Mitral valve repair versus replacement in the elderly: Short-term and long-term outcomes

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Objective: To compare the short-term and long-term outcomes of mitral valve repair (MVP) versus mitral valve replacement (MVR) in elderly patients.

Methods: All patients, age 70 years or greater, with mitral regurgitation who underwent MVP or MVR with or without coronary artery bypass graft (CABG), tricuspid valve surgery, or a maze procedure between 2002 and 2011 were retrospectively identified. Patients with a rheumatic cause or who underwent concomitant aortic valve or ventricular-assist device procedures were excluded.

Results: Overall, 556 patients underwent MVP and 102 patients underwent MVR. The mean age of the patients in the MVR group was 78 years versus 77 years for those in the MVP group ($P < .02$). The patients in the MVR group had a better mean left ventricular ejection fraction than those in the MVP group (60% vs 55%, $P = .04$). The incidence of concomitant CABG, tricuspid valve operations, and atrial fibrillation ablation procedures was similar in both groups, but perfusion time was significantly longer for the MVR group (median 177 minutes vs 146 minutes for MVP, $P = .001$). Postoperatively, patients in the MVR group had a higher incidence of stroke (6% vs 2%, $P < .10$) and significantly longer intensive care unit stay (median 86 hours vs 55 hours, $P = .001$) and hospital stay (9 days vs 8 days, $P < .01$). Operative mortality of patients was significantly higher for the MVR group (8.8% vs 3.6%, $P = .03$) and remained significant long-term on Kaplan-Meier analysis. Cox regression analysis of all 658 patients and propensity-matched analysis of 96 patients also confirmed these results.

Conclusions: Elderly patients with mitral regurgitation who undergo MVP have better postoperative outcomes, lower operative mortality, and improved long-term survival than those undergoing MVR. MVP is a safe and more effective option for the elderly with mitral regurgitation. (J Thorac Cardiovasc Surg 2014;148:1400-6)

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Mitral regurgitation (MR) is becoming more common with the aging population in the United States.[1,2] However, because of the increased risk of mortality, these patients are often not considered for surgery.[3,4] Mitral valve valvuloplasty (MVP) has superior results compared with mitral valve replacement (MVR) both in short-term and long-term results in young patients.[5,6] Although some clinicians consider older patients to be poor surgical candidates for MVP because of potentially longer cardiopulmonary bypass (CPB) and ischemic times and difficulty of repair compared with valve replacement,[7,8] others do not.[9,10] Reconstruction of valvular apparati includes a combination of chordoplasty, posterior leaflet resection, sliding valvuloplasty, foldoplasty, commissuroplasty, Alfieri stitch repair, and/or annuloplasty with a complete or a partial ring, and therefore may require longer CPB times; elderly patients especially may not tolerate a failed repair.[7] Another factor is that elderly patients often have more friable or calcified tissues and poor preoperative ventricular function compared with younger patients, making repair technically more challenging, thereby increasing the risk of failure and/or need for reoperation.[7,11] The shorter life expectancy of elderly patients may decrease the benefit of MVP over MVR. There is also a belief that elderly patients have slower structural valve deterioration of bioprosthesis compared with the younger patients who receive MVR, which would lower the risk of reoperation.[12] A recent study from the Society of Thoracic Surgeons (STS) database showed that the overall repair rate in patients undergoing isolated mitral valve surgery was 61%,[2] but when limited to those older than 65 years of age, less than 50% received repair.[1]

The recent literature, however, suggests that the elderly benefit from the high success rates of MVP over MVR.[7,10,13] Benefits include avoiding foreign tissue, avoiding long-term anticoagulation, lower risks of hemolysis and infection, improved left ventricular (LV) remodeling with native tissue, and reduced operative morbidity and mortality.[7,14,15] Opponents still question the uncertainty of repair and its durability,[11,16] but

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Abbreviations and Acronyms

CABG	= coronary artery bypass graft
COPD	= chronic obstructive pulmonary disease
CPB	= cardiopulmonary bypass
IABP	= intra-aortic balloon pump
ICU	= intensive care unit
IQR	= interquartile range
IRB	= Institutional Review Board
LOS	= length of stay
LV	= left ventricular
MR	= mitral regurgitation
MVP	= mitral valve repair
MVR	= mitral valve replacement
NYHA	= New York Heart Association
RBC	= red blood cell
STS	= Society of Thoracic Surgeons

long-term follow-up studies have demonstrated comparable survival and freedom from reoperation for the 2 surgical groups even after propensity-matched analysis.[7]

At the Brigham and Women's Hospital, we have been performing MVP regardless of age for both myxomatous and functional causes and the current study reports our experience with patients more than 70 years of age with MR undergoing MVP or MVR.

