Comparison of Early Surgery Versus Conventional Treatment in Asymptomatic Severe Mitral Regurgitation

Duk-Hyun Kang, MD, PhD; Jeong Hoon Kim, MD; Ji Hye Rim, MD; Mi-Jeong Kim, MD; Sung-Cheol Yun, PhD; Jong-Min Song, MD, PhD; Hyun Song, MD, PhD; Kee-Joon Choi, MD, PhD; Jae-Kwan Song, MD, PhD; Jae-Won Lee, MD, PhD

Background—The optimal timing of surgical intervention in asymptomatic patients with severe mitral regurgitation is unclear. We therefore compared the long-term results of early surgery with a conventional treatment strategy.

Methods and Results—From 1996 to 2005, 447 consecutive asymptomatic patients (253 men, age 50 ± 15 years) with severe degenerative mitral regurgitation and preserved left ventricular function were evaluated prospectively. The end point was defined as the composite of operative mortality, cardiac death, repeat mitral valve surgery, and urgent admission due to congestive heart failure during follow-up. Early surgery was performed on 161 patients (operated group), and the conventional treatment strategy was used for 286 patients (conventional treatment group). There were no significant differences between the 2 groups in terms of age, gender, euroSCORE (European System for Cardiac Operative Risk Evaluation), or ejection fraction. During a median follow-up of 1988 days, there were 2 repeat surgeries and no cardiac deaths or operative mortality in the operated group compared with 12 cardiac deaths, 1 repeat surgery, and 22 admissions for congestive heart failure in the conventional treatment group. The estimated actuarial 7-year cardiac mortality rate was 0% in the operated group and 5.2% in the conventional treatment group (P = 0.008), and for 127 propensity score–matched pairs, the estimated actuarial 7-year event-free survival rate was significantly higher in the operated than in the conventional treatment group (99 ± 1% versus 85 ± 4%, P = 0.007). In the conventional treatment group, baseline grade of pulmonary hypertension (hazard ratio 1.87, 95% CI 1.22 to 2.87, P = 0.003), age (hazard ratio 1.02, 95% CI 1.01 to 1.04, P = 0.005), and effective regurgitant orifice area (hazard ratio 2.06, 95% CI 1.11 to 3.82, P = 0.02) were independent variables that predicted late development of surgical indications or congestive heart failure on Cox multivariate analysis.

Conclusions—Compared with conservative management, the strategy of early surgery was associated with an improved long-term event rate by decreasing cardiac mortality and congestive heart failure hospitalization more effectively in patients with severe degenerative mitral regurgitation. Early surgery may therefore further improve clinical outcomes in asymptomatic severe mitral regurgitation with preserved left ventricular systolic function and a high likelihood of mitral valve repair. (Circulation. 2009;119:797-804.)

Key Words: surgery ■ prognosis ■ regurgitation ■ mitral valve ■ echocardiography
increasing need for direct comparison between watchful waiting and early MV repair. To the best of our knowledge, however, there have been no clinical studies comparing early surgery with the conventional treatment strategy based on the 1998 American College of Cardiology/American Heart Association guidelines.1 The primary goal of the present study was to compare clinical outcomes of early surgery with those of the conventional treatment strategy using our prospectively collected registry data on patients with severe degenerative MR. We also evaluated the prognostic impact of echocardiographic assessment of degenerative MR.

Methods

Study Population

A prospective registry, started in 1996 and using a standard case report form, has included all consecutive patients with MR undergoing echocardiography at our hospital. Case report forms, including patient demographics, clinical presentation, and echocardiographic data, were stored in an electronic database.11 Clinical and echocardiographic follow-up data of study patients were collected annually and entered into the database. From 1996 to 2005, a total of 447 asymptomatic patients (253 men; mean age 50±15 years) with severe MR due to MV prolapse and/or flail MV who were potential candidates for early surgery were consecutively enrolled in the present study. According to the recommendations of the 1998 American College of Cardiology/American Heart Association guidelines for surgical indications of severe MR,1 the criteria for exclusion from the study were defined as patients with exertional dyspnea, LV ejection fraction (EF) <0.60, LV end-systolic diameter >45 mm, atrial fibrillation, significant aortic valve disease, or Doppler-estimated systolic pulmonary artery pressure >50 mm Hg and those who were not candidates for surgery on the basis of age >85 years and coexisting malignancies. Patients with a history of coronary artery disease or regional wall-motion abnormalities were also excluded, but 19 patients with incidental coronary artery disease detected on preoperative coronary angiography and 4 with moderate to severe tricuspid regurgitation were not excluded. The decision for early surgery or conventional treatment was at the discretion of the attending physician. The attending physicians explained the operative risks and potential benefits of early surgery in detail and considered the preference of each patient most importantly. Early elective surgery was performed on 161 patients (operated group) within 6 months of the initial echocardiographic evaluation. The conventional strategy was chosen for 286 patients (conventional treatment group), and patients in this group were observed without medical therapy, because in the absence of hypertension, there is no known indication for the use of medical therapy in asymptomatic patients with MR and preserved LV systolic function.1 Informed consent was obtained from each patient, and the study protocol was approved by the ethics committee of our institution.

