physiology, being mostly used to treat patients for whom the risk of the stage 1 Norwood procedure is believed to be high or prohibitive. Initial enthusiasm for this strategy has somewhat tapered off, because potential advantages are yet to be determined and overall outcomes remain similar to those of the stage 1 Norwood procedure.² Compared with patients undergoing the stage 1 Norwood procedure, those who undergo a hybrid procedure usually have higher prevalences of prematurity, low birth weight, chromosomal abnormalities, and unstable preoperative hemodynamics.³ Davies and colleagues¹ have succeeded in demonstrating that patient's risk factors are not always mitigated by the hybrid procedure, and in about 28% of the cases an early stage 1 Norwood procedure may be required. In their experience, 8 patients underwent an unplanned stage 1 Norwood procedure after a complete hybrid palliation: indications were progressive hypoxia, resolution of contraindication to cardiopulmonary bypass, increased flow acceleration through the ductal stent or recoarctation, and excessive pulmonary blood flow. Overall mortality was 50%. These data highlight the existence of a "gray zone" of patients: those for whom we have to face an early failure of the procedure because of either technical factors or intrinsic patient characteristics.

From September 2011 to date, we adopted a 100% hybrid procedure use policy at our institution. Twenty-nine consecutive patients underwent neonatal hybrid palliation, and 7 (24%) of these had conversion to a stage 1 Norwood procedure, with 2 deaths. Indications for proceeding to a stage 1 Norwood procedure rather than waiting for a comprehensive stage 2 procedure were as follows: restrictive atrial communication not amenable to stenting (n = 3), poor hemodynamics with marginal somatic growth (n = 2), reverse coarctation (n = 1), and ductal stent displacement (n = 1). Analysis of the implications of this innovative approach at our institution is still ongoing. As pointed out by Caldarone,⁴ we have no evidence yet that the routine interposition of stage 1 Norwood procedure between the hybrid palliation and the comprehensive stage 2 is associated with a decrease in overall lifetime morbidity and mortality. On the other hand, hybrid procedures are usually not considered "preparatory" to a stage 1 Norwood procedure, with the goal instead being to bridge the patient successfully to a comprehensive stage 2 procedure with a more physiologic source of pulmonary blood flow (superior cavopulmonary connection). To the best of our knowledge, the majority of early stage 1 Norwood conversions are performed as rescue procedures and are thus undertaken when the hybrid palliation is overtly failing; this carries the risk of high procedural mortality. Lloyd and associates⁵ recently drew the attention to the need for an early stage 1 Norwood procedure after hybrid palliation. Because of the complexity of the comprehensive stage 2 procedure, and to reduce the significant morbidity associated with branch

pulmonary artery stenosis, they are switching their management strategy to an intermediate stage 1 Norwood procedure beyond the neonatal period. There is growing evidence that there is a subgroup of neonates, considered to lie within a gray zone where decisions as to surgery versus hybrid palliation are not black and white. For them we advocate the preemptive use of a 4-stage approach.

Matteo Trezzi, MD
Enrico Cetrano, MD
Adriano Carotti, MD
Children Hospital
Bambino Gesù I.R.C.C.S.
Rome, Italy

References

1. Davies RR, Radtke W, Bhat MA, Baffa JM, Woodford E, Pizarro C. Hybrid palliation for critical systemic outflow obstruction: neither rapid stage 1 Norwood nor comprehensive stage 2 mitigate consequences of early risk factors. *J Thorac Cardiovasc Surg.* 2015;149:182-93.
2. Baba K, Kotani Y, Chetan D, Chaturvedi RR, Lee KJ, Benson LN, et al. Hybrid versus Norwood strategies for single-ventricle palliation. *Circulation.* 2012; 126(11 Suppl 1):S123-31.
3. Karamlou T, Overman D, Hill KD, Wallace A, Pasquali SK, Jacobs JP, et al. Stage 1 hybrid palliation for hypoplastic left heart syndrome—assessment of contemporary patterns of use: an analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database. *J Thorac Cardiovasc Surg.* 2015;149:195-201. 202.e1.
4. Caldarone CA. W(h)ither the hybrid? Up the "Slope of Enlightenment" *J Thorac Cardiovasc Surg.* 2015;149:7-8.
5. Lloyd DF, Cutler L, Tibby SM, Vimalasvaran S, Qureshi SA, Rosenthal E, et al. Analysis of preoperative condition and interstage mortality in Norwood and hybrid procedures for hypoplastic left heart syndrome using the Aristotle scoring system. *Heart.* 2014;100:775-80.

