Long-term outcomes of concomitant aortic and mitral valve repair

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Objective: To evaluate the short- and long-term outcomes of concomitant aortic (AVr) and mitral (MVr) valve repair.

Methods: This retrospective analysis of prospectively collected data identified patients who had undergone AVr and MVr surgery from March 1996 to October 2009. Patients were included if they had undergone combined repair on the aortic and mitral valves. Excluded were those <18 years in whom valve replacement was performed. Data were collected on the short-term morbidity and mortality (<30 postoperative days), long-term survival, and freedom from valve-related events and echocardiographic outcomes.

Results: A total of 65 patients underwent AVr and MVr (mean age, 56.4 ± 15.8 years, 46 men). Preoperatively, 30 patients (46.1%) had aortic insufficiency (AI) >2+, 20 patients had AI ≥2+ with aortic dilatation (30.7%), and 4 patients (6.1%) had aortic dilatation only. Of the 65 patients, 57 had tricuspid (87.6%) and 8 had bicuspid aortic valves (12.3%). All patients had mitral insufficiency preoperatively. One in-hospital death occurred (1.5%). At discharge, no patient had AI >2+ versus 30 patients preoperatively ($P < .001$), and 7 patients had AI >1+ versus 61 patients preoperatively ($P < .001$). At discharge, the mean left ventricular end-diastolic diameter was 48 ± 7 mm versus 59 ± 9 mm preoperatively ($P < .007$), and the mean left ventricular end-systolic diameter was 33 ± 5 mm versus 38 ± 14 mm preoperatively ($P = .36$). The mean clinical follow-up duration was 62 ± 45 months (median, 50; range, 1-177). At the latest follow-up visit, 17 patients were New York Heart Association class ≥2 versus 52 patents preoperatively ($P < .001$). Four cardiac deaths occurred, and at 1, 5, and 10 years, the freedom from cardiac death was 100%, 93.4% ± 3.7%, and 88.5% ± 5.9%, respectively. Eight valve reinterventions were required, and the freedom from valve reintervention at 1, 5, and 10 years was 95.3% ± 2.6%, 91.6% ± 3.6%, and 78.4% ± 8.0%, respectively. At 1, 5, and 10 years, the freedom from AI 2+ was 98.2% ± 1.7%, 93.4% ± 3.7%, and 88.3% ± 5.8% and the freedom from mitral insufficiency 2+ was 96.4% ± 2.4%, 93.3% ± 3.8%, and 93.3% ± 3.8%, respectively.

Conclusions: Concomitant AVr/MVr is associated with acceptable survival and freedom from valve reintervention. (J Thorac Cardiovasc Surg 2014;148:454-60)

Aortic (AV) and mitral (MV) valve insufficiency coexist in ≤10% of patients undergoing valvular cardiac surgery.[1-3] Traditionally, concomitant disease has been treated with double valve replacement (DVR), with either mechanical or bioprosthetic valves. Mechanical valves require lifelong anticoagulation and, therefore, have been associated with the risk of major hemorrhage or thrombosis. Bioprosthetic valves do not require anticoagulation but have a limited durability; thus, patients can require reoperation during their lifespan. Studies have demonstrated that repairing the MV at the same time as AV replacement (AVR) results in superior outcomes to DVR.[4-6] Specifically, MV repair (MVr) combined with AVR has been shown to improve overall survival, reduce valve-related complications, and provide advantages for patients who are unable to adhere to intensive anticoagulation regimens.[4,6]

AVR has generally been considered to be the reference standard treatment of AV disease, although, recently, the outcomes of AV repair (AVr) have improved.[7-10] The reasons for this have been multifactorial but not least have included a better understanding of the functional anatomy of the AV, the mechanisms underlying aortic insufficiency (AI), and the development of a classification system that informs research and standardizes communication among healthcare professionals.[11-13] The primary advantage of AVr is that the native valve will be preserved, which can reduce long-term valve-related complications,[7,14] prolong survival,[15] and increase quality of life.[16] However, the durability of AVr in the modern era is largely unknown, and reoperation could be required.[15] Despite the potential

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Abbreviations and Acronyms

AI = aortic insufficiency
AV = aortic valve
AVR = aortic valve replacement
AVr = aortic valve repair
AVr/MVr = combined AV and MV repair
DVR = double valve replacement
LV = left ventricular
MI = mitral insufficiency
MV = mitral valve
MVr = mitral valve repair
NYHA = New York Heart Association

benefits, few studies have evaluated combined AVr and MVr (AVr/MVr) for concomitant AI and mitral insufficiency (MI).[17,18] The present study, therefore, assessed the long-term outcomes of combined AV and MV reconstructive surgery.

