A 15-mm mechanical aortic prosthesis in a small infant

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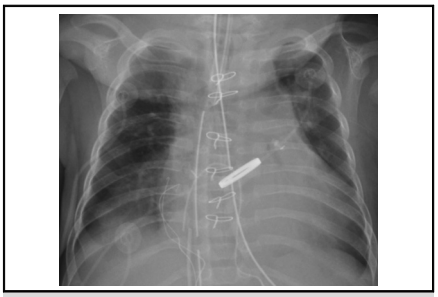

Chest radiograph of a 15-mm mechanical valve in the aortic position in an infant.

CENTRAL MESSAGE

A 15-mm mechanical valve in the aortic position represents a useful option for valve replacement in severe circumstances in which other options are unavailable in infants as small as 3.7 kg.

Children with aortic valve disease face a challenging dilemma when replacement is necessary. Although the Ross operation is known to be a superior option, it is not always possible, particularly in children with truncus arteriosus (TA). The limitations of homografts and heterografts in children are well documented.[1] Although mechanical prostheses also have issues of concern, mainly the ongoing need for anticoagulation, they do offer the prospect of long-term durability.[2]

Experience with mechanical prostheses is increasingly reported in children.[3] There are limited descriptions of mechanical prosthetic use in infants.[4] The smallest patient reported was a 4.6-kg infant with TA and truncal insufficiency (TI) in whom a St Jude mechanical valve (SJMV; Abbott Laboratories) was implanted in the aortic/truncal position; the size of the valve was not specified.[5]

In this report, we describe the use of a 15-mm SJMV in the aortic position in a 3.7-kg infant. The institutional review board of The University of Texas at Austin did not approve this study because it is a case report with 1 patient and approval was not required. The patient's parents provided written informed consent for the publication of the study data.

CASE

A 1.7-kg boy was born at 34 weeks estimated gestational age. Comorbidities included DiGeorge Syndrome, TA, a quadricuspid, dysplastic truncal valve with retracted valve cusps resulting in severe TI, type II interrupted aortic arch, and a large malaligned, conoventricular ventricular septal defect.

On day of life 3, he underwent surgical repair which included aortic arch repair (autologous, tissue–tissue repair), truncal valve repair with approximation of 2 commissures, transventricular ventricular septal defect closure with autologous pericardium, and placement of a 7-mm right ventricle-to-pulmonary artery (RV-PA) bifurcation pulmonary valve conduit. The surgical result seemed satisfactory, aside for significant TI.

Over subsequent weeks, the TI worsened, and he developed heart failure despite aggressive medical management. Reintervention was deemed necessary and he was taken back to the operating room on postoperative day (POD) 112 now weighing 3.7 kg.

The RV-PA conduit was replaced with a 12-mm Contegra (Medtronic, Inc) bovine jugular valved conduit. Repair of the truncal valve was attempted using a "bicuspidization" technique. However, severe TI persisted, and truncal valve replacement was necessary. A homograft was considered less durable and more likely to require reintervention in the short term,[1] so the truncal valve was replaced using a 15-mm SJMV with simple, interrupted sutures. No manipulation or enlargement of the annulus was necessary.[5] Intraoperative transesophageal echocardiogram showed no evidence of intracardiac shunting and good function of the SJMV and the RV-PA valved conduit.

The chest was left open and required mediastinal washout on POD 0 with chest closure on POD 1. He had

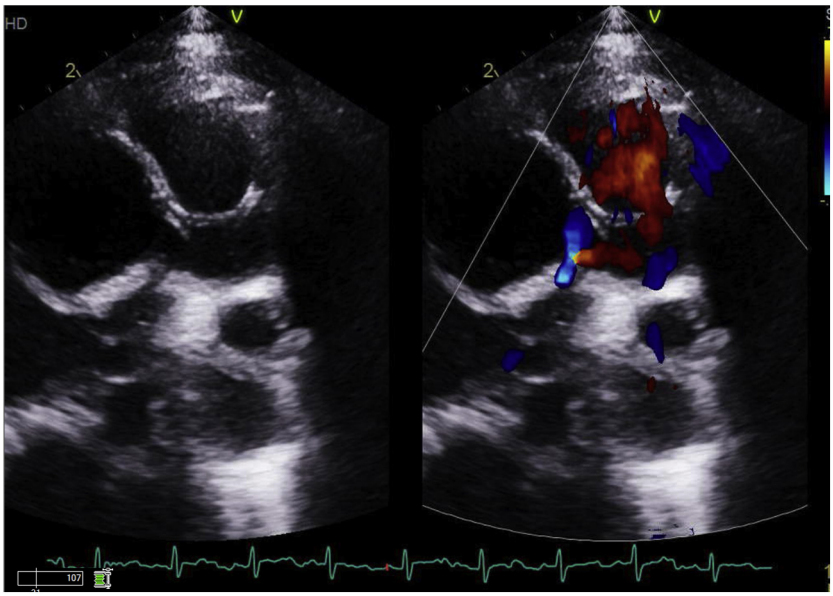

FIGURE 1. Transthoracic echocardiograms of a St Jude mechanical valve in the aortic position with washing jets.

a protracted subsequent length of stay for noncardiac medical management and anticoagulation titration. He was ultimately discharged home on hospital day 246. Antithrombotic therapy consisted of aspirin 40.5 mg and coumadin 2.2 mg with a goal international normalized ratio of 1.5 to 2.0. This goal was less than used in other reports,[4] but was selected after discussion with the manufacturer and our hematologists because flow is higher than seen in the mitral position and the infant was very small for the coumadin dose required to achieve the lower goal. The annular size of the SJMV (1.3 cm^2) corresponds to the normal size for a body surface area of a 0.5 (11 kg) child, so we expect the SJMV to last at least 2 years. The last follow-up was 2 months after discharge. He has been doing well, growing, and continuing aspirin and coumadin for antithrombosis therapy. Follow-up echocardiograms showed no evidence of aortic insufficiency or stenosis (Figure 1).

DISCUSSION

Aortic valve repair and replacement in the infant with valvular abnormalities remains a challenging situation. The 15-mm SJMV has received Federal Drug Administration approval for use in the mitral and aortic positions in 2018, but there are limited data available for the valve in the aortic position. The 15-mm size in the aortic position may represent a useful possibility in severe circumstances in which other options are unavailable. Studies are ongoing to gain additional clinical evidence supporting this indication.

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