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A RANGE OF OPTIONS FOR STAGED PALLIATION OF HYPOPLASTIC LEFT HEART SYNDROME

Reply to the Editor:

We read with interest the letter by Trezzi and colleagues that described their experience with staged palliation for hypoplastic left heart syndrome. Their approach is to use a hybrid palliation strategy with conversion to stage 1 Norwood when the hybrid approach fails. Current reports in the literature, including our own experience, suggest that there is no strategy clearly better in all patients.¹ To date, it has been difficult to identify a single management strategy that could provide optimal outcomes for all patients, particularly considering the vast range and combination of non-modifiable patient factors. Considering the existing data, it is likely that the best strategy may depend on a combination of factors, including surgeon and center experience as well as patient characteristics.^{2,3}

It is critically important to recognize the diversity of strategies included within a hybrid approach. The use of ductal

stenting, the timing and indications for an early stage 1 or comprehensive stage 2, the use of a reverse Blalock-Taussig shunt, and definitions of hybrid failure with the need for conversion to a traditional palliation pathway all differ across centers. Trezzi and colleagues suggest that the primary indication for a stage 1 Norwood following a hybrid procedure is failure of hybrid palliation. Before this transition to a traditional palliation pathway is labeled a failure, it seems necessary to understand the intent of the hybrid approach in these patients. In our report, although some patients underwent conversion to stage 1 Norwood as a result of residual lesions (ie, progressive gradient across the stent or retrograde flow across the distal arch), many underwent a planned Norwood procedure once the contraindication for surgery had resolved (ie, intracranial bleed, necrotizing enterocolitis, or renal dysfunction). We submit that in this scenario the hybrid was not a failure but rather a success, considering that the objective was achieved.

We¹ and others⁴ have reported the use of branch pulmonary artery banding as a stabilizing maneuver in patients presenting in extremis. In these cases, we often plan to proceed to a traditional stage 1 Norwood as soon as the patient's hemodynamic parameters are stabilized. Because of the reduction in the duration of branch pulmonary artery banding, we believe this limits the risk of branch stenosis.⁵ Furthermore, because patients are maintained on prostaglandins rather than having a ductal stent implanted, the arch reconstruction is no more challenging than in a primary stage 1. However, based on individual patient characteristics and our center's experience and strengths, we select the most appropriate palliation strategy for each patient. We continue to advocate tailoring the palliation strategy to the patient, rather than employing a 1-size-fits-all approach. Whether subsequent analyses will identify subgroups of patients who will benefit from particular strategies across centers remains unclear. Until then, it remains important to critically evaluate both patient selection and palliation strategy as we search to enhance the survival of these challenging patients.

Ryan R. Davies, MD
Christian Pizarro, MD
Nemours Cardiac Center
A. I. duPont Hospital for Children
Wilmington, Del
Department of Surgery
Thomas Jefferson University
Philadelphia, Pa

References

1. Davies RR, Radtke W, Bhat MA, Baffa JM, Woodford E, Pizarro C. Hybrid palliation for critical systemic outflow obstruction: neither rapid stage 1 Norwood nor

comprehensive stage 2 mitigate consequences of early risk factors. *J Thorac Cardiovasc Surg.* 2015;149:182-93.

2. Karamlou T, Overman D, Hill KD, Wallace A, Pasquali SK, Jacobs JP, et al. Stage 1 hybrid palliation for hypoplastic left heart syndrome—assessment of contemporary patterns of use: an analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database. *J Thorac Cardiovasc Surg.* 2015;149:195-201.
3. Davies RR. Stage 1 hybrid palliation for hypoplastic left heart syndrome—assessment of contemporary patterns of use: an analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database. *J Thorac Cardiovasc Surg.* 2015;149:203-4.
4. Guleserian KJ, Barker GM, Sharma MS, Macaluso J, Huang R, Nugent AW, et al. Bilateral pulmonary artery banding for resuscitation in high-risk, single-ventricle neonates and infants: a single-center experience. *J Thorac Cardiovasc Surg.* 2013;145:206-13; Discussion 213-4.
5. Davies RR, Radtke WA, Klenk D, Pizarro C. Bilateral pulmonary arterial banding results in an increased need for subsequent pulmonary artery interventions. *J Thorac Cardiovasc Surg.* 2014;147:706-12.

<http://dx.doi.org/10.1016/j.jtcvs.2015.05.016>

DO LUNG SECONDARY NODULES ALWAYS MEAN METASTASIS?

To the Editor:

We read with interest the recent article by Stiles and colleagues¹ about the prognostic impact of secondary nodules (SNs) in patients submitted to lung resection for non-small cell lung cancer. The finding of SNs at preoperative computed tomographic (CT) scan for early-stage lung cancer is a frequent occurrence. Unfortunately, their pathologic diagnosis is often difficult or impossible. The decision whether to suspend surgery, considering the nodes to be either benign or second primary malignancy rather than metastatic, is based exclusively on surgeon personal experience. As underlined by Ng,² Stiles and colleagues¹ suggested not suspending surgery, despite the impossibility to exclude a metastatic nature of SNs. In fact, according to their data, the rate of SNs detected on initial CT scans for dominant lung tumors referred for surgery was high (>50%), but the rate of malignancy in these nodules was low (13% of total SNs resected). Moreover, Stiles and colleagues¹ reported that survival was not influenced by SNs and that, surprisingly, morphologic characteristics according to CT (solid or nonsolid nodules) were not predictors of malignancy at multivariate statistical analysis.

Our concerns with their results are 2-fold.

First, this is a retrospective study. The low rate of malignancy in resected SNs may therefore have been influenced by some elements of surgical judgment in recruiting patients. In other words, patients were referred for surgery despite SNs because those SNs were already considered benign, probably on the basis of further information (patient age, clinical history, smoke attitude, nodal status, absence of nodule growth, etc).

The second concern is about tumor histologic type. In fact, 105 SNs (77%) were solid, and only 21 (15%)