Atrioventricular valve replacement options are limited in infants and small children. The Melody stented bovine jugular vein conduit is being used with increasing frequency for percutaneous pulmonary valve replacement. The Melody valve can be serially dilated over time to accommodate the somatic growth of pediatric patients. We report the initial experience of using the Melody valve as a surgical tricuspid valve replacement in an infant.


A 5-month-old (5.5 kg) male infant with signs of heart failure underwent surgical closure of a large perimembranous ventricular septal defect and posteroseptal tricuspid valve commissuroplasty to reduce the incompetence noted on static testing. The patient also had trivial regurgitation through a dysplastic mitral valve, which was not addressed. The postoperative course was complicated by transient, self-limited complete heart block, depressed right ventricular systolic function, and prolonged dependence on a ventilator. An echocardiogram and cardiac catheterization performed 3 months later revealed severe tricuspid valve regurgitation caused by leaflet prolapse, moderate tricuspid valve stenosis (a-wave to end diastolic pressure gradient = 6 mm Hg), and severe mitral valve regurgitation.

The patient then underwent a second surgical procedure during which posterior mitral suture annuloplasty was performed through a transseptal approach. The native tricuspid leaflets were severely dysplastic and demonstrated inadequate coaptation. The anterior and posterior leaflets were completely excised, and subtotal excision of the septal leaflet was performed. Prominent muscle bundles within the body of the right ventricle were divided and excised to effectively enlarge the ventricular cavity. A thin strip of bovine pericardium was circumferentially affixed to the external surface of the Melody conduit with running monofilament suture. Sutures were placed in a partial thickness manner to avoid injury to the leaflets within the conduit. The inflow tines of the stent were folded back 180° to reduce the overall length of the valve (Fig 1). The valve was then evenly compressed over a 10-mm Hegar dilator. The bovine pericardial “sewing ring” was secured to the tricuspid annulus with continuous monofilament suture. Suture bites were placed through the base of the septal leaflet of the tricuspid valve in the region of the atrioventricular conduction tissue. After the valve was seated, the stent was expanded with a 12 mm × 3 cm Braun Z-med balloon (B. Braun Interventional Systems Inc, Bethlehem, PA) before the suture was tied. The right atrium was enlarged with an extracellular matrix patch (CorMatrix, CorMatrix Cardiovascular Inc, Roswell, GA) to accommodate the atrial portion of the Melody valve.

Fig 1. A strip of bovine pericardium is circumferentially affixed (black arrow) to the Melody valve, and the inflow tines of the stent are folded back 180° (white arrow) to reduce the overall length of the stent.

References

The patient experienced complete heart block, for which an epicardial pacing system was implanted. However, he recovered atrioventricular conduction 2 months later. Transthoracic echocardiographic evaluation 3 months after implantation demonstrated a competent Melody valve prosthesis, with a mean transvalvular gradient of 3 mm Hg.

Comment

No tricuspid valve prostheses are currently available for infants and small children. Although supraannular implantation techniques may be used to maximize the size of mitral prostheses, this approach cannot be used for tricuspid valve replacement because of anatomic constraints related to the coronary sinus, inferior vena cava, right coronary artery, and atrioventricular conduction system.

The Melody valve has been used for percutaneous tricuspid valve replacement in older children and adults aged 8 to 88 years [2, 3]. Percutaneous delivery of the Melody valve was not an option for our patient because he was too small to accept the 22 French sheath needed for transvenous placement. Additionally, surgical implantation was necessary to enlarge the right atrial chamber and reduce the height of the Melody prosthesis. The technique for infant surgical mitral Melody valve implantation has also been previously reported [4]. Modifications of the surgical technique were used for implantation in the tricuspid position. Rather than cutting through the Melody valve stent material to reduce its length, the proximal tines of the stent were folded back to avoid creating sharp metal ends that could injure the atrial wall. Additionally, we enlarged the right atrium so that the valve could be positioned more proximally in the atrium and a shorter segment of the stent would sit in the cavity of the right ventricle (Fig 2). Furthermore, a continuous suture technique was used to reduce the risk of injury to the conduction system. Although our patient initially experienced complete block, normal conduction returned within 2 months, which implied that radial pressure applied during stent implantation rather than suture technique was an etiologic factor.

An attractive aspect of using the Melody valve in infants and small children is the potential for serial balloon dilation of the valve over time. The Melody valve is designed to be expanded to a maximum diameter of 22 mm. Although the long-term durability of the Melody valve in the tricuspid position is unknown, with serial dilation it may be a useful method of managing clinically significant tricuspid disease in small children until they are large enough for a conventional bioprosthetic or mechanical valve. To our knowledge, this represents the first report of surgical implantation of a Melody valve in the tricuspid position. The initial outcome has been favorable, and this technique may hold promise for small patients in whom other surgical valve prostheses will not fit.

References


Pulmonary Valve Replacement Through a Left Minithoracotomy: An Alternate Approach

Faisal H. Cheema, MD, Elbert E. Heng, and Atiq Rehman, MD

University of Maryland School of Medicine, Baltimore, Maryland; College of Physicians and Surgeons of Columbia University, New York, New York; and Sarasota Memorial Hospital, Sarasota, Florida

We present a case of an isolated pulmonary valve endocarditis in a 23-year-old woman with a history of heavy oxycodone abuse. She presented with fever and