Echocardiographic Evaluation

Echocardiographic evaluation was performed before surgery and annually during follow-up. Two-dimensional echocardiography and Doppler color flow imaging were performed on all patients with a Hewlett-Packard Sonos 2500 or 5500 imaging system equipped with a 2.5-MHz transducer (Hewlett-Packard, Andover, Mass). End-systolic diameter and end-diastolic dimension of the LV were measured from parasternal M-mode acquisitions, and end-systolic volume, end-diastolic volume, and EF of the LV were calculated with the simplified proximal isovelocity surface area (PISA) method.12 With the simplified proximal isovelocity surface area (PISA) method, the degree of MR was graded as mild (PISA radius <4 mm), moderate (PISA radius <8 mm), or severe (PISA radius ≥8 mm).13 Severe degenerative MR was defined as severe prolapse and/or flail leaflet of the MV with a PISA radius ≥8 mm. The effective regurgitant orifice area (ERO) was determined by dividing the regurgitant flow rate, calculated as $2\pi r^2 \times \text{aliasing velocity}$, where $r$ is the PISA radius, by peak MR velocity14 (Figure 1). Transesophageal echocardiography was performed in 345 patients (77%) to evaluate the functional anatomy of the MV in detail and to assess the feasibility of repair. Pulmonary artery systolic pressures (PAPs) were estimated by continuous-wave Doppler with the simplified Bernoulli equation ($4 \times \text{peak velocity of tricuspid regurgitation}^2$), with 5 mm Hg added for the estimated right atrial pressure,15 and significant pulmonary hypertension was defined as peak velocity of tricuspid regurgitation ≥3.4 m/s, equal to
PAP >50 mm Hg. In patients without significant pulmonary hypertension, its severity was graded as 0, 1, or 2 when the peak velocity of tricuspid regurgitation was <3.0, 3.0 to <3.2, and 3.2 to 3.4 m/s, respectively.

**Surgical Procedures**
The procedures were performed with the use of standard cardiopulmonary bypass. In the operated group, MV repair and replacement were performed successfully in 151 patients (94%) and 10 patients (6%), respectively, and concomitant CABG at the time of MV surgery was performed on 19 patients (12%), with bypass grafts of 1.9±1.2 vessels. In 24 patients with anterior leaflet prolapse, MV replacement was performed in 1 patient (4%) and MV repair in 23 patients, most frequently with the new chord formation technique. In 96 patients with posterior leaflet prolapse, MV replacement was performed in 4 patients (4%) and MV repair in 92 patients, with the following technique singly or in combination: quadrangular resection (55%), new chord formation (28%), and commissuroplasty (17%). In 41 patients with involvement of both leaflets, MV replacement was performed in 5 (12%) and MV repair in 36, with the new chord formation technique (44%), commissuroplasty (30%), and quadrangular resection (26%). All but 1 patient also underwent annuloplasty with an annular ring, the mean size of which was 30.1±2.4 mm.

**Follow-Up**
Patients in the conventional treatment group were referred for surgery if they developed exertional dyspnea, LV EF <0.60, LV end-systolic diameter >45 mm, Doppler-estimated PAP >50 mm Hg, or atrial fibrillation. Data were obtained until February 2008 during annual visits to the outpatient clinic or by telephone interviews. Operative mortality was defined as death within 30 days of surgery. Deaths were classified as cardiac or noncardiac on the basis of medical records. For the 17 patients (4%) lost to follow-up, data on vital status, dates of death, and causes of death were obtained from the Korean national registry of vital statistics.

