Beyond ECMO: Successful Bridge to Heart Transplantation Using Continuous-Flow Biventricular Assist Devices in a 19-kg Child

Authors and Affiliations

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Background: Advanced pediatric heart failure is associated with high morbidity and mortality, particularly in settings where access to durable pediatric ventricular assist devices (VADs) is limited. Continuous-flow centrifugal pumps adapted for paracorporeal support may provide an effective bridge to heart transplantation in children with severe biventricular failure.

bjectives: To describe the successful use of continuous-flow paracorporeal biventricular assist device (biVAD) support as a bridge to heart transplantation in a small child with refractory cardiogenic shock.

Methods: We report the clinical course and management of a 7-year-old (19 kg) child with end-stage dilated cardiomyopathy who developed refractory cardiogenic shock despite mechanical ventilation and high-dose vasoactive support. Owing to severe biventricular dysfunction (left ventricular ejection fraction 15%) and urgent transplant listing, a paracorporeal continuous-flow biVAD using two CentriMag™ centrifugal pumps was implanted. Cannulation consisted of left ventricular apical and right atrial inflow with aortic and pulmonary artery outflow grafts. Pump flows, anticoagulation, and afterload reduction were tailored to optimize systemic perfusion and ventricular unloading.

Results: Postoperative complications included hemothorax requiring surgical washout and one failed extubation attempt. After successful respiratory recovery, a suitable donor heart became available on biVAD support day 9, and orthotopic heart transplantation was performed. The postoperative course was complicated by primary graft dysfunction requiring venoarterial extracorporeal membrane oxygenation (VA-ECMO) and cytokine hemoadsorption. Progressive myocardial recovery allowed ECMO decannulation after seven days. The patient was discharged home with preserved graft function, intact neurological status, and no evidence of end-organ dysfunction.

Conclusion: Continuous-flow paracorporeal biVAD support can provide an effective bridge to heart transplantation in small children with advanced biventricular failure. This case demonstrates that centrifugal pump technology represents a valuable alternative when dedicated pediatric VADs are unavailable and highlights the complementary role of VA-ECMO in managing severe post-transplant primary graft dysfunction.

References:

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