18. Jacobs JP, Pasquali SK, Morales DL, Jacobs ML, Mavroudis C, Chai PJ, et al. Heterotaxy: lessons learned about patterns of practice and outcomes from the congenital heart surgery database of the society of thoracic surgeons. *World J Pediatr Congenit Heart Surg*. 2011;2:278-86.
19. Caldarone CA, Najm HK, Kadletz M, Smallhorn JF, Freedom RM, Williams WG, et al. Surgical management of total anomalous pulmonary venous drainage: impact of coexisting cardiac anomalies. *Ann Thorac Surg*. 1998;66:1521-6.
20. Hancock Friesen CL, Zurakowski D, Thiagarajan RR, Forbess JM, del Nido PJ, Mayer JE, et al. Total anomalous pulmonary venous connection: an analysis of current management strategies in a single institution. *Ann Thorac Surg*. 2005;79:596-606.
21. Lodge AJ, Rychik J, Nicolson SC, Ittenbach RF, Spray TL, Gaynor JW. Improving outcomes in functional single ventricle and total anomalous pulmonary venous connection. *Ann Thorac Surg*. 2004;78:1688-95.
22. Daenen W, Eyskens B, Meyns B, Gewillig M. Neonatal pulmonary artery banding does not compromise the short-term function of a Damus-Kaye-Stansel connection. *Eur J Cardiothorac Surg*. 2000;17:655-7.
23. Odum JN, Laks H, Drinkwater DC Jr, George BL, Yun J, Salem M, et al. Staged surgical approach to neonates with aortic obstruction and single ventricle physiology. *Ann Thorac Surg*. 1999;68:962-8.
24. Clark AJB, Kasahara S, Andrews DR, Cooper SG, Nicholson IA, Chard RB, et al. Mid-term results for double inlet left ventricle and similar morphologies: timing of Damus Kaye Stansel. *Ann Thorac Surg*. 2004;78:650-7.
25. Alsoufi B, Al-Wadai A, Khan M, Al-Ahmadi M, Kallooghian A, Bulbul Z, et al. Outcomes of Damus-Kaye-Stansel anastomosis at time of cavopulmonary connection in single ventricle patients at risk of developing systemic ventricular outflow tract obstruction. *Eur J Cardiothorac Surg*. 2014;45:77-82.

EDITORIAL COMMENTARY

Strike up the band!

Harold M. Burkhart, MD

See related article on pages 213-20.

Over the past 2 decades, there has been a trend to avoid main pulmonary artery banding and advocate for early definitive surgical repair or alternate palliative strategies. This controversy is nowhere more apparent than when discussing the management of patients with a single ventricle with unrestricted pulmonary blood flow, particularly those with the potential for developing systemic ventricular outflow tract obstruction. These patients typically present with a double inlet left ventricle with discordant ventriculoarterial connection, tricuspid atresia with discordant ventriculoarterial connection, and double outlet right ventricle with mitral atresia. The patients are at risk of developing outflow tract obstruction at the level of the bulboventricular foramen, which is the pathway into the rudimentary subaortic outlet chamber. Ventricular hypertrophy secondary to a pulmonary band may lead to subaortic obstruction resulting from an increasingly restrictive bulboventricular foramen, enlarging subaortic conus, or both. In addition, concerns exist regarding ventricular diastolic dysfunction due to hypertrophy. Other

issues with pulmonary artery band placement in patients with a single ventricle include distortion of the branch pulmonary arteries or pulmonary valve as well as the adequacy of the band to provide appropriate pulmonary blood flow.

Alsoufi and colleagues¹ present a timely, comprehensive 10-year review of their experience with pulmonary artery banding in 73 patients who presented with a single ventricle and unrestricted pulmonary blood flow. The patient group was a complex group, including heterotaxy and mitral atresia as well as double inlet left ventricle and tricuspid atresia; 40% required aortic arch/coarctation repair. Early mortality was excellent at 4.1%. Reoperation before staged Glenn operation was required in 22% of patients. Only 4 of these reoperations were for the development of systemic ventricular outflow tract obstruction, and none were in patients with double inlet left ventricle. Despite this, the majority of patients (89%) progressed to Glenn operation.

The authors¹ make a strong case—one that I wholeheartedly agree with—for the use of pulmonary artery banding in patients with a single ventricle with unobstructed pulmonary blood flow. There are, of course, going to be times when a more definitive procedure will be required as in the case of a restrictive bulboventricular foramen or a significantly hypoplastic aortic valve, outflow tract, or ascending aorta. However, if given the option of a pulmonary artery band there are obvious advantages, including the avoidance of cardiopulmonary bypass and the ability to perform the operation with minimal insult. Care has to be taken to ensure the band is placed above the pulmonary valve and below the branch pulmonary arteries to avoid distortion. Band stay sutures placed strategically are necessary to avoid band migration. After

From the Division of Cardiovascular and Thoracic Surgery, Children's Hospital of Oklahoma, University of Oklahoma Health Sciences Center, Oklahoma City, Okla. Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Oct 5, 2014; accepted for publication Oct 6, 2014; available ahead of print Nov 4, 2014.

Address for reprints: Harold M. Burkhart, MD, Division of Cardiovascular and Thoracic Surgery, Children's Hospital of Oklahoma, University of Oklahoma Health Sciences Center, PO Box 26901, WP-2230, Oklahoma City, OK 73105 (E-mail: Harold-burkhart@ouhsc.edu).

J Thorac Cardiovasc Surg 2015;149:220-1
0022-5223/\$36.00

Copyright © 2015 by The American Association for Thoracic Surgery
<http://dx.doi.org/10.1016/j.jtcvs.2014.10.019>

banding, close follow-up and repeated imaging are necessary to avoid the complications associated with the development of systemic ventricular outflow tract obstruction. Progressing to the next stage when physiologically possible will avoid/reduce some of the issues associated with band placement, including pulmonary tree distortion and ventricular hypertrophy. This strategy, in selected

patients, should provide a successful surgical pathway for these complex patients.

Reference

1. Alsoufi B, Manlhiot C, Ehrlich A, Oster M, Kogon B, Mahle WT, et al. Results of palliation with an initial pulmonary artery band in patients with single ventricle associated with unrestricted pulmonary blood flow. *J Thorac Cardiovasc Surg*. 2015;149:213-20.