It's not “just a shunt” but sometimes it should be...

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This article from the Congenital Heart Surgeons Society Data Center¹ attempts to determine the association between the surgical management of pulmonary blood flow at the initial and staged operations in patients with tricuspid atresia with survival to the Fontan procedure. As with most Congenital Heart Surgeons Society projects, the article is well written and the statistics are comprehensive. This analysis provides thought-provoking data that have practical surgical implications but also raise additional questions about the research conducted.

Although all subtypes of tricuspid atresia were analyzed in this report, the main focus is on infants with restricted antegrade pulmonary blood flow (Type 1b). Establishing an optimal balance between systemic and pulmonary blood flow during early infancy in these patients can be challenging. The most salient findings include:

1. The requirement for a systemic to pulmonary artery shunt results in increased mortality.
2. Performing a shunt operation with concomitant main pulmonary artery (MPA) intervention increases the risk of mortality, a risk that persists even beyond the cavopulmonary shunt.

Understanding the implications of a neonatal shunt in this patient population is important. Secondarily, the authors emphasize the finding that these shunt operations should be accompanied by patent ductus arteriosus ligation when spontaneous closure has not already occurred preoperatively. When a systemic to pulmonary artery shunt is required during the newborn period, the take-home messages for surgeons managing these children's condition should be to avoid native MPA intervention during the initial shunt operation and closure of a patent ductus arteriosus is associated with improved survival.

Although the 2 principal findings listed above are not disputable, understanding their basis is more difficult. Theories are discussed by the authors, yet they are unable to definitely elucidate the reasons for these findings. The unanswered questions relate to cause and effect. Is the

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Central Message

Balancing systemic and pulmonary blood flow in infants with tricuspid atresia requires thoughtful initial surgical management.

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requirement for a neonatal shunt a surrogate for disease complexity, which naturally predisposes the patient to a higher mortality, or is it the actual surgical procedure; that is, the systemic to pulmonary artery shunt, that contributes to mortality? As with many things, the true answer likely comprises both factors and needs further study. Regarding MPA intervention at the time of the systemic to pulmonary artery shunt, clearly performing a concomitant shunt operation and an MPA interruption procedure leads to worse results. The natural question is why would MPA interruption be performed simultaneously with a procedure that is being performed to augment pulmonary blood flow? If too much antegrade flow results from the combination of a shunt and antegrade flow, then either the shunt was not necessary or a smaller shunt could have been chosen. The natural extension of this article is to develop an algorithm for determining the size and perhaps design of the systemic to pulmonary artery shunt when competing blood flow exists.

It is also difficult to understand why a concomitant MPA intervention at the time of the systemic to pulmonary artery shunt is a risk factor for death after the superior cavopulmonary connection. The authors postulate that the potential benefits of maintained forward flow through the MPA after stage 2 include improved oxygenation, continued pulmonary artery growth, protection of normal pulmonary vasculature with decreased reduced pulmonary vascular

resistance, and prevention of pulmonary arteriovenous malformations, but this study cannot definitely establish these assertions. Again the finding cannot be disputed and it behooves us as surgeons to at least consider the potential positive attributes of maintaining some antegrade flow at the time of the cavopulmonary anastomosis.

Given the limitations of this multiinstitutional retrospective database analysis, including—as conceded by the authors—a lack of comprehensive data regarding surgical details, clinical status, and causes for death, this article

does reinforce the overall excellent results with this population of children with a single ventricle and highlights aspects of their care that may contribute to mortality, allowing us to potentially alter these factors and improve outcomes.

Reference

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