

Helping kids with severe respiratory failure survive until lung transplantation

May 6 2013

Adults with end-stage respiratory failure and pulmonary hypertension requiring ECMO (extracorporeal membrane oxygenation) have been "bridged" toward lung transplantation with novel lung assist devices such as the Novalung. This and related devices work based on pumpless application of oxygenators. A presentation by David M. Hoganson, MD, and colleagues from Washington University School of Medicine in St. Louis at the Congenital Heart Disease Session of the 93rd AATS Annual Meeting describes the first time application of this technology to newborns and small children.

Neonates or small children with severe respiratory failure may be candidates for [lung transplantation](#) – if they survive long enough to receive the transplant. They may be placed temporarily on ECMO, but weaning from ECMO is difficult and outcomes are poor. Often children on ECMO are removed from the [transplant list](#). New options are needed to support these children until they can receive a [lung](#) transplant or recover from [medical therapy](#).

"This case series demonstrates the feasibility of a new treatment option for these [patients](#)," says Dr. Hoganson, a fellow in the Division of Cardiothoracic Surgery at Washington University School of Medicine. "Use of a paracorporeal lung assist device successfully supported four patients to recovery, lung transplantation, or past the average wait time for pediatric [donor lungs](#) (27 days)."

Dr. Hoganson describes experiences with four young patients ranging in

age from 23 days to 23 months. Two children presented with primary lung disease including alveolar capillary dysplasia; one patient with horseshoe lung with right pulmonary hypoplasia, pulmonary interstitial glycogenosis, and an atrioventricular canal defect; and the fourth with primary pulmonary hypertension. All patients had pulmonary hypertension. Patients were on ECMO for an average of eight days, and were supported by the oxygenator for five to 74 days (44 days average).

Using the new device, one patient was able to undergo a [lung transplant](#) after five days of lung device support and one was weaned to medical management after 42 days of support. Two of the patients died, after 54 and 74 days of support.

"Anticoagulation management of these oxygenators in infants is challenging because of the low flow rates and a small cardiac structure, as well as the use of a metal right angle cannula in the left atrium," says Dr. Hoganson.

An aggressive anticoagulation regimen was adopted to counter the high risk of developing a blood clot. Despite efforts to optimize the balance between bleeding and thrombosis, three of four patients experienced strokes. To minimize the risk of clotting for the fourth patient, Dr. Hoganson describes a novel cannulation technique that was developed for left atrial blood return.

Paracorporeal support may also offer other benefits that ECMO does not. Two patients were able to be extubated for a majority of their time, which allowed the children the opportunity to interact better with their families and take oral feedings. They could participate in physical therapy and required less sedatives or narcotics.

Dr. Hoganson concludes, "Paracorporeal lung assist device support of neonates and young children has been demonstrated to be feasible in this

early patient series. Continued optimization of anticoagulation and further refinement of cannulation strategies will hopefully make this therapy applicable to patients needing short to medium term lung support following respiratory decompensation."

Adds Pirooz Eghtesady, MD, PhD, senior author and chief of pediatric surgery at Washington University School of Medicine, "My colleagues and I are cautiously optimistic of this technology, based on its use in four unique patients with [respiratory failure](#) and elevated pulmonary artery pressures. More research is needed to see whether this technology can be more broadly applied to other young patients."

More information: "Paracorporeal Lung Assist Devices as a Bridge to Recovery or Lung Transplant in Neonates and Young Children," by David M. Hoganson, Avihu Z. Gazit, Umar S. Boston, Stuart C. Sweet, R. Mark Grady, Charles B. Huddleston, Pirooz Eghtesady. Presentation at the 93rd AATS Annual Meeting. May 4-8, 2013, Minneapolis MN, during the Congenital Heart Disease Session on May 6, 4:15 PM CT. aats.org/annualmeeting/

Provided by American Association for Thoracic Surgery

Citation: Helping kids with severe respiratory failure survive until lung transplantation (2013, May 6) retrieved 19 September 2024 from <https://medicalxpress.com/news/2013-05-kids-severe-respiratory-failure-survive.html>

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