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Commentary: Tetralogy of Fallot— in pursuit of perfection

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The management of tetralogy of Fallot has evolved significantly since the first repairs were performed in the mid-20th century. The focus has shifted from mere survival to optimizing long-term performance of the right ventricle and avoiding reinterventions. In this regard, several methods have been developed to achieve pulmonary valve competency and limit the size of the right ventricular incision.¹⁻³ In their article in this issue of the *Journal*, Patukale and colleagues⁴ describe their results with a technique of pulmonary valve reconstruction that involves implantation of an anterior pulmonary leaflet following transannular incision. The technique was reasonably successful at preventing early pulmonary regurgitation (approximately 10% had moderate or greater pulmonary regurgitation at hospital discharge).

A recurring concern with valve-sparing repair and valve-preservation techniques is the risk of developing early pulmonary stenosis. In this series, 7% of patients required reintervention on the reconstructed pulmonary valve due to development of stenosis. In our single institutional analysis, the rate of early pulmonary valve stenosis was similar.⁵ Although comparative analysis was not performed with patients undergoing traditional transannular patch repair, early stenosis is extremely rare after transannular patch reconstruction, and this represents one of the downsides of valve-sparing reconstruction techniques.² Close follow-up is necessary to ensure that stenosis does not lead to long-standing right ventricular hypertension.

Another sobering finding was the long-term freedom from pulmonary regurgitation. In this series, 30% freedom from moderate or greater pulmonary regurgitation was observed at 10-year follow-up, consistent with our single institutional results.⁵ This begs the question—what exactly

Valve reconstruction with PTFE during tetralogy repair.

CENTRAL MESSAGE

Valve-preservation techniques show early promise, but long-term valve incompetence remains a concern.

is the goal of the valve reconstruction in tetralogy repair? Does delaying the onset of significant pulmonary regurgitation improve the long-term prognosis and performance of the right ventricle? Since magnetic resonance imaging was not routinely performed in follow-up, it is hard to estimate the risk of long-term right ventricular dilation and dysfunction. It is likely that many of these patients will go on to require pulmonary valve replacement, similar to the experience with traditional transannular patch repair. Whether you have used this technique or any of the other valve-sparing repairs, don't be lulled into complacency; the risk of right ventricular dilation, dysfunction, and arrhythmias may not have been eliminated by reconstruction.

The materials science of valve reconstruction has intrigued surgeons for many years. This study found that use of polytetrafluoroethylene for pulmonary valve reconstruction demonstrated a superior outcome compared with autologous pericardium or bovine pericardium. This is consistent with the findings of others and may be attributed to the relatively inert properties of polytetrafluoroethylene and its resistance to intrafiber hemorrhage and thrombosis, which lead to calcification.³ Unfortunately, the current study does not provide echocardiographic or histologic details that might help us understand the mode of failure and inform future modifications to their technique.

We have come a long way, but it is clear that we have our job cut out for us. Numerous techniques have been developed, and we need to compare these techniques systematically to determine the optimal design and material for valve

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Disclosures: Dr Emani reported consultant for Cheisi Pharmaceuticals.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Feb 26, 2021; revisions received Feb 26, 2021; accepted for publication March 2, 2021; available ahead of print March 5, 2021.

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J Thorac Cardiovasc Surg 2021;162:1321-2

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2021.03.001>

reconstruction. We need to understand whether the theoretical benefits of valve preservation lead to the intended benefit of right ventricular performance. I, for one, still hold on to the belief that preserving valve competence helps; I just need to reassure myself with supporting data.

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Commentary: Is it beneficial to add a monocusp during non–valve-sparing tetralogy of Fallot repair? Is there a way to settle this debate 3 decades later?

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CENTRAL MESSAGE

Pulmonary valve augmentation for repair of TOF reduces pulmonary insufficiency, at the expense of a small incidence of RVOT obstruction. Is it time to assess if the benefit justifies the risk?

In this issue of the *Journal*, Patukale and colleagues¹ present the experience of 2 centers with the pulmonary valve leaflet augmentation technique during non–valve-sparing tetralogy of Fallot (TOF) repair. This technique was first described by Sung and colleagues from Dong-A University Hospital in Pusan, South Korea.^{1,2} The patch used to augment the native pulmonary valve is sutured to the remnants of the divided anterior native pulmonary valve leaflet and then to the endocardium of the ventriculotomy rather than the epicardial surface, thus creating a long pulmonary neosinus. Any attachments of the leaflets and commissures

to the pulmonary artery wall are divided and the leaflets are mobilized. There are theoretical advantages of this modification compared with the standard monocusp. The patch used in the leaflet augmentation technique uses the native valve hinge mechanism. This may lead to better coaptation with the native pulmonary valve tissue and thus to less regurgitation. By attaching the patch to the leaflets, this technique may preserve a growth potential. Finally, by separating the patch used for the augmentation of the leaflet from the epicardial transannular patch (TAP), this technique creates a pulmonary root neosinus, mitigating a common mechanism of failure, the adherence of the monocusp to the TAP material.²

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Disclosures: The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Jan 30, 2021; revisions received Jan 30, 2021; accepted for publication Feb 1, 2021; available ahead of print Feb 5, 2021.

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J Thorac Cardiovasc Surg 2021;162:1322-3

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2021.02.004>