Aortic Valve Repair Using a Geometric Annuloplasty Device in Pediatric and Congenital Heart Disease Patients

Objective: Existing replacement options for the aortic valve have significant drawbacks, especially in children. A recently introduced geometric annuloplasty device has been shown in adults to help produce consistent and durable aortic valve repair. Only limited experience with the use of this device has been reported in pediatric patients and those with congenital heart disease.

Methods: Out of all patients at our institution who have undergone aortic valve repair with placement of a subvalvar geometric annuloplasty ring, pediatric patients and adult patients with congenital heart disease were selected for review. The study period spanned from July 2018 to present. The annuloplasty device was implanted according to manufacturer's recommended technique, and a variety of other valve repair techniques were also employed when appropriate. Pre- and post-operative aortic insufficiency was evaluated by transthoracic echocardiography using a numeric scale (0=none/trivial, 1=mild, 2=moderate, 3=moderate-severe, 4=severe).

Results: The study included 35 patients who met the above criteria. Median patient age was 17.4 years (range 8.1-30.3 years). Twenty-one patients were under age 18. The most common underlying diagnoses were congenital aortic stenosis with bicuspid or functionally unicuspid aortic valve (n=10) and neo-aortic valve insufficiency or neo-aortic root dilation after prior Ross operation (n=11), single ventricle palliation (n=4), truncus arteriosus repair (n=2), or arterial switch operation (n=1). Two patients (6%) had intraoperative conversion to aortic valve replacement, both due to concerns for valve stenosis with use of the annuloplasty ring. Of the 33 patients with procedural success, 30 (91%) had use of additional valve repair techniques (such as leaflet plication, fenestration repair, and others), and 25 (76%) had an additional concomitant procedure performed (most commonly remodeling-type valve-sparing aortic root replacement, ascending aorta replacement, or RV-PA conduit change). Operative mortality was 0% (0/33), and major complication rate was 6% (2/33) (reoperation for bleeding, n=1; readmission, n=1). Median follow-up time was 1.4 years (range 1 month-3.2 years). Mean grade of aortic insufficiency was significantly reduced from preoperative to first discharge echo and remained stable through most recent follow-up echo (Figure). Reoperation-free survival over the follow-up period was 97% (32/33). One patient had repair failure at 1.5 years due to progressive aortic stenosis, requiring mechanical aortic valve replacement.

Conclusions: A geometric annuloplasty device can be used to help achieve consistently successful aortic valve repair with excellent perioperative and mid-term outcomes, even in pediatric and complex congenital heart disease patients.

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