See Article page 1075.

Commentary: To remove (a heart), or not to remove, that is the question

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Because of the heterogeneity of pediatric heart failure, there are situations in which standard ventricular assist device (VAD) support is not sufficient, necessitating a more aggressive approach, such as total artificial heart (TAH) placement. Although commercially available TAHs, such as the SynCardia TAH (SynCardia Systems, LLC, Tucson, Ariz) are potential options for adolescents, such options do not exist for small children. Consequently, these patients are often supported with extracorporeal membrane oxygenation, despite its suboptimal outcomes and significant risk profile. In this context, the technique presented in this issue of the *Journal* by Woods and colleagues¹ represents a unique and innovative option to enable TAH-like support in smaller children. The novelty of their approach is characterized by the use of the Berlin EXCOR cannulas (Berlin Heart Inc, The Woodlands, Tex) and associated cardiectomy, which makes the implant procedure more applicable even to conditions that may be unsuitable for typical VAD implantation, such as intracardiac tumor. Woods and colleagues¹ are to be congratulated for the tenacity they have demonstrated, striving to save their patients in critical conditions.

One facet of this case series that certainly warrants further discussion is the patient population best served by the approach described by Woods and colleagues.¹ A variety of pathologies were supported in this series. The proposed approach, however, should not supplant initial more conventional strategies, such as durable VAD support with

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CENTRAL MESSAGE

Pediatric biventricular failure represents a challenging clinical situation with limited options for support. Woods and colleagues describe innovative means of support for small infants and children.

medical support of the right ventricle. Rather, it ought to be considered as a last resort for patients with biventricular failure who could not otherwise be supported with conventional VAD alone. A VAD surgeon needs to be a minimalist, simply providing a support that is “just enough” and “not excessive.”

One of the fundamental differences between VAD and TAH support is the presence or absence of a native cardiac chamber that serves as a reservoir for an artificial pump. Allowing a TAH to fill only partially may allow some capacity to accommodate abrupt increases in device preload.² This can represent a double-edged sword, because accommodating variations in preload must be balanced against decreased stroke volume and cardiac output. Nevertheless, without proper reservoir capacity, excessively increased preload will result in direct transmission of higher pressures to the systemic and pulmonary venous systems. Woods and colleagues¹ provide a thorough description of their strategies to minimize time spent in this state, which include the use of both upsized pumps and valved conduits. The fact that artificial pumps have robust systolic capabilities but limited diastolic reserve denotes the importance of retaining a cardiac chamber to accommodate changes in preload, whenever feasible. The optimal means of protecting the venous systems from high back pressure remains to be determined;

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however, careful consideration of the strategies put forth by Woods and colleagues¹ in this article will be of utmost importance when considering this approach to cardiac support in future patients.

Pediatric heart failure in small children remains a challenge, with high mortality and limited options for mechanical support. The rescue strategy described by Woods and colleagues¹ is a creative approach that could potentially save the lives of children in critical condition who would not be candidates for conventional VAD support. Further

discussion is warranted to define the population best served by this aggressive approach.

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