Is This a T(r)oll-Free Bridge?

Ronald K. Woods, MD, PhD

Ye et al report use of the polytetrafluoroethylene "bridge" technique to repair an incompetent atrioventricular (AV) valve in the setting of left atrial isomerism, unbalanced AV canal defect (single ventricle), and dextrocardia.[1] No doubt this was a challenging case, and I commend the authors for an excellent early outcome.

The "bridge" technique, wellillustrated in this and prior reports, includes repair of clefts and annular support when feasible.[1–4] How and when to support the annulus requires good judgment and adherence to basic principles—provide effective support (partial or complete), avoid injury to the AV node or coronary arteries, and maintain nonstenotic valve inflow as the patient grows. Fortunately, even in younger patients, the annulus is often large enough to accommodate various methods of annular support. In a univentricular arrangement with left atrial isomerism, the location of the AV node can indeed be difficult to predict. Smith et al's 2006 report describes both variable locations as well as "disconnects" between the node(s) and the bundles, with documented conduction abnormalities during life.[5] On the other hand, with right atrial isomerism, determination of ventricular topology (right or left handed) can reduce uncertainty in determining the location of the node.

Various authors have written on the topic of AV valve incompetence in single-ventricle hearts.[6–12] Based on this collective experience, most, I think, would agree with the following: (1) it occurs commonly—approximately 30–40% by 5–7 years of age; (2) while annular dilatation is a common feature, there are often structural abnormalities of the valve; (3) it is a bad sign and associated with notably worse survival—freedom from death or transplant approximately 55% at 10 years; (4) the intended volume unloading effect of the superior cavopulmonary shunt may not result in marked improvement in valve function; and (5) it is difficult to achieve a durably competent repair—20–35% undergo reoperation in 5 years, and approximately a third of patients without reoperation demonstrate at least moderate insufficiency.

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Central Message

The "bridge" technique can restore valve competency in the setting of single ventricle and common atrioventricular valve.

The data are less clear on two very important questions: (1) when should repair occur; and (2) when should replacement occur. In thinking about this, keep in mind this is a single-ventricle circulation with all the limitations inherent to such, even when the ventricle and valve are functioning well. Deciding the "when" is not simply a matter of applying usual practice guidelines for a child with mitral insufficiency and a two-ventricle circulation. I applaud the authors' "preventive" approach, but would note that a regurgitant fraction of 31% may still be "late" if left untreated for more than a limited period of time. Unfortunately, we do not know what "limited" is when the patient is asymptomatic and the function is normal or supranormal. We do know that a mild decrease in ventricular function with a regurgitant valve can indicate a ventricle with important functional limitations. Of course the theoretical superiority of establishing competence as soon as possible must be balanced against various practical considerations. Perhaps the "bridge" technique will facilitate better repairs in younger patients, but whether there is a toll above this bridge, or a troll under this bridge remains to be seen in longer term followup.

I qualify the following commentary—I recognize it departs from common practice, but the purpose is to provoke a

Division of Cardiothoracic Surgery, Department of Surgery, Medical College of Wisconsin, Herma Heart Institute, Children's Hospital of Wisconsin, Milwaukee, Wisconsin

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Address reprint requests to Ronald K. Woods, MD, PhD, Division of Cardiothoracic Surgery, Department of Surgery, Medical College of Wisconsin, Children's Hospital of Wisconsin, 9000 W Wisconsin Avenue, MS B 730, Milwaukee, WI 53226. E-mail: rwoods@chw.org

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thoughtful response. If we accept the theoretical premise that any degree of insufficiency is undesirable then we need a more strict definition of successful repair. I do not know exactly what that should be, but moderate insufficiency at the time of discharge is not good enough. As there is usually some degree of progression of insufficiency from the intraoperative echocardiogram to the discharge echocardiogram, perhaps our goal in the operating room should be no worse than trivial insufficiency. In many cases, this may simply be impossible—which brings us to the second issue of when to replace. I recognize this sounds extreme—we are all clearly in favor of repair for a variety of reasons. It is very difficult to look across the drape at mild to mild plus insufficiency and feel comfortable with returning to bypass, rearresting the heart, and replacing the valve. But this is a unique patient population with poor long-term outcomes associated with usual management practices. If outcomes can be improved, we need either timely, better first-time repairs, or we need to accept the negative consequences of a replacement valve for the gain of achieving good valve function and maintaining ventricular function.

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