demonstrated that in most patients a Z-score of +3 was not achieved, likely because of the perceived space constraints within the chest or a prohibitive mismatch between an oversized conduit and the size of the pulmonary artery confluence or right ventricular opening, leading the surgeon to select a smaller conduit option. It is also possible that the largest conduits were placed in patients with generously sized branch pulmonary arteries, which further led to the superiority of the results.

In the adolescent/young adult patient group (>20 kg) in whom future somatic growth is perhaps less important, conclusions regarding conduit size become even more nebulous. No patients received conduits with a Z-score of more than +2, and therefore conclusions regarding the performance of conduits with a Z-score of +3 or greater seem even more theoretical and detached from clinical practice.

In summary, the article by Willetts and colleagues¹ provides an exceptional glimpse into the past of practice patterns and durability of RVPA conduits in children and

young adults over a 30-year period. However, in real-world practice there are often few options available to the surgeon for a given patient. Future advances in RVPA conduit technology will hopefully improve conduit performance and lead to additional alternatives.^{3,4}

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Commentary: The conduit's gambit

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Historically, the preference of conduit type to establish right ventricle-to-pulmonary artery continuity has been largely a discussion of religion. Homograft artery with valve, porcine, or bovine jugular vein composite tubes, polytetrafluoroethylene with or without leaflets, and stem cell-seeded scaffolds all have been proposed as superior vehicles, where success is measured in years of durability and valve competence. Although the platonic flame burns brightly for a “living” connection that might

What is the Fischer clock of conduits?

CENTRAL MESSAGE

While “judicious oversizing” of conduits hopes to maximize durability, should we focus on strategies of care that incorporate the chance of accelerated deterioration or future transcatheter solutions?

enlarge to accommodate somatic growth while maintaining valve function, the reality is that currently most often the strongest influence for conduit selection is local availability.

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The first conduit implant for pediatric patients “starts the clock ticking” toward inexorable replacement, and so in this sense the somewhat-mundane decision of initial conduit size and type can govern a lifetime of procedures. Willetts and colleagues¹ in this issue of the *Journal* review their 30-year experience with a variety of right ventricle-to-pulmonary artery conduits with the hope of identifying maxims for durability. An impressively balanced cohort (despite historical changes in use) with a robust analysis, the study generally supports current practice—namely, the paucity of candidate choices for small babies, a lack of superiority among homografts (pulmonary vs aortic), and limitations specifically for bovine jugular vein and porcine valved conduits.

Interestingly, there did not appear to be a large impact from the use of a bovine pericardial hood (albeit the size of the hood extension was not quantified), nor the proximal origin (orthotopic vs heterotopic), and the “hard” end point of time-to-replacement was likely obscured by changing practice patterns as they relate to thresholds for reintervention in the absence of strict clinical pathways. Sadly, although the reader might have hoped for more nuanced recommendations as to an exacting “sweet spot” of z-score oversizing that would presage superior outcomes, the conclusion (judicious oversizing for those 5-20 kg in weight) is somewhat intuitive, even if slightly different from previous reports suggesting detriment to substantial oversizing.² The more fundamental yet elusive question is what is the mechanistic pathway that underlies accelerated conduit

calcification, stenosis, and dysfunction in some individuals and not others?

A slightly different (and potentially more contemporary) series of chess moves would posit that additional considerations be made for the possibility of (1) later catheter-based interventions that could prolong the time to conduit replacement—or eliminate it altogether—given the next generation of transcatheter valve replacement options and/or (2) the use of novel balloon-expandable polytetrafluoroethylene tube grafts. In this sense, perhaps the more important question is not which of the 4 conduit types is “the best” but rather which strategy of combinations of surgical and transcatheter approaches in an individual patient yields the fewest number of operations/interventions over the patient’s lifetime. One of Bobby Fischer’s contributions to the game of chess was the introduction of “increments” that allotted more time to the game clock for each move; we should be so lucky as to discover such “Fischers” in conduit game theory.³

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