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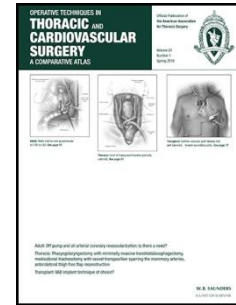
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# Mechanical Circulatory Support Following Norwood Palliation

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Disclosures: This manuscript describes the off-label use of the Berlin Heart EXCOR<sup>®</sup> pediatric ventricular assist device cannulas

## ABSTRACT

Historically, mechanical circulatory support for the newborn, particularly those with single ventricle physiology such as hypoplastic left heart syndrome, has been limited to extracorporeal membrane oxygenation (ECMO). The results using (ECMO) have been less than optimal and application of the Berlin Heart, the only pediatric ventricular assist device FDA approved to date, has also been unsuccessful. We present a complication of techniques that can be applied to these infants. The key principle revolves around the cannulation technique (and cannula used) which involves placement of an "aortic" cannula flush with the surface of the common atrium (avoiding any extracorporeal surface exposure *within* the heart chambers). Further, the application of centrifugal pump allows for quite effective decompression of the heart in this setting. Lastly, the described approach allows provision of support in a rather simple fashion without the use of cardiopulmonary bypass support and without the need for a ventriculotomy.

Keywords: VAD, ECMO, HLHS, Hybrid

## INTRODUCTION

Despite medical and surgical advances, two-thirds of neonates who have undergone Norwood Stage I palliation for single ventricle anomalies survive infancy without transplant. The 2014 report from the multi-institutional Single Ventricle Reconstruction (SVR) trial showed 64% 3-year transplant-free survival at 15 high-volume and experienced centers.<sup>1</sup> For patients with failing physiology, extracorporeal membrane oxygenation (ECMO) has been the primary method of mechanical circulatory support as a bridge to buy time until transplantation. Attempts have also been made to "unload" the ventricle with salvage bidirectional Glenn palliation, but rarely has this approach been successful enough to avoid transplantation. Overall poor outcomes<sup>2,3</sup> following these approaches has led to a generally pessimistic view of ECMO and any other measures to rescue the failing single ventricle patient with shunt-dependent circulation. In a recent review of data from the IDE trial of the Berlin Heart EXCOR device (the only circulatory support device other than ECMO currently approved for use in children), only 1 out of 9 infants with single ventricle physiology and shunt dependent pulmonary blood flow

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