The end point of the study was defined as the composite of operative mortality, cardiac death, repeat MV surgery, and hospitalization due to congestive heart failure (CHF) during follow-up. A CHF hospitalization was defined as an unplanned, urgent admission for the management of CHF. A patient admitted for CHF had to show resting dyspnea and radiological signs of pulmonary edema and require intravenous diuretics.

**Statistical Analysis**
Long-term outcomes were compared directly between the operated and conventional treatment groups. Categorical variables are presented as numbers and percentages and were compared with the χ² test and Fisher’s exact test. Continuous variables are expressed as mean±SD and were compared with the Student’s unpaired t test or the Mann-Whitney U test. To reduce the effect of treatment-selection bias and potential confounding in this observational study, we performed rigorous adjustment for the differences in the baseline characteristics by use of propensity score matching.16,17 The propensity scores were estimated without regard to outcome variables, with multiple logistic regression analysis. All prespecified covariates were included in the full nonparsimonious models for treatment with early surgery versus conventional strategy (Table 1). The discrimination and calibration ability of the propensity score model was assessed by means of the C-statistic and the Hosmer-Lemeshow statistic. For development of the propensity score–matched pairs without replacement (a 1:1 match), the greedy 5→1 digit match algorithm was used as shown previously.18 After propensity score matching, the baseline covariates were compared between the 2 groups with the paired t test or the Wilcoxon signed rank test for continuous variables and the McNemar test or marginal homogeneity test for categorical variables. These results are shown in Table 2.

The analysis of clinical end points was done on an intention-to-treat basis and included all patients. In the propensity score–matched cohort, the risks of clinical end points were compared with Cox regression models with robust SEs that accounted for the clustering of matched pairs, and event-free survival curves were constructed with Kaplan-Meier estimates and compared with the log-rank test. For Kaplan-Meier analysis, we analyzed all clinical events by time to first event. Clinical and echocardiographic variables were evaluated by Cox proportional hazards analysis to identify predictors of late development of indications for surgery or of CHF in the conventional treatment group. All reported P values were 2-sided, and a value of P<0.05 was considered statistically significant. SAS software, version 9.1 (SAS Institute, Inc, Cary, NC), was used for statistical analyses.

The authors had full access to and take full responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

**Results**

**Baseline Characteristics**
A comparison of baseline clinical and echocardiographic characteristics of the operated and conventional treatment groups is shown in Table 1.
Conventional Treatment Groups

Comparison Between the Operated and Conventional Treatment Groups

There were no cases of operative mortality in the operated group. The median follow-up was 2118 days (interquartile range 2657 to 1245 days) in the operated group and 1908 days (interquartile range 2773 to 1303 days) in the conventional treatment group. During follow-up, there were 7 noncardiac deaths and no cardiac deaths in the conventional treatment group. The estimated actuarial 7-year cardiac mortality rate was significantly higher and ERO of MR, LV end-systolic diameter, and LV end-diastolic dimension were significantly larger in the operated group ($P<0.01$). Propensity score matching for the entire population yielded 127 matched pairs of patients (Table 2). In the matched cohort, there were no significant differences between group differences for any covariates.

In 6 patients who died of CHF, the euroSCORE (European System for Cardiac Operative Risk Evaluation) was increased significantly from 3.8±1.2 at baseline to 8.5±0.5 at admission for CHF ($P=0.027$). Urgent surgery was recommended to these patients, but 5 refused surgery because of high surgical risks. Two patients in the operated group and 1 patient in the conventional treatment group required repeat MV surgery, and 22 patients in the conventional treatment group required hospitalization for CHF without cardiac mortality. Thus, 2 patients (1%) in the operated group and 35 (12%) in the conventional treatment group attained the composite end point, and the estimated actuarial 7-year event-free survival rate was 99±1% in the operated group and 85±3% in the conventional treatment group, respectively ($P<0.001$). For the 127 propensity score–matched pairs, the estimated actuarial 7-year event-free survival rate was significantly higher in the operated group than in the conventional treatment group (99±1% versus 85±4%; $P=0.007$; Figure 3).

