See Article page 300.

Commentary: Help a sister out: Dual cannulation strategy for neonatal heart surgery in a conjoined twin

Douglas M. Overbey, MD,
Joseph W. Turek, MD, PhD, and
Nicholas D. Andersen, MD

The conduct of deep hypothermic circulatory arrest (DHCA) during neonatal heart surgery requires careful management of the circulation while on bypass, including closely regulating temperature and blood pressure. Additional challenges are encountered with conjoined twins, since they share physical proximity and some degree of shared circulation. In this issue of *JTCVS Techniques*, Geoffrion and colleagues¹ from the Children's Hospital of Philadelphia describe their perfusion strategy and operative approach to the repair of a hypoplastic aortic arch and ventricular septal defect (VSD) in 1 of 2 pyopagus conjoined twins using DHCA for the operative twin and extracorporeal membrane oxygenation (ECMO) support in the nonoperative twin.

Although many congenital cardiac anomalies in conjoined twins can be palliated until separation, the complexity and timing of the planned separation can lead to rare occasions in which definitive cardiac repair predates the separation. In this case, complete repair of the underlying congenital cardiac defects was considered necessary to provide these children the best opportunity to embark on surgical separation at a later age. Therefore, the pediatric heart team was charged with devising a plan for neonatal arch/VSD repair in 1 of 2 conjoined twins.

From Duke Children's Pediatric & Congenital Heart Center, Duke Children's Hospital, Durham, NC.

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 April 10, 2020; revisions received April 10, 2020; accepted for publication April 14, 2020; available ahead of print May 4, 2020.

Address for reprints: Nicholas D. Andersen, MD, Division of Cardiovascular and Thoracic Surgery, Duke University Medical Center, 2301 Erwin Rd, DUMC 3474, Durham, NC 27710 (E-mail: Nicholas.Andersen@Duke.edu).

JTCVS Techniques 2020;3:303-4
2666-2507

Copyright © 2020 The Authors. Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).
<https://doi.org/10.1016/j.jtc.2020.04.019>

Uncharted territory: Pushing the boundaries of neonatal heart surgery in conjoined twins.

CENTRAL MESSAGE

The authors describe an innovative approach to neonatal open-heart surgery in conjoined twins using extracorporeal membrane oxygenation and deep hypothermic circulatory arrest.

For arch augmentation, several well described techniques exist for repair at near normal temperatures,^{2,3} but some surgeons prefer DHCA given anatomic limitations or personal/institutional experience, and the use of DHCA was selected in this case. Since physical proximity alone would lead to conductive and radiant heat transfer to the operative twin, the authors cooled the nonoperative twin to 24°C using ECMO via neck vascular access. This technique minimized direct heat transfer and shared circulatory heat transfer to the operative twin during the period of DHCA and prevented nonperfusing hypothermic arrhythmias in the nonoperative twin.

The amount of shared circulation between conjoined twins can vary widely, depending on the area conjoined and vascular anatomy.⁴ In this case, the amount of shared circulation was initially unknown, but observations within the case included delivery of paralytic to the opposite twin during induction and significant blood return during circulatory arrest originating from the ECMO circuit. Further studies could include a quantitative analysis of shared circulation via imaging or laboratory studies. Regardless, the use of ECMO to cool and support the nonoperative twin appeared to be wise and successful.

This description adds to the armamentarium of congenital heart surgeons and pushes the boundaries of neonatal heart surgery in conjoined twins into uncharted territory (Figure 1). The approach used was creative, ambitious,

FIGURE 1. Uncharted territory: pushing the boundaries of neonatal heart surgery in conjoined twins.

and will allow for optimal management of these 2 children as they embark on their next surgical journey of twin separation. A job well done and an educational report from a talented and experienced team.

References

1. Geoffrion TR, Ravishankar C, Dorfman AT, Montenegro LM, Nicolson SC, Mascio CE. Repair of arch hypoplasia and ventricular septal defect in unseparated, pyopagus conjoined twins. *J Thorac Cardiovasc Surg Tech.* 2020;3:300-2.
2. Lodge AJ, Andersen ND, Turek JW. Recent advances in congenital heart surgery: alternative perfusion strategies for infant aortic arch repair. *Curr Cardiol Rep.* 2019;21:13.
3. Turek JW, Hanfland RA, Davenport TL, Torres JE, Duffey DA, Patel SS, et al. Norwood reconstruction using continuous coronary perfusion: a safe and translatable technique. *Ann Thorac Surg.* 2013;96:219-23.
4. Mathew RP, Francis S, Basti RS, Suresh HB, Rajarathnam A, Cunha PD, et al. Conjoined twins: role of imaging and recent advances. *J Ultrason.* 2017;17:259-66.