Composite polytetrafluoroethylene homograft with external stent as valved pulmonary conduit: All hat and no cattle?

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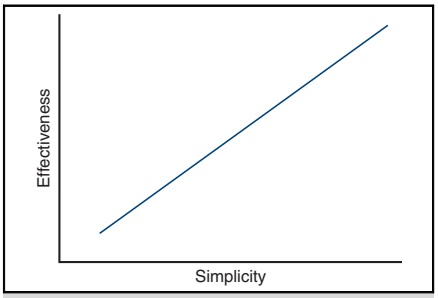

Simplicity and effectiveness generally covary.

Central Message

Venous homograft holds promise as a valve alternative for use in newborn infants. As a short-term Sano conduit, a complex composite of polytetrafluoroethylene (PTFE), venous homograft, and external stent is challenged to show efficacy over a simple PTFE conduit.

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Finding a reliable valved cardiac conduit for newborn infants and infants has been an elusive goal for decades. Homograft conduit narrowing and progressive valve incompetence are troublesome expectations, and many interventions will be avoided when better solutions emerge. Important progress has been made in tissue engineering, and recipient endothelium-lined conduit is an implantable reality,[1] but work remains before a valve scaffold that sustains competence and supports renewable cellular architecture is a practical reality. On the road to a full solution, Carreon and colleagues[2] deliver an insightful cellular-level characterization of 1 interim solution.

This work and previous work from this group explores 2 questions: What is the pathophysiology of valved venous homograft as conduit and, What is the importance of having a valved Sano (right ventricle to pulmonary artery) conduit at the Norwood stage 1 palliation? Question 2 could be restated this way: Is this construct efficacious? Further, is it cost-efficacious to build an expensive, multicomponent complex for a short-term purpose?

Homograft vein conduit has been studied as a coronary bypass graft alternative, but without attention to the venous valve structure. Carreon and colleagues[2] report appreciable information about the fate of the valve and the conduit. Homograft vein conduits exhibit the expected myointimal thickening by myofibroblast and smooth muscle cell infiltration, with donor and recipient cells populating the grafts. Notably, venous valve leaflets were relatively spared from hyperplasia, and valve function was preserved, with some competent at 1 year. An encouraging histopathologic profile of these valves invites consideration of further attention to femoral vein homograft as a valve alternative.

In the setting of the Sano conduit at Norwood stage 1 construction, it is reasonable to hypothesize that a competent valve may enhance forward flow, have a positive effect on pulmonary artery growth, and may diminish diastolic volume load that benefits systemic ventricular health.

What have we learned since the valved venous homograft conduit for the Norwood stage 1 was first reported in 2002?[3] Various studies do[4] or do not[5,6] suggest improved pulmonary artery growth, do[5] or do not[7,8] suggest a benefit to the right ventricle in interstage, and do[6] or do not[9] support reliable venous valve competence at the second stage palliation that is performed only 3 to 5 months later. Stenosis and reintervention are reported as same or worse for valved venous homograft conduit as compared with a valveless polytetrafluoroethylene conduit, across all studies, with a particular predisposition toward stenosis when saphenous vein grafts are used.[6] So far, evidence shows no survival benefit and debatable pulmonary artery or right ventricular benefit for any variant of valved conduit in this setting, including aortic, pulmonary, and vein homografts. Even across a short interstage timeline to measure effect, there is a paucity of evidence that homograft vein valve competence is durable. The question of efficacy remains open. Especially considering the short interstage period, is this complicated construct of 3 suture lines, a homograft, and a stent a case of all hat, no cattle compared with the simple, single-component polytetrafluoroethylene standard?

Further work is justified to explore the use of femoral vein homografts in the pulmonary outflow tract, but for the Norwood stage 1 Sano conduit application at present,

it seems the complexity (eg, extra suture lines and 3-component construct), and expense (eg, cost and reintervention) must be weighed against effect (eg, debatable advantage to pulmonary artery growth and right ventricular function). Effectiveness and simplicity may covary here as it does in many other realms.

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