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Commentary: Laudable but incremental improvements ahead of a sea change

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Many of our more complex operations involve a right ventricle-to-pulmonary artery (RV-PA) connection. This fundamental component of our repertoire is associated with highly variable and frankly disappointing outcomes. We have normalized the expectation of poor outcomes as we work the limitations of current solutions. In the context of a neonatal intervention, replacement of an RV-PA connection and its future impact on child and family is understandably minimized, but we know that adolescents and adults stress about the tube that is “failing” inside them. Whilst we offer “safe” replacement, the pathway remains problematic.

It is valuable to understand baseline outcomes of current practice. In this report,¹ a noncontemporaneous comparison of RV-PA connections was made, contrasting pulmonary and aortic homografts with femoral venous conduits. As usual in our field, there is profound case heterogeneity that can't easily be controlled for; the quality of pulmonary arteries, distal pulmonary artery pressures, heterotopic versus orthotopic lie of the conduit and surgeon-specific technical factors. “Time to replacement” is an objective and easily measurable end point, but it says nothing about the preceding and concurrent processes of valve dysfunction and size mismatch between conduit and patient. Institutional guidelines determining indications for conduit replacement are provided, but there are no patient-specific or objective measurements determining time to replacement beyond simple echocardiographic assessment. We don't



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CENTRAL MESSAGE

Femoral venous conduits offer some advantages in the right ventricle-to-pulmonary artery position with few downsides. New technologies are needed to improve on current allo- and xenogenic offerings.

know what proportion of time patients experience freedom from both stenosis and regurgitation.

The headline is that the femoral venous conduit is noninferior to homografts. In this regard, it is a useful follow-up to earlier reports demonstrating their application.² The reduced cost and greater availability of the femoral venous conduit are additional benefits. The freedom from endocarditis stands in contrast to reports of the other available non-homograft choice, the bovine jugular vein conduit.³ Femoral vein conduits may well have an incremental benefit over homograft tissues. Their ovoid shape and low profile might better suit construction of heterotopic pathways between the right ventricle, sternum anteriorly, and posteriorly positioned pulmonary arteries.

To address the bigger issue, it is now time to gather prospective data on patients with RV-PA conduits to objectively compare early, midterm, and late patterns of “failure.” This should include assessments of stenosis, regurgitation, right ventricular work, and energy loss across the conduit. Whilst we hope and expect that surgically revised conduits are free of obstruction, early competence of homograft valves in particular can be disappointing. Catheter-based technology (valve supported by stent) may well be superior to standard surgical approaches.

New classes of biomaterial used for both conduit and valve are in development and in some cases in clinical trials. These include early human experience in congenital patients (Xeltis

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technology,^{4,5}) as well as in adult acquired valvular disease (Foldax valve, [ClinicalTrials.gov Identifier: NCT03851068](https://clinicaltrials.gov/ct2/show/study/NCT03851068)⁶). These hold the promise of non-immunogenic material with avoidance of both allo- and xeno-antigens. Customization of valve design and personalization⁷ of implanted conduit remain opportunities to address deficiencies in the clinical pathway for those with an RV conduit. It is time for greater expectations.

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