METHODS

Study Population

The present study comprised a retrospective analysis of prospectively collected data from patients undergoing AVr/MVr for coexistent AI and MI. The procedures were performed from March 1996 to October 2006. The indications for surgery included patients with primary severe AI/root dilatation with at least moderate MI, those with severe MI with at least moderate AI and/or aortic root dilatation, and those with isolated aortic root dilatation with at least moderate MI. Not all valves had organic pathologic features. In 39 patients (59.9%), dilatation of the aortic annulus and/or aorta (type IA, IB, IC, ID) was present without organic aortic valve pathologic features. Thirty patients (46.1%; type IB, IC, ID) primarily had aortic dilatation. However, owing to the nature of aortic disease, these 4 subtypes are not mutually exclusive and overlap exists among the 4 types. Bicuspid and tricuspid AVs were repaired. Excluded were patients undergoing either MV replacement or AVR and those aged <18 years. The local institutional review board waived the requirement for participant consent. All patients routinely underwent echocardiography before surgery to assess the AV and MV parameters, left ventricular (LV) function, and the LV and proximal aortic dimensions. Coronary angiography was performed preoperatively to identify coexistent coronary disease that might require surgery. Data were collected from the electronic hospital records and bespoke surgical databases. Data extraction included (1) participant demographics (age, gender, height, weight, body surface area); (2) preoperative echocardiographic parameters and New York Heart Association (NYHA) classification; (3) operative characteristics (nature and duration of surgical procedure performed, pathologic findings, concomitant procedures); (4) early postoperative events (mortality, complications, residual AI or MI and AV gradient), and (5) follow-up details (follow-up duration, overall survival, need for valve reintervention, NYHA classification, echocardiographic parameters).

Surgical Technique

The techniques of AVr[8,13,14] and MVr[19-23] have been previously reported.

Outcomes

The primary outcome was overall survival, defined as death from any cause from the date of surgery to the latest follow-up visit. The secondary outcomes included in-hospital mortality (defined as death from any cause within 30 days of surgery and/or during the index hospital admission), early complications (within 30 postoperative days), late valve-related events (beyond 30 postoperative days), functional outcomes (NYHA classification), early and late echocardiographic outcomes (AI grade, AV area, AV gradient, MI grade, LV ejection fraction, LV dimensions, aortic dimensions), freedom from AI >2+, freedom from MI>2+, and freedom from valve reintervention (any reoperation of the AV or MV, including transcatheter interventions, during follow-up). Valve-related complications were determined by the occurrence of reoperation, bleeding, endocarditis, and thromboembolism, with the help of comprehensive cardiology follow-up clinics, where clinical and echocardiographic parameters were assessed at regular intervals. A composite outcome of freedom from both valve-related mortality and late valve-related events was calculated.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences, version 16.0 (SPSS, Inc, Chicago, Ill). Data are presented as the mean ± standard deviation or median and range, as appropriate. To compare the continuous variables, the Student unpaired t test or Mann-Whitney U test was used. For categorical variables, the chi-square or Fisher's exact test were used. The Kaplan-Meier method was used to evaluate time-dependent variables, and comparisons were made between groups using the log-rank test of equality. $P < .05$ was considered statistically significant.

RESULTS

Patients

A total of 65 patients underwent AVr/MVr from March 1996 to October 2006 (Table 1). The mean patient age was 57.4 ± 15.8 years (median, 59.9; range, 16.4-84.1), and most patients were men (n = 46, 70.7%). Preoperative echocardiography demonstrated that the mean ejection fraction of the included patients was 60% ± 13%, and 12 patients (18.4%) had evidence of impaired LV ejection fraction preoperatively (<50%). The indications for AVr were AI >2+ (n = 30, 46.1%), AI ≥2+ with aortic dilatation (n = 20, 30.7%), and aortic dilatation only (n = 4, 6.1%). Six patients (9.2%) had previously undergone cardiac surgery (coronary artery bypass grafting in 2, repair of aortic coarctation in 2, ventricular septal defect closure, pulmonary valvotomy, and tricuspid valve repair in 1, and MVr in 1). The underlying AV pathologic findings included degeneration (n = 46; 70.7%), bicuspid AV (n = 8; 12.3%), Marfan's disease (n = 4; 6.1%), rheumatic heart disease (n = 5; 7.7%), and infective endocarditis (n = 2; 3%). The etiology of MV disease was degenerative (n = 33; 50.7%), rheumatic (n = 12; 18.4%), endocarditis (n = 4; 6.1%), functional (n = 10, 15.3%), ischemic (n = 2, 3.0%), and other findings (n = 4; 6.1%).

Operative Details

The operative details are listed in Table 2. The mean cardiopulmonary bypass time was 127.6 ± 45.4 minutes, and the mean aortic crossclamp time was 109.9 ± 50.5 minutes. The most frequently performed AV procedures