limiting and should be abandoned because it provides no advantage and makes transplantation not an option.

We commend Lancaster and colleagues[1] on reporting the largest North American single-institution experience with the Potts shunt compared with lung transplant in the management of PHTN in children. With further development and evolution of the technique, the question of whether to transplant or not to transplant may not need to be mutually exclusive because the Potts shunt will likely develop into a bridge to lung transplant.

References

1. Lancaster TS, Shahanavaz S, Balzer DT, Sweet SC, Grady RM, Eghtesady P. Mid-term outcomes of the Potts shunt for pediatric pulmonary hypertension, with comparison to lung transplant. *J Thorac Cardiovasc Surg*. 2021;161:1139-48.
2. Baruteau AE, Belli E, Boudjemline Y, Laux D, Lévy M, Simonneau G, et al. Palliative Potts shunt for the treatment of children with drug-refractory pulmonary arterial hypertension: updated data from the first 24 patients. *Eur J Cardiothorac Surg*. 2015;47:e105-10.
3. D'Alonzo GE, Barst RJ, Ayres SM, Bergofsky EH, Brundage BH, Detre KM, et al. Survival in patients with primary pulmonary hypertension. Results from a national prospective registry. *Ann Intern Med*. 1991;115:343-9.
4. Hayes D, Cherikh WS, Chambers DC, Harhay MO, Khush KK, Lehman RR, et al. The International Thoracic Organ Transplant Registry of the International Society for Heart and Lung Transplantation: twenty-second pediatric lung and heart-lung transplantation report—2019; focus theme: donor and recipient size match. *J Heart Lung Transplant*. 2019;38:1015-27.
5. Goldstein BS, Sweet SC, Mao J, Huddleston CB, Grady RM. Lung transplantation in children with idiopathic pulmonary arterial hypertension: an 18-year experience. *J Heart Lung Transplant*. 2011;30:1148-52.
6. Niwa K, Perloff JK, Kaplan S, Child JS, Miner PD. Eisenmenger syndrome in adults: ventricular septal defect, truncus arteriosus, univentricular heart. *J Am Coll Cardiol*. 1999;34:223-32.

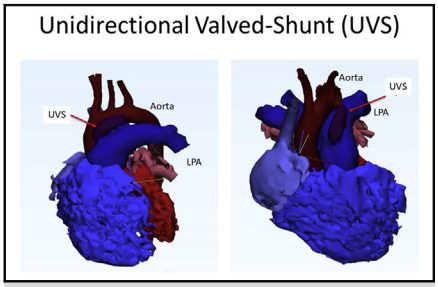
CONG

See Article page 1139.

Check for updates

Commentary: Will the reversed Potts shunt replace lung transplantation for children with end-stage pulmonary arterial hypertension?

Erika B. Rosenzweig, MD,[a] and Emile Bacha, MD[b]



Valved reversed Potts shunt placed between the main pulmonary artery and the distal aortic arch.

CENTRAL MESSAGE

The exact indications for and techniques of the reversed Potts shunt are currently being refined. This shunt is anticipated to play a major role in the management of children with advanced pulmonary hypertension.

Lancaster and colleagues[1] should be congratulated on reporting their first 23 pediatric patients with advanced pulmonary arterial hypertension (PAH) undergoing a reversed Potts shunt procedure. Although perioperative mortality and morbidity were relatively high after the reversed Potts shunt, these patients are extremely challenging to manage, and all would have likely died without the reversed Potts shunt or lung transplantation. The authors highlight some of the critical lessons learned in their early experience that led to abandonment of the Potts shunt as a rescue procedure for those sick enough to be on extracorporeal membrane oxygenation (ECMO) preoperatively. In addition to the patients on preoperative ECMO, there

From the [a]Division of Pediatric Cardiology and [b]Section of Congenital and Pediatric Cardiac Surgery, Division of Cardiothoracic Surgery, Columbia University Irving Medical Center–New York Presbyterian Hospital, New York, NY.

Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Nov 4, 2020; revisions received Nov 4, 2020; accepted for publication Nov 5, 2020; available ahead of print Nov 19, 2020.

Address for reprints: Emile Bacha, MD, Section of Congenital and Pediatric Cardiac Surgery, Division of Cardiothoracic Surgery, Columbia University Irving Medical Center–New York Presbyterian Hospital, New York, NY 10032 (E-mail: eb2709@cumc.columbia.edu).

J Thorac Cardiovasc Surg 2021;161:1150-1
0022-5223/$36.00

https://doi.org/10.1016/j.jtcvs.2020.11.024

were also 4 patients who were mechanically ventilated before the Potts shunt procedure, which raises questions about the optimal timing of this surgical intervention, which remains unknown. However, as experience in performing the reversed Potts shunt or its valved equivalent[2,3] accumulates, the hope is that perioperative outcomes can be substantially improved by taking this approach earlier in the course of disease before the patient is fully decompensated, and possibly even in lieu of lung transplantation for some patients.

The authors do not describe precisely how they reached the decision to proceed with a reversed Potts shunt versus lung transplantation, aside from those patients who were not eligible for transplantation. As the algorithm evolves for the management of end-stage PAH in children, it will be important to determine how to choose from among these medical adjuncts, including atrial septostomy, Potts shunt, and lung transplantation. The authors do compare the outcomes of Potts shunt versus lung transplantation perioperatively and at a mid-term follow-up. The median duration of follow-up was 1.8 years for the Potts shunt group versus 3.3 years in the lung transplant group, with overall comparable outcomes at 3 years even when the authors exclude patients on ECMO preoperatively. Other outcomes, including World Health Organization functional class, B-natriuretic peptide, and the need for parenteral prostanoids were improved after the Potts shunt but not described in the lung transplantation group. While prostanoids are discontinued at the time of lung transplantation, a similar analysis of measures of functional capacity following lung transplantation is important to help determine the best approach.

The authors also highlight some of the considerations for surgical technique in performing the reversed Potts shunt, ranging from the type of shunt (direct anastomosis vs valved conduit) to the incisional approach (eg, left thoracotomy vs sternotomy). Our team has used a unidirectional-valved shunt (UVS)[2] to avoid left-to-right shunting during diastole, which the authors describe in their most recent cases. As the pulmonary arterial pressure decreases to systemic levels following the shunt procedure, the UVS can prevent reversal of flow-through into the pulmonary vascular bed. Furthermore, using a sternotomy (while respecting pleural spaces) versus a left thoracotomy approach can help ensure that adhesions are not problematic if lung transplantation is eventually needed.

Overall, this article highlights a relatively new approach and likely a new era for the treatment of children with this previously universally fatal disease. The use of advanced medical therapies for PAH and further refinement of the technique for, timing of, and approach to the reversed Potts shunt will likely delay and potentially eliminate the need for lung transplantation for many of these patients in the future.

CONG

References

1. Lancaster T, Shahanavaz S, Balzer D, Sweet SC, Grady RM, Eghtesady P. Mid-term outcomes of the Potts shunt for pediatric pulmonary hypertension with comparison to lung transplant. *J Thorac Cardiovasc Surg*. 2021;161:1139-48.
2. Rosenzweig EB, Ankola A, Krishnan U, Middlesworth W, Bacha E, Bacchetta MJ. A novel unidirectional-valved shunt approach for end-stage pulmonary arterial hypertension: early experience in adolescents and adults. *J Thorac Cardiovasc Surg*. November 14, 2019 [Epub ahead of print].
3. Salna M, van Boxtel B, Rosenzweig EB, Bacchetta M. Modified Potts shunt in an adult with idiopathic pulmonary arterial hypertension. *Ann Am Thorac Soc*. 2017; 14:607-9.