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Commentary: How to VAD to avoid BAD in high-risk single ventricle

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The options of mechanical circulatory support (MCS) as a bridge-to-transplantation (BTT) in infants with a high-risk single ventricle (SV) physiology during peri-stage one palliation have been limited. Although initial success using the Berlin EXCOR as a BTT was reported by Pearce and colleagues,¹ the rate of survival to transplantation for SV patients status post-stage one palliation using this strategy was reported as 10%.² Given the absence of a clear consensus, medical management often has been the sole option for this cohort of patients until transplantation.

In their article in this issue of the *Journal*, Philip and colleagues³ demonstrate the safety and feasibility of pulsatile paracorporeal ventricular assist device (VAD) as a BTT in patients with high-risk SV physiology either before or after their first stage of palliation.³ A unique aspect of their approach was the impetus on prepalliation implantation of VAD as BTT and its effect on enhancing patient survival to transplantation. In brief, the inclusion criteria for pre-emptively implanting a Berlin EXCOR before palliation or after palliation included poor ventricular or atrioventricular valve function, heart failure, persistent mechanical ventilation or inotropic support, and inability to feed or rehabilitate. The target cardiac index was very high at 3.5 to 4.0 L/min/m², which was increased to 4.5 to 5 L/min/m² over the first 6 weeks of MCS. Bivalirudin was the primary method of anticoagulation. Parallel blood circulation to either the systemic or pulmonary circulation was preferentially through a PDA stent with or without pulmonary artery bands; a Y-graft from outflow graft to aorta or modified Blalock-Taussig shunt for pulmonary perfusion were other

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CENTRAL MESSAGE

A well-planned early MCS in peri-stage one palliation single ventricle physiology is feasible and safe.

available options. Six out of 9 patients on support were awaiting surgical palliation, and the overall survival in this cohort of patients was 66%, demonstrating a marked improvement compared with previous reports.^{2,4}

Besides the technical aspect of the VAD configuration, Philip and colleagues identify several nonsurgical factors that might have led to the higher rate of survival they observed. These include considerations, such as prepalliation selection, early deployment of MCS before end-organ dysfunction, the use of common atrium cannulation for enhanced cardiac decompression and thereby improved pulmonary and hepatic decongestion, and the use of bivalirudin as the primary anticoagulation strategy.⁵⁻⁷ Especially regarding prepalliation and early deployment of MCS, one study reported similar findings, with early initiation of MCS following stage one palliation in hypoplastic left heart syndrome leading to a survival rate of 90%, suggesting the importance of patient selection and initiation of MCS in a timely fashion before the onset of irreversible end-organ dysfunction to improve clinical outcomes in patients with peri-stage one SV physiology.⁸ A remarkably low rate of thromboembolic events is another noteworthy result from this report, which may be related to the combination of the high-index pump flow and the use of bivalirudin, which has been shown to dramatically decrease the rate of thromboembolic events in pediatric VAD populations.^{5,6,9}

Although more data are needed to draw firm conclusions, these preliminary findings help elucidate the role of early MCS as a BTT in peri-stage one palliation SV physiology as being both feasible and safe. As the literature is still undecided regarding the optimal protocol and timing for the initiation of MCS in SV physiology, Philip and colleagues'

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remarkable experiences offer valuable insights and can help streamline the algorithm for MCS management strategy in this group of SV patients. They should be applauded for their contributions.

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Commentary: Promise with pulsatility? Early bridging of high-risk patients with single-ventricle physiology with a ventricular assist device

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The outcomes for use of the Berlin Heart Excor (The Woodlands, Tex) in patients after stage 1 palliation have been dismal. In previous studies, no single-ventricle (SV) patient

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CENTRAL MESSAGE

Successful outcomes are possible using a Berlin Heart Excor ventricular assist device as a bridge to transplant in high-risk patients with single ventricle physiology, yet outcomes after Norwood remain uncertain.

weighing ≤ 7 kg could successfully be bridged to transplantation.^{1,2} However, the current article describes a more promising experience with the Excor ventricular assist device (VAD) in 9 patients with single ventricle physiology, before ($n = 6$) or after ($n = 3$) the first stage of palliation.³ Overall, hospital survival was 66% (6 out of 9 patients), which represents a major improvement in survival in comparison with previous reports. Notably, only 1 patient had a VAD placed after Norwood and that patient survived but had a major neurological injury.

The authors should be congratulated for quickly identifying before palliation or soon after a failed palliation,

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