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Commentary: Systemic ventricular assist devices for the Fontan circulation: We can, but for whom and when?

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Bedzra and colleagues¹ from the Society of Thoracic Surgeons Fontan Ventricular Assist Device (VAD) group provide an updated report on the current experience of systemic VAD use in the Fontan circulation in the United States. This study includes 55 pediatric patients with Fontan circulation from the Intermacs and Pedimacs registries with systemic ventricular dysfunction who received systemic VAD support and closely mirrors the report from the Advanced Cardiac Therapies Improving Outcomes Network (ACTION) collaborative published in May, which included 45 patients with Fontan circulation.² It is very likely that these 2 studies incorporated many of the same patients, given the scarcity of this procedure, although the present study offers a larger patient cohort and slightly longer follow-up (2 years).

Patients were further divided into 2 eras (2012-2017 and 2018-2019) with nearly equal numbers of patients in each era, which indicates the recent trend in increased VAD use. The median length of support was 3.8 months, with 5 patients supported for more than 1 year. In contrast to the ACTION cohort, this patient group had reduced renal function and bilirubin levels, lower rate of bridge to transplantation, and a greater rate of pre-VAD extracorporeal membrane oxygenation (ECMO) support. Interestingly, the only pre-VAD clinical difference between eras was a slightly better renal function, with no difference in age and weight at implantation, hepatic function, cardiac status, ECMO support, most common device used (implantable continuous), and

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CENTRAL MESSAGE

Experience with systemic VAD placement in the Fontan circulation continues to slowly grow, although optimal patient selection, timing of placement, and physiological outcomes remain unclarified.

6-month survival. Patients who received ECMO support before VAD placement appeared to have a lower 6-month survival than those who did not (32.4% vs 86.4%), although the difference did not reach statistical significance. Half the mortalities occurred within 2 weeks of device placement. Only 4 patients underwent device replacement, whereas 38% were bridged to transplantation. Rates of stroke, device malfunction, and bleeding all were less than 10% and generally occurred beyond 2 weeks after device implantation.

This study appears to provide additional support for systemic VAD support in patients with Fontan circulation with systemic systolic and possibly diastolic ventricular dysfunction. The complication and adverse events profiles are not trivial, and timing of placement seems imperative, although the optimal window remains unclear. Even the present study has very limited follow-up data at 3 months, including data for end-organ function. While we collectively hope an existing mechanical support platform could reverse the late adverse consequences of the Fontan circulation, it is still difficult to discern truth from hype in this very challenging clinical context.

The authors speculate that this type of VAD use will continue to increase based on growing numbers of patients surviving with single-ventricle physiology and results of these recent studies. Systemic ventricular dysfunction is a strong determinant of death and need for heart transplantation

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in this patient population.^{3,4} While these patients comprise a small proportion of patients referred for heart transplantation, we need viable solutions for these uniquely challenging patients now. Hopefully, the support technology we have seen before us over the past decade for noncongenital patients will be such a solution, but only time and data will tell.

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