Listen to this “high-pitched” melody!

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Central Message

Technical modifications in the use of Melody valve for pediatric mitral valve replacement may reduce complications and liberalize patient selection criteria.

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Symptomatic congenital mitral valve disease is rarely amenable to medical management alone. If surgery is indicated, mitral valve repair is the primary and preferred strategy due to the current lack of an ideal valve substitute with natural growth potential. However, if the formidable choice of replacing the mitral valve has to be made, alternatives for a valve substitute are limited. Furthermore, the outcome of mitral valve replacement within the first few years of life is subject to improvement with still-high operative mortality (19%-42%).^{1,2} A greater mortality seems to be associated with younger age at operation, prosthesis size-weight mismatch, and a supra-annular valve replacement. Although the mortality rate plateaus out, the rates of reoperation remain high in later decades.³

The smallest commercially available bileaflet mitral mechanical prosthetic valve is designed with an effective orifice diameter of 15 mm (outer diameter of 20 mm). The attractive option of transcatheter mitral valve implantation with low-profile biological valves in high-risk patients has of yet been available for the adult population only.⁴ However, valves with similar low profiles can be implanted in the pediatric population under direct vision.

In this issue of the *Journal*, Langer and colleagues⁵ present novel modifications for the implantation of the Melody valve in the mitral position. We congratulate the authors on their innovative methods with the potential to mitigate challenging problems that are encountered due to the length and position of the valve in the mitral position and the successful implementation of their techniques in several cases.

The length of stented bioprosthetic valves is a drawback and may result either in left ventricular outflow tract obstruction (LVOTO) or obstruction pulmonary venous return. Several modifications have been suggested to prevent them.⁶⁻⁸ Emani⁷ has recommended removing part of valve in the left ventricular outflow tract, whereas Hofmann and colleagues⁸ described bending of both ends of the metal stent. The left atrium can be enlarged with an augmentation of the interatrial septum to overcome the problem with

pulmonary vein obstruction due to a similar mechanism as with LVOTO. Furthermore, a paravalvular leak can be prevented using a pericardial skirt, suturing the distal end of the stent to posterior wall of left ventricle and selecting a balloon size 1 to 2 mm larger than measured annulus.

In their modification, Langer and colleagues⁵ have bent the proximal and distal ends of stents as described by Hofmann and colleagues and have used a CardioCel patch to fix the distal end of the stent to the annulus. As a result, the prosthesis is situated entirely in the left atrium, precluding the possibility of a LVOTO. Pulmonary vein obstruction is avoided by the alternative means of augmenting the left atrium with a patch at the left atriotomy (close to Sondergaard's groove). Thus, with the proposed modifications of the surgical implantation technique, these valves bear the potential to accommodate to the specific anatomy of the patient, particularly in patients with smaller left-sided structures.

Stented bioprosthetic valves have several advantages over the conventional mechanical counterparts. First, there is no requirement for anticoagulation except the antiplatelet therapy. Second, the resultant left atrial pressures may be lower^{5,6} as compared with the use of supra-annular mechanical prostheses.⁹ This could be attributed to the larger effective orifice area due to the absence of sewing rings and leaflet housing. Third, there is a potential for stepwise transcatheter enlargement of the prosthesis to match the needs of the growing child. An important well-known disadvantage, however, remains the limited durability of bioprosthetic valves due to their accelerated structural degeneration, particularly in young patients.¹⁰

In summary, mitral replacement with a stented bioprosthetic valve is an effective bailout procedure including the pediatric population if a valve repair is not feasible or has failed. However, the current lack of prospective, long-term outcome studies hinders a liberalized recommendation of this technique as the procedure of choice for mitral valve replacement in the pediatric population. We are still hoping for the growing valve substitute with no need for anticoagulation that may be the product of the advances in the tissue-engineering methods. We thank the authors for sharing their invaluable experience.

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