Use of a pediatric ventricular assist device in a patient with a failed Norwood Procedure as a bridge to transplantation

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Introduction

The use of the Berlin Heart ventricular assist device is increasing in prevalence as a longer term device as a bridge to eventual transplantation. The use of such an assist device has been documented in several patients with a failing Fontan circulation. The use of the Berlin Heart following a failed Norwood is less well described.

Case

An infant was born at our hospital with a prenatal diagnosis of hypoplastic left heart syndrome (HLHS). She was initially intubated and placed on room air. A bedside echocardiogram confirmed the diagnosis of HLHS as well as mitral and aortic atresia. She was scheduled for surgical palliation of her defects and on day of life 6, she underwent a Norwood procedure with Sano modification as well as neoaorta reconstruction under deep hypothermic circulatory arrest. The patient was unable to separate from cardiopulmonary and was therefore placed on extra corporeal membrane oxygenation (ECMO). While on ECMO, she required multiple blood transfusions for excessive bleeding from her chest tubes. Despite systemic heparinization, clots were repeatedly noted in the ECMO circuit. In addition, despite inotropic support, the patient did not tolerate flows below 350 ml/minute. Recognizing the temporal limits of ECMO, consideration was given to placement of a Berlin Heart EXCOR ventricular assist device to provide longer term support while awaiting transplantation.

On post operative day 7, the decision was made to support the single ventricle with the Berlin Heart Excor device. The inflow cannula of the ventricular assist device (VAD) was placed in the right atrium. The outflow cannula of the VAD was placed in the right atrium. The outflow cannula of the VAD was placed in the neoaorta. The VAD was started with a rate initially of 30. This was slowly and successfully increased to a rate of 55.

Eventually, the patient underwent successful orthotopic heart transplantation.

Discussion

- The use of ECMO as a bridge to recovery in single ventricle physiology is well described. Success rates depend on the lesion, but typically range from 40-50%.
- Ventricular assist devices, though relatively newer, have been shown to improve survival and allow for longer term support versus conventional ECMO. The incidence of adverse events is similar between the two treatment modalities.
- The early institution of mechanical support for single ventricle physiology is increasingly being utilized.
- There is emerging evidence to suggest decreased use of blood products on pulsatile ventricular assist devices compared to ECMO.

References