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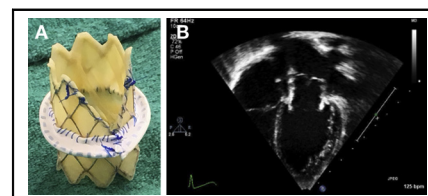


Commentary: The antifragility of the Melody valve

Christoph Haller, MD, and Osami Honjo, MD, PhD

Atrioventricular valve replacement is considered a last resort in children with severe valvar dysfunction not amenable to repair, thereby asking for the impossible: a valve that is small enough to fit the patient but large enough to allow unobstructed inflow in a period of rapid somatic growth. Since the first description of the surgical implantation of a modified Melody stent-mounted valved bovine jugular vein graft (Medtronic, Minneapolis, Minn) in the mitral position in children,¹ a large body of evidence has arisen proving its legitimacy as a valve replacement option in small children. Recent results have reported superiority compared with pericardial or porcine valves² and advantages compared with mechanical valves smaller than 19 mm despite a greater need for reintervention.^{3,4} Despite the success of stented bovine jugular vein grafts for left atrioventricular valve replacement, it must not be forgotten that this valve prosthesis is used off-label in this position. Modifications are necessary to allow surgical anchoring of the valve, and techniques limiting protrusion into the atrium and preventing left ventricular outflow tract obstruction have been reported.⁵ Therefore, it is essential to learn from experience and adjust technical aspects of the surgical procedure or even refine the valve itself to improve clinical outcomes.

A rare complication after replacement of a surgically implanted stented bovine jugular vein graft is reported in this issue of the *Journal* by Castellanos and colleagues.⁶ An 11-month-old child with a previously repaired partial atrioventricular septal defect underwent left atrioventricular valve replacement with a Melody valve, followed by



Modified Melody valve for surgical left atrioventricular valve replacement.

CENTRAL MESSAGE

Challenges and complications associated with Melody valve atrioventricular valve replacements have only pushed this technique further up to its remarkably valuable position as a prosthetic valve option in small children.

2 balloon dilations postimplantation. The patient ultimately underwent re-replacement of the left atrioventricular valve with a 19-mm mechanical valve for severe regurgitation of the stented valve. Early postoperatively, a small left ventricular pseudoaneurysm was detected. The authors intervened successfully more than 1 year later once progression of the aneurysm was demonstrated.

Left ventricular pseudoaneurysms are a known complication of mitral valve replacement associated with high mortality.⁷ Specific pediatric data are scarce and limited to case reports and small series; however, there are certain characteristics of the Melody valve when used in the left atrioventricular position that may increase the risk for complications such as this. The orientation of the long cylinder of the valve is crucial to avoid obstruction of the left ventricular outflow tract.⁸ Thus, the distal aspect of the valve is fixed to the posterior aspect of the endocardium, shifting it away from the outflow tract axis. Consequently, the struts of the stent are pushing directly against the posterior free wall, putting it at risk of mechanical injury. This technique also makes dissection of the valve during valve re-replacement challenging, because a plane between the endocardial ventricular surface and the valve must be created. Previous reports have shown that although the valve leaflets can be relatively spared, the external conduit is encased in pannus, making removal of the valve particularly challenging.^{9,10} The location of the left ventricular pseudoaneurysm described by Castellanos and colleagues seems to be this very area of

From the Department of Cardiovascular Surgery, The Labatt Family Heart Centre, The Hospital for Sick Children, University of Toronto, Toronto, Ontario, Canada. Disclosures: The authors reported no conflicts of interest.

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Address for reprints: Christoph Haller, MD, Division of Cardiovascular Surgery, The Hospital for Sick Children, 555 University Ave, Toronto, Ontario, Canada M5G 1X8 (E-mail: christoph.haller@sickkids.ca).

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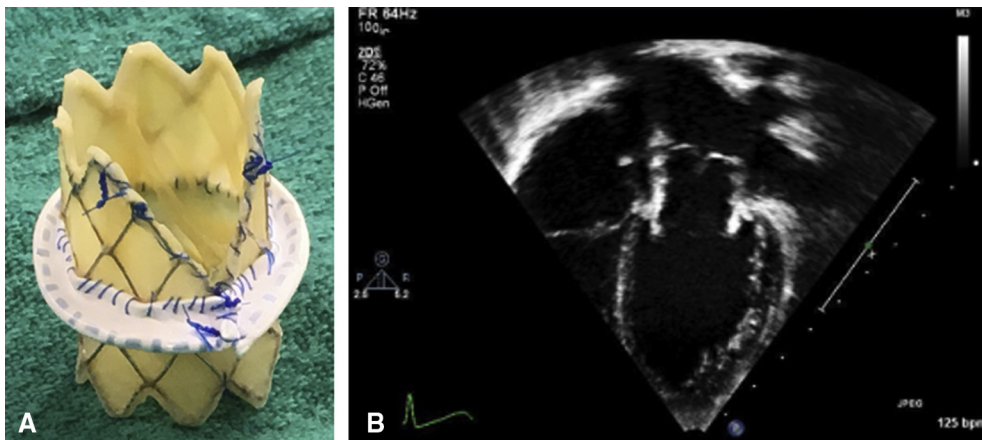


FIGURE 1. A, Melody valve with polytetrafluoroethylene cuff and wedge cutout to prevent left ventricular outflow tract obstruction. B, Echocardiography after implantation of the Melody valve showing its position in relation to the left atrioventricular valve annulus and posterolateral free wall.

abutment of endocardium and conduit. Oversizing of the balloon on expansion of the valve, as well as repeat dilations may further contribute to myocardial thinning, areas of localized ischemia, and structural weakening of the posterior ventricular wall, ultimately allowing it to rupture after removal of the stented valve. We are currently using a 4-mm polytetrafluoroethylene tube graft (WL Gore & Associates, Flagstaff, Ariz) as a sewing cuff for the valve. This material has proven to be nonadherent and to facilitate relatively easy removal.⁹ The position of the cuff can also ensure limited protrusion of the valve into the left ventricle, further reducing the risk of posterior wall compromise (Figure 1).

The case report by Castellanos and colleagues highlights a new complication associated with the Melody valve in the left atrioventricular position. It stresses the importance of careful removal of the valve and thorough inspection of the ventricular wall and other surrounding structures, as well as a close follow-up of patients after valve replacement. Considering the high risk associated with ventricular pseudoaneurysms, early intervention is advisable in most patients, although extensive pericardial adhesions may help contain free rupture. Does this report diminish the reputation of the stented bovine jugular vein graft as an atrioventricular valve replacement in children? Certainly not. It reminds us that we are meeting the lack of specific pediatric medical devices in cardiac surgery with surgical

ingenuity and that we thrive with these challenges through constant reassessment, adjustment, and advancement.

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