### Table 2. Baseline Characteristics of Propensity Score–Matched Patients

<table>
<thead>
<tr>
<th></th>
<th>Surgical Group (n=127)</th>
<th>Conventional Treatment Group (n=127)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>49±14</td>
<td>49±14</td>
<td>0.86</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>71 (56)</td>
<td>70 (55)</td>
<td>0.99</td>
</tr>
<tr>
<td>Body surface area, m²</td>
<td>1.70±0.18</td>
<td>1.69±0.19</td>
<td>0.90</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>24.3±3.3</td>
<td>24.3±3.9</td>
<td>0.99</td>
</tr>
<tr>
<td>Smoking, n (%)</td>
<td>41 (32)</td>
<td>40 (31)</td>
<td>0.88</td>
</tr>
<tr>
<td>Diabetes, n (%)</td>
<td>6 (5)</td>
<td>8 (6)</td>
<td>0.75</td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>38 (30)</td>
<td>45 (35)</td>
<td>0.35</td>
</tr>
<tr>
<td>Cholesterol, mg/dL</td>
<td>186±43</td>
<td>186±38</td>
<td>0.99</td>
</tr>
<tr>
<td>EuroSCORE</td>
<td>1.00±1.21</td>
<td>0.98±1.18</td>
<td>0.91</td>
</tr>
<tr>
<td>End-systolic dimension, mm</td>
<td>36±5</td>
<td>36±4</td>
<td>0.96</td>
</tr>
<tr>
<td>End-diastolic dimension, mm</td>
<td>59±7</td>
<td>59±6</td>
<td>0.58</td>
</tr>
<tr>
<td>EF</td>
<td>0.66±0.05</td>
<td>0.66±0.05</td>
<td>0.89</td>
</tr>
<tr>
<td>No. of prolapsed segments</td>
<td>1.76±1.46</td>
<td>1.74±1.44</td>
<td>0.93</td>
</tr>
<tr>
<td>Flail leaflet, n (%)</td>
<td>58 (46)</td>
<td>56 (44)</td>
<td>0.89</td>
</tr>
<tr>
<td>ERO, cm²</td>
<td>0.87±0.38</td>
<td>0.86±0.42</td>
<td>0.94</td>
</tr>
<tr>
<td>Pulmonary hypertension, n (%)</td>
<td>115 (91)</td>
<td>117 (92)</td>
<td>0.71</td>
</tr>
<tr>
<td>Grade 1</td>
<td>6 (5)</td>
<td>5 (4)</td>
<td></td>
</tr>
<tr>
<td>Grade 2</td>
<td>6 (5)</td>
<td>5 (4)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. Occurrence of cardiac death in the conventional treatment group (CONV) during follow-up. OP lx(+) indicates patients who developed surgical criteria during follow-up; OP lx(−), patients who did not develop surgical criteria.

Figure 3. Comparison of event-free survival rates between the operated (OP) and conventional treatment (CONV) groups in propensity-matched pairs.
we observed significant differences in terms of postoperative end-systolic and end-diastolic volume between patients undergoing early surgery and those undergoing late surgery. Although immediate postoperative and late follow-up EF did not differ significantly between these 2 groups, larger LV end-systolic and end-diastolic volumes may reflect the occurrence of adverse remodeling in patients who underwent late surgery.

We also found that the cardiac mortality and cardiac event rates of the conventional treatment group in the present study were significantly lower than those of the operated group, with the significant differences in volumes maintained during follow-up (Table 4). Three patients in the operated group and 1 patient in the conventional treatment group who underwent late surgery showed recurrence of severe MR, with repeat MV surgery performed on 2 of the 3 patients in the operated group and on the sole patient in the conventional treatment group.