MATERIALS AND METHODS

Patient Selection

All patients, age 70 years or greater, who underwent MVP or MVR between 2002 and 2011 were retrospectively analyzed. A total of 1230 patients were identified. Patients undergoing mitral valve surgery for mitral stenosis or reoperative surgeries were excluded from the analysis. Patients undergoing concomitant aortic valve surgery, ascending aortic surgery, or ventricular-assist device placement were also excluded. However, patients undergoing concomitant coronary artery bypass grafting (CABG), tricuspid valve surgery, or ablation procedures for atrial fibrillation were included. A total of 658 of the 1230 patients met our selection criteria. This study was approved by the Institutional Review Board (IRB) of Brigham and Women's Hospital. Patient consent was waived by the IRB for this study.

Operative Strategy

All operations were performed using either full sternotomy or lower hemisternotomy. Arterial cannulation was performed centrally in all patients; venous cannulation was performed centrally in the full sternotomy group and peripherally by femoral vein for the hemisternotomy group. In this elderly population, epiaortic ultrasonography was used in all cases to avoid crossclamping a calcified aorta. Standard repair strategies were used such as leaflet resection, foldoplasty, and ring annuloplasty. Our previous article provides the details of the repair techniques used.[17]

Data Presentation and Analysis

Patient demographics and hospital outcomes were recorded at the time of presentation and coded according to the STS Adult Cardiac Surgery Database specifications, version 2.52. Our primary outcomes of interest included postoperative stroke, reoperation for bleeding, time in the intensive care unit (ICU, in hours), postoperative length of stay (LOS, in days), and operative mortality. Long-term survival was also evaluated. Mortality data were collected by routine patient follow-up and query of the Social Security Death Index.

Normally distributed continuous variables are presented as means and standard deviations. Nonnormally distributed continuous variables are presented as medians with interquartile ranges (IQR). Analyses of continuous variables was done using the Student *t* test with the Levine homogeneity of variance or Mann-Whitney *U* tests as appropriate. Dichotomous variables are presented as the number and percentage of cases, and were evaluated using the Fisher exact test. Survival and time to outcomes of interest were analyzed by Kaplan-Meier analysis. All statistical analyses were done using SPSS 13.0 (SPSS, Inc, Chicago, Ill).

Propensity-Matched Cohort

A matched group analysis was conducted using propensity-matched cases (MVR) and controls (MVP). Propensity scores were generated using logistic regression analyses, done in 2 steps. Variables for the logistic regression analysis were selected based on literature review, known covariates and confounders of the outcomes of interests, differences between the 2 patient groups (Table 1), and clinical judgment. A forward stepwise regression analyses was conducted, including examinations for interaction effects. An interaction variable between the surgeon and the year of surgery was included to control for differences in patient mix and comorbidity loads. Any variable with a *P* value of .15 or less was entered into a final model, which was an enter-method logistic regression. The resulting adjusted predicted probability for each patient was then used to select matched groups. Groups were matched using the following a priori algorithm: within a probability score less than .01, followed by age, gender, and previous cardiac surgery.

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RESULTS

The final analysis included 658 patients: 556 patients who underwent MVP and 102 patients who underwent MVR. Total patient years of follow-up was 2811 years, with a median time per patient of 4.1 years (IQR, 1.6-6.8 years).

Preoperative Characteristics

As seen in Table 1, the patients in the MVR group were older than those in the MVP group (77.9 years vs 76.6 years, $P = .018$) and had a higher incidence of renal failure (15.5% vs 7.6%, $P = .019$) and cardiogenic shock (10.8% vs 2.5%, $P = .001$), although with a higher ejection fraction (median, 60% [IQR, 50%-65%] vs median, 55% [IQR, 40%-60%] $P = .042$). All other preoperative risk factors were similar between the 2 groups. There was significantly lower percentage of ischemic MR in the MVR group (16.7% vs 27.5% for MVP; $P = .026$) and higher percentage of endocarditis in the MVR group (8.8% vs 1.1%; $P = .001$). Distribution of the remaining causes were substantially similar.

Operative Outcomes

Table 2 shows the operative outcomes for the analysis. Of the 102 patients in the MVR group, 92.2% had a bioprosthetic valve implanted and 7.8% had a mechanical