Shunt right or left? Decision 2016

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The reintroduction of the right ventricle–pulmonary artery (RV-PA) conduit into the neonatal palliation of hypoplastic left heart syndrome¹ has been reported to improve early survival²; however, its effect on right ventricular function and pulmonary artery growth are still debated.^{3,4} The procedure is spatially and geometrically complex, and a number of different techniques have been proffered to optimize pulmonary blood flow and reduce right ventricular injury. Placements of the RV-PA conduit to the left and to the right of the neo-aortic reconstruction have been described, along with the benefits and pitfalls of each.⁵⁻⁷

In this issue of the *Journal*, Andersen and colleagues⁸ present a relatively large (n = 274) retrospective cohort review of the data available from the National Institutes of Health National Heart, Lung, and Blood Institute Pediatric Heart Network Single Ventricle Reconstruction (SVR) trial, investigating the influence of right- or left-sided shunt placement on survival, reintervention, and pulmonary artery development. Because of a number of differences in the conduct of the operations; most notably, shunt size and length as well as perfusion strategy, a subgroup analysis with propensity-score matching was performed. Placement of the RV-PA conduit to the right of the neo-aorta was associated with fewer shunt revisions and improved survival; however, pulmonary artery size, the number of reinterventions, and hemodynamic parameters were not affected by the shunt position.

The subject of this article is important to the surgeon, because the shunt remains the Achilles' heel of the Norwood procedure. Andersen and colleagues⁸ have offered a number of inferences from the available data; however, the SVR trial was not designed to ferret out the effects of shunt “sidedness.” The randomization dealt with the dichotomy of the Blalock-Taussig shunt versus the RV-PA shunt. In the SVR public data set, center volume is not provided as a continuous variable, and the patient age and the dates and timing of reinterventions are not consistently reported, restricting the use of more precise statistical methods. The use of propensity matching by Andersen and colleagues⁸ likely limits confounders, but it significantly reduces (by >50%) the sample size and removes

Optimal shunt positioning may depend on techniques of arch and pulmonary artery repair.

Central Message

Outcomes after the Norwood procedure are likely a product of the complex interplay of the geometry of the aortic arch and pulmonary artery reconstruction as well as the “sidedness” of the Sano shunt.

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the majority of patients undergoing a Norwood procedure with circulatory arrest. No reliable data are available concerning the types of shunts or the techniques of the proximal or distal shunt anastomoses. One finding not to be ignored is that the need for a surgical shunt revision was associated with a 42% mortality. It behooves us to get this correct.

Shunt sidedness will likely prove to be one of many important interrelated factors. A number of new technical modifications to the shunt have evolved since the SVR trial.⁹⁻¹² Limiting the ventriculotomy, using partial or complete rings to support the graft, and the technique of closure of the distal pulmonary artery stump may all prove to be factors. The final stage I reconstruction must exist within the confines of the neonatal mediastinum. Space is at a premium, and pulmonary artery development is no doubt related in each case to the intricacies of the dimensions of the chest and the geometry of the arch reconstruction and pulmonary artery, in addition to the shunt type and position.¹³⁻¹⁵ Future studies will need to consider all these variables. Magnetic resonance imaging and mathematical modeling may be helpful.^{16,17}

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