end-organ perfusion and rest the failing myocardium. The use of venoarterial extracorporeal membrane oxygenation (VA-ECMO) has increased in recent times to provide biventricular support in patients with severe CS. It provides hemodynamic support to patients, allowing oxygenation and removal of carbon dioxide. Nevertheless, this is only a short-term solution because patients frequently develop complications when supported on VA-ECMO, increasing with each additional day on support. The aim is often that VA-ECMO is used as a bridge to recovery, with sufficient time on support allowing the underlying cardiac dysfunction to improve. If this does not occur, VA-ECMO may be used as a bridge to cardiac transplantation (BTT), or alternatively as a bridge to another more durable MCS device, a bridge-to-bridge

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CENTRAL MESSAGE

In patients with cardiogenic shock with biventricular failure supported on venoarterial ECMO, Total Artificial Heart implantation can be used as a successful bridge to transplant.

(BTB) strategy, allowing more time for either recovery or for a suitable donor organ to become available.²

In their study, Noly and colleagues³ describe a multi-center, observational, North American experience of using the Total Artificial Heart (TAH) (SynCardia Systems, Tucson, Ariz) device as a temporary BTT after liberation from VA-ECMO.³ The study reports on 54 patients who were supported with this sequential BTB strategy, comparing them with 163 patients who were supported with TAH alone as BTT. Despite BTB, patients having higher acuity (all were INTERMACS profile 1) before TAH implantation, important clinical outcomes, including discharge from hospital (32% vs 37%; $P = .09$), survival to transplant (59% in BTB vs 65% in TAH alone group; $P = .44$), and survival after transplantation (87% vs 83%; $P = .82$) were similar in those patients to those supported with TAH alone. Median time of support on TAH was 3.0 months.

The authors should be congratulated for demonstrating the feasibility of bridging patients supported with VA-ECMO to transplantation using TAH. Patients with biventricular dysfunction have fewer options for support, with biventricular ventricular assist device (VAD) the only alternative to TAH for longer-term BTT. The authors compare these 2 strategies in their discussion, but registry data are not sufficiently granular to afford a meaningful comparison—the International Society for Heart and Lung Transplantation Registry for Mechanically Assisted Circulatory Support analyses include various configurations of both temporary and durable VAD.⁴ Another concern is volume

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of TAH implantation. In this study, 2 centers performed the bulk of TAH procedures, with the other 4 centers implanting fewer than 5 devices per year. There is robust evidence suggesting that very-low implanting centers (implanting fewer than 10 durable VADs) have poorer outcomes when compared with more experienced centers.⁵ It may be that a similar volume of surgeries is required to maintain competence in TAH implantation too. Finally, it is unclear if the 2 high-volume centers use TAH preferentially as their MCS device of choice, even when durable left VAD with temporary right-sided support may be an option, which may add further bias into patient selection across different study locations.

Nevertheless, despite limitations associated with observational studies, this report significantly contributes to the understanding of feasible options for patients in CS supported with VA-ECMO who may not be immediately suitable for transplantation or may need to wait for a suitable

donor organ to become available. The challenge for clinicians in the field remains choosing which strategy and device is best suited to individual patients; a challenge that is yet to be overcome.

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