Commentary: Filling the gap: Can ventricular assist devices support hearts with a single ventricle?

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Disclosures: Authors have nothing to disclose with regard to commercial support.

Received for publication April 24, 2019; accepted for publication April 25, 2019; available ahead of print June 10, 2019.

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0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2019.04.069>

Philip and colleagues¹ report the successful experience of bridging an infant with hypoplastic left heart syndrome to heart transplantation using an Excor ventricular assist device (VAD) (Berlin Heart Inc, The Woodlands, Tex).¹ The authors describe an innovative strategy for supporting failing stage 1 single ventricle physiology in small patients (2.5-3.75 kg). Innovations include the choice of a pulsatile pump, the use of bivalirudin for anticoagulation, pulmonary artery banding, and atrial cannulation. Although the use of VADs in pediatrics has been associated with a 50% reduction in waitlist mortality, congenital heart disease (CHD) and small patient size remain strong risk factors for waitlist mortality.² Infants with single ventricle (SV) physiology pose additional anatomic and physiologic challenges when considering mechanical circulatory support due to the need to balance cardiac output to the pulmonary and systemic circulations. A previous analysis described poor outcomes for small infants supported with the Excor and particularly poor survival in those weighing <5 kg.³ Despite small size/weight and SV physiology, complication-free support is feasible with some innovation.

Recent analysis of the Pediatric Interagency Registry for Mechanical Circulatory Support demonstrated that patients with CHD continue to have higher mortality than patients without CHD on VAD support, but SV physiology did not seem to further influence outcomes.⁴ The authors believe that this observation supports ongoing innovations like that described by Philip and colleagues¹ to support patients with SV physiology with bridging strategies.

There are no consensus guidelines on how to manage patients with SV physiology on a VAD. Even the choice of pump varies between centers. In a study by Peng and colleagues,⁴ 78% of patients with SV physiology after stage 1 palliation were supported with a paracorporeal continuous flow pump that appeared to be associated with improved survival in those patients. The atrial cannulation approach used in this patient—and previously described by Ma and colleagues⁵ for patients with a smaller ventricular

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Central Message

Novel management strategies for pediatric patients with a VAD might be safely expanding the VAD support strategies for infants with complex congenital heart disease.

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cavity—is an example of an innovative strategy that may have augmented the device's ability to provide balanced cardiac output with a pulsatile pump in the context of a systemic right ventricle. In addition, anticoagulation management is evolving with direct thrombin inhibitors gaining popularity based on limited but positive reports of safety and efficacy.^{6,7}

Philip and colleagues¹ identify this strategy as part of a successful program at their institution aimed at supporting failing small patients with SV physiology to transplant or decision with acceptable outcomes in the current era. We encourage them to expand this experience with VADs after stage 1 palliation for SV physiology and hope the wider community is emboldened to pursue larger-scale collaborations directed at making extracorporeal support a more consistent option for this high-risk group.

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