

See Article page 308.



Commentary: Operating on fewer veins in vain

Michael Ma, MD

Kisamori and colleagues¹ delineate a novel method to temporize patients with obstructed total veins in a challenging subset of patients with right atrial isomerism and functional single ventricle. This is a vexing issue, with several single-center series reporting operative mortality on the order of 40% to 80%.^{2,3} The authors' single-center retrospective cohort comprises 29 patients over a 30-year period who were treated either with primary surgical or catheter-based (ie, obstructed draining vein stenting [DVS]) intervention with delayed surgical repair, and provides a comparison of the 2 strategies.

This intriguing alternative to high-risk primary surgery demonstrates reduced early and late mortality, a similar rate of complication (ie, pulmonary vein obstruction), and greater achievement of long-term single ventricle palliation. Nineteen patients treated by primary surgery demonstrated 55.6% survival at 90 days, compared with 100% in 11 patients treated by primary DVS. The survival trend persisted to 5 years, with 38.9% versus 54.9% survival. Patients undergoing DVS were more likely to have mixed-type pulmonary venous anatomy (45.5% vs 11.1%; $P = .03$) and intervening shunt procedures (81.8% vs 33.3%; $P = .04$). Primary surgical repair and delayed surgical repair after primary stenting both incurred a similar degree of subsequent pulmonary vein stenosis (46.2% vs 45.5%; $P = .97$), and ultimate Fontan completion rates were statistically similar (33.3% vs 45.5%; $P = .38$).

From the Division of Pediatric Cardiac Surgery, Department of Cardiothoracic Surgery, School of Medicine, Stanford University, Stanford, Calif.

Disclosures: The author 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 24, 2021; revisions received Nov 24, 2021; accepted for publication Dec 8, 2021; available ahead of print March 8, 2022.

Address for reprints: Michael Ma, MD, Division of Pediatric Cardiac Surgery, Department of Cardiothoracic Surgery, School of Medicine, Stanford University, 300 Pasteur Dr, Stanford, CA 94305 (E-mail: mma@stanford.edu).

JTCVS Open 2022;10:322-3

2666-2736

Copyright © 2022 The Author(s). 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.xjon.2021.12.008>



Michael Ma, MD

CENTRAL MESSAGE

Primary draining vein stenting may be an attractive alternative to surgery in patients with right atrial isomerism, single ventricle, and obstructed total anomalous pulmonary venous connection.

Several pearls can be extracted from this article for practical use. Preoperative evaluation was generally limited to echocardiography alone, with catheterization to both diagnose and treat a substantial number of anomalous (ie, mixed) pulmonary venous confluences, without the use of computed tomography or magnetic resonance imaging. Key technical insights from primary DVS included being cautious in situations of short landing zones, with 1 patient requiring emergency surgical therapy after stent migration, and planning for rapid embolization of indwelling draining vein stent (when in the ductus venosus) after interval surgical repair to reduce the risk of liver damage (from portal venous return bypassing the liver parenchyma through steal into the ductus and reconstituted pulmonary venous/common atrial confluence).

A few notable caveats to the strategy's purported benefit:

- Both treatment groups were small and included only patients who were selected to receive intervention.
- The 2 groups were separated by era, with primary DVS used exclusively after index use during 2009, and primary surgery used exclusively prior. The overall management of complex single ventricles has evolved between eras and cannot be adequately captured in this analysis.
- Despite imaging criteria for defining obstruction, there may have been differences between the groups, with a

greater percentage of the earlier primary surgical patients requiring intervention within 24 hours of birth (44.4% vs 18.1%; $P = .14$), although this did not achieve statistical significance. Other subtle evolutions in selection by era are not well characterized.

All considered, the authors are to be congratulated on a novel method for treatment of a very challenging cohort. Ongoing assessment and follow-up will be paramount to enable adoption in appropriately selected patients. We all look forward to operating on fewer veins in vain.

References

1. Kisamori E, Kotani Y, Raja FK, Kobayashi J, Kuroko Y, Kawabata T, et al. Strategy of delayed repair of total anomalous pulmonary venous connection in right atrial isomerism and functional single ventricle. *J Thorac Cardiovasc Surg Open*. 2022;10:308-19.
2. Khan MS, Bryant R, Kim SH, Hill KD, Jacobs JP, Jacobs ML, et al. Contemporary outcomes of surgical repair of total anomalous pulmonary venous connection in patients with heterotaxy syndrome. *Ann Thorac Surg*. 2015;99:2134-40.
3. Hoashi T, Kagisaki K, Oda T, Kitano M, Kurosaki K, Shraishi I, et al. Long-term results of treatments for functional single ventricle associated with extracardiac type total anomalous pulmonary venous connection. *Eur J Cardiothorac Surg*. 2013;43:965-70.