Commentary: Bridging the gap with temporary ventricular assist devices in pediatrics

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In this issue of the Journal, Cho and colleagues review their institutional experience supporting pediatric patients with temporary ventricular assist devices (tVADs) over a 25-year period. In total, 108 patients were supported during 114 clinical encounters, with the implantation of 126 tVADs. An extracorporeal centrifugal pump was used in 70 encounters, with a catheter-based axial pump (CBAP) used in the remainder. In total, 85% of encounters resulted in bridge-to-recovery, bridge-to-bridge, or bridge-to-transplant (primary end point), with a favorable outcome achieved in 73% of patients at 6-months’ post-VAD implant.

While direct comparisons with multicenter studies are limited as the result of heterogeneous patient populations, support strategies, and era effect, this single-center experience appears to exceed previous multicenter reports with pediatric tVADs and provides more granular follow-up data. In a 2018 review of the Pediatric Interagency Registry for Mechanical Circulatory Support, Lorts and colleagues reported a positive primary end point in 71% of patients supported with tVADs, whereas Yarlagadda colleagues reported a 61% 90-day survival among children supported with tVADs awaiting transplant. The improved survival in the current study is likely multifactorial and includes the recoverable etiology in some patients, the shorter support duration, and the increasing use of CBAP in the more recent era. The study cohort was also older and had fewer instances of congenital heart disease and single-ventricle physiology as compared with previous reports.

The current study does support the advantage of tVAD as compared with extracorporeal membrane oxygenation in the setting of acute cardiac etiologies with potential for myocardial recovery, with 73% of encounters for myocarditis demonstrating improvement. Importantly, as noted by the authors, the threshold to offer tVAD support has been lowered by CBAP. Although CBAP use was not a statistically significant factor on mortality, renal failure and mechanical ventilation were, implying that the trend toward better outcomes with CBAP may be attributable to the timing of implantation. This trend was seen with a similar number of patients with an Interagency Registry for Mechanically Assisted Circulatory Support profile 1 in both groups, likely reflecting the inability of Interagency Registry profiles to adequately differentiate the extent and duration of cardiogenic shock. It may also be explained by the less-invasive implantation technique and different patient populations, with patients receiving an extracorporeal centrifugal pump being both younger and smaller, as well as having a greater incidence of chronic etiologies and congenital heart disease.

This study highlights several challenges with pediatric mechanical circulatory support. For smaller patients, tVADs require a sternotomy with extracorporeal support.
via a pump often designed for larger patients. Although the incidence of neurologic events was not included in the paper, 24% of deaths on support were caused by neurologic dysfunction. Although there may be a benefit to enabling end-organ recovery with tVAD before durable VAD placement, is this strategy advantageous for smaller patients with chronic etiologies in whom recovery is unlikely? Meanwhile, the study underscores the progress that has been made supporting children with VADs. This summary illustrates the contemporary landscape of temporary support options beyond extracorporeal membrane oxygenation for pure cardiac dysfunction while encouraging forward thinking about early myocardial decompression of the failing ventricle, with an increasing “armamentarium” of advanced cardiac therapies for pediatric patients.

References