See Article page 1466.

Commentary: Precision surgery for cyanotic neonatal patients with tetralogy

R. D. B. Jacquiss, MD

Tetralogy of Fallot is the most common complex congenital heart defect, with an enormous literature describing diagnosis, treatment, and prognosis. A search on “tetralogy of Fallot” in November 2019 returned 11,876 items, including the first surgical report, from 1947.¹ Surprisingly, 72 years later the optimal approach to the cyanotic neonate with tetralogy remains unsettled. The persistent uncertainty reflects a constantly evolving therapeutic armamentarium, linguistic imprecision, and lack of consensus about end points. Contemporary initial options include systemic-to-pulmonary shunt, complete repair, ductal stenting, right ventricle-to-pulmonary artery conduits, transannular patching, and balloon angioplasty, with or without stenting. End points include operative mortality, resource utilization, preservation of pulmonary valve or annulus, intervention-free survival, and late right ventricular function. Which intervention is best, and which outcome measure is best? The answers are not simple, and the literature is confusing. Against this backdrop, the publication in this issue of the *Journal* from Jeon and colleagues,² writing for Yun’s group at the Asan Medical Center, is a model of clear exposition and analysis, and it represents progress in answering both questions, with several aspects worthy of emphasis.

The most important lesson is that all neonates are not alike. Annulus preservation is likely for a z score is -1 but not at a z score of -5 . Such patient-level description is lost in administrative data sets, such as those used in a recent article describing survival disadvantage with primary repair.³ The current report of Jeon and colleagues² presents

R. D. B. Jacquiss, MD

CENTRAL MESSAGE

Individualized initial treatment for cyanotic neonates with tetralogy of Fallot results in high rates of annulus preservation.

a more tailored approach, as nicely shown in their central figure.

The choice by Jeon and colleagues² to describe the procedure as annulus preserving, rather than the oft-used descriptor *valve sparing*, is laudable. This latter term, more appropriate to describe aortic root operations, is misleading in conjuring the image of thin and mobile cusps in a tricommissural arrangement. Annulus preservation is straightforward; cut or no cut. Valve preservation is a murkier proposition that may involve commissurotomy, cusp thinning or patching, delamination, and sundry other techniques, often leaving a dysplastic structure with abnormal mobility.⁴ The term *valve preservation* would seem a bit grand in this context.

Another strength of the present work is the success metric, termed *optimal early outcome*. This was defined as the absence in the first year of death, significant right ventricular outflow tract obstruction, significant pulmonary valve insufficiency, or catheter or surgical reintervention. This definition of success is refreshingly stringent, removing the potential to claim success in one arena (elimination of obstruction) while ignoring failure in another (prevention of valvar insufficiency). Reintervention is a softer end point, although equally applied across treatment groups, and inclusion of not operative mortality but all mortality is also to be applauded.

Two weaknesses of the study are worth noting. The first is the clichéd observation that the study is retrospective, with treatment decided by surgical judgment. A prospective, protocolized approach based on annulus z score would have perhaps avoided “inappropriate” treatment assignments. Another limitation is lack of ductal stenting as

From the Division of Pediatric Cardiothoracic Surgery, Department of Thoracic and Cardiovascular Surgery, UT Southwestern Medical Center/Children’s Medical Center, Dallas, Tex.

Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Nov 19, 2019; accepted for publication Nov 19, 2019; available ahead of print Jan 8, 2020.

Address for reprints: R. D. B. Jacquiss, MD, 1935 Medical District Dr, Dallas, TX 75235 (E-mail: Robert.jaquiss@utsouthwestern.edu).

J Thorac Cardiovasc Surg 2020;159:1477-8

0022-5223/\$36.00

Copyright © 2019 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2019.11.092>

palliation. This option was not available during the study, but it may have an advantage relative to a surgical shunt.^{5,6}

Although this is certainly not the final word, Jeon and colleagues² have offered an approach that matches treatment to anatomy and results in a high likelihood of annulus preservation in even the youngest patients with tetralogy of Fallot.