**Discussion**

The present study demonstrates that in asymptomatic patients with severe degenerative MR and preserved LV systolic function, early surgery is associated with more improved long-term clinical outcomes than a conventional treatment strategy via a decrease in cardiac mortality and CHF hospitalization. Although the risk of sudden cardiac death is very low in patients with degenerative MR,19 the presence of flail leaflet was associated with a higher risk of sudden cardiac death. The yearly rate of sudden death in asymptomatic patients with flail leaflet and preserved LV systolic function was shown to be 0.8%,20 which suggests that early surgery may be more effective than conventional treatment in preventing sudden cardiac death.21,22 Because elective MV repair is associated with a very low operative mortality rate,20 the benefit of early surgery in preventing cardiac mortality may outweigh the potential risks related to early surgery. Although a conventional treatment strategy may decrease the number of surgeries performed, we found that the overall operative risks in the conventional treatment group tended to become higher during follow-up. In addition to potentially preventing sudden cardiac death and decreasing the operative risks related to urgent surgery, early surgery may prevent postoperative LV dysfunction. It has been shown that LV contractile dysfunction is present in many patients with severe MR despite a normal EF,23,24 and we observed significant differences in terms of postoperative end-systolic and end-diastolic volume between patients undergoing early surgery and those undergoing late surgery. Although immediate postoperative and late follow-up EF did not differ significantly between these 2 groups, larger LV end-systolic and end-diastolic volumes may reflect the occurrence of adverse remodeling in patients who underwent late surgery.

### Table 3. Baseline Characteristics of Patients Who Reached Surgical Criteria and Those Who Did Not During Follow-Up

<table>
<thead>
<tr>
<th>OP bx (+) (n=79)</th>
<th>OP bx (−) (n=207)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>54±16</td>
<td>49±15</td>
</tr>
<tr>
<td>Male gender, n (%)</td>
<td>45 (57)</td>
<td>121 (58)</td>
</tr>
<tr>
<td>Diabetes, n (%)</td>
<td>10 (13)</td>
<td>7 (3)</td>
</tr>
<tr>
<td>End-systolic dimension, mm</td>
<td>36±5</td>
<td>35±4</td>
</tr>
<tr>
<td>End-diastolic dimension, mm</td>
<td>59±6</td>
<td>57±5</td>
</tr>
<tr>
<td>EF</td>
<td>0.66±0.06</td>
<td>0.65±0.05</td>
</tr>
<tr>
<td>Flail leaflet, n (%)</td>
<td>34 (43)</td>
<td>58 (28)</td>
</tr>
<tr>
<td>ERO, cm²</td>
<td>0.84±0.42</td>
<td>0.71±0.33</td>
</tr>
<tr>
<td>No. of prolapsed segments</td>
<td>1.75±1.43</td>
<td>1.82±1.44</td>
</tr>
<tr>
<td>Pulmonary hypertension, n (%)</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td>Grade 1</td>
<td>68 (86)</td>
<td>196 (95)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>6 (8)</td>
<td>7 (2)</td>
</tr>
<tr>
<td>Grade 3</td>
<td>5 (6)</td>
<td>4 (2)</td>
</tr>
</tbody>
</table>

OP bx (+) indicates patients who developed surgical criteria during follow-up; OP bx (−), patients who did not develop surgical criteria.

### Table 4. Comparison of Echocardiographic Results Between the Early Surgery Group and Those Who Had Late Surgery

<table>
<thead>
<tr>
<th></th>
<th>Early Surgery Group (n=161)</th>
<th>Late Surgery Group (n=53)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preop</td>
<td>Postop</td>
</tr>
<tr>
<td>LVEDD, mm</td>
<td>36±5</td>
<td>34±6†</td>
</tr>
<tr>
<td>LVEDD, mm</td>
<td>59±6</td>
<td>49±7*</td>
</tr>
<tr>
<td>LVEVG, mL</td>
<td>45±16</td>
<td>38±17†</td>
</tr>
<tr>
<td>LVEDV, mL</td>
<td>130±40</td>
<td>85±28‡</td>
</tr>
<tr>
<td>EF</td>
<td>0.66±0.05</td>
<td>0.56±0.09</td>
</tr>
</tbody>
</table>

Preop indicates before surgery; Postop, after surgery; LVEDD, LV end-systolic dimension; LVEVG, LV end-diastolic dimension; LVEVG, LV end-systolic volume; and LVEDV, LV end-diastolic volume.

*P<0.05, †P<0.01 vs late surgery group.
were lower than those in a previous study of asymptomatic patients under medical management with severe MR of ERO ≥0.40 (36±9% and 62±8%, respectively, at 5 years). These differences may have been due to the younger mean age of patients in the present study (52±15 versus 61±14 years) and other favorable baseline characteristics, which may have contributed to differences in clinical outcomes. A recent study of asymptomatic patients of mean age 55±15 years with severe MR and preserved LV function4 yielded outcome results similar to those in the present study. A recent report on the natural history of asymptomatic MR25 showed that 10-year