References

1. Taussig HB, Blalock A. The tetralogy of Fallot; diagnosis and indications for operation; the surgical treatment of the tetralogy of Fallot. *Surgery*. 1947;21:145.
2. Jeon B, Kim D-H, Kwon BS, Choi ES, Park CS, Yun T-J. Surgical treatment of tetralogy of Fallot in symptomatic neonates and young infants. *J Thorac Cardiovasc Surg*. 2020;159:1466-76.e2.
3. Savla JJ, Faerber JA, Huang YV, Zaoutis T, Goldmuntz E, Kawut SM, et al. 2-year outcomes after complete or staged procedure for tetralogy of Fallot in neonates. *Am Coll Cardiol*. 2019;74:1570-9.
4. Vida VL, Guariento A, Zucchetta F, Padalino M, Castaldi B, Milanese O, et al. Preservation of the pulmonary valve during early repair of tetralogy of Fallot: surgical techniques. *Semin Thorac Cardiovasc Surg Pediatr Card Surg Annu*. 2016;19:75-81.
5. Glatz AC, Petit CJ, Goldstein BH, Kelleman MS, McCracken CE, McDonnell A, et al. Comparison between patent ductus arteriosus stent and modified Blalock-Taussig shunt as palliation for infants with ductal-dependent pulmonary blood flow: insights from the Congenital Catheterization Research Collaborative. *Circulation*. 2018;137:589-601.
6. Bentham JR, Zava NK, Harrison WJ, Shauq A, Kalantre A, Derrick G, et al. Duct stenting versus modified Blalock-Taussig shunt in neonates with duct-dependent pulmonary blood flow: associations with clinical outcomes in a multicenter national study. *Circulation*. 2018;137:581-8.

See Article page 1466.

Commentary: Tetralogy of Fallot: Will time tell?

Ralph S. Mosca, MD

The treatment of tetralogy of Fallot (TOF) is one of the great success stories of congenital cardiology and cardiac surgery. The accompanying crippling cyanosis was the impetus for the development of aortopulmonary shunts¹ and one of the driving forces behind early intracardiac repairs.^{2,3} The major tenets of the procedure were defined nearly 40 years ago,^{4,5} yet despite all the accrued knowledge and experience, today the optimal timing and strategy of repair remain controversial. Opinions are particularly divergent when discussing the roles of primary repair versus palliation in the symptomatic neonate.⁶⁻⁸

As the negative effects of long-standing pulmonary valve insufficiency became clear, focus has been shifted toward preserving pulmonary valve function. How best to accomplish this goal remains controversial. The current manuscript by Jeon and colleagues⁹ aims to answer these

CENTRAL MESSAGE

After nearly 75 years, we lack consensus on the care of symptomatic neonates with tetralogy of Fallot. Treatment strategies yield similar early results. Long-term, well-designed studies are needed.

questions. The study goal was to identify the optimal surgical strategy for individual patients to achieve preservation of the pulmonary valve annulus (PVA). The authors' retrospective, observational analysis suffers from the familiar shortcomings: selection bias, lack of a control group, etc. However, it does represent a well-matched group from the standpoint of patient characteristics cared for at a single center providing similar perioperative care. Given the small numbers of patients involved, patients with major associated abnormalities and palliative strategies other than Blalock-Taussig shunts should likely have been excluded from the analysis. The composite metric, "optimal early outcome," encompasses what most would agree are the accepted goals following treatment.

From the Department of Cardiothoracic Surgery, NYU Langone Medical Center, New York, NY.

Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Nov 20, 2019; revisions received Nov 20, 2019; accepted for publication Nov 20, 2019; available ahead of print Jan 14, 2020.

Address for reprints: Ralph S. Mosca, MD, Department of Cardiothoracic Surgery, NYU Langone Medical Center, 530 First Ave, Suite 9V, New York, NY 10016 (E-mail: ralph.mosca@nyumc.org).

J Thorac Cardiovasc Surg 2020;159:1478-9

0022-5223/\$36.00

Copyright © 2019 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2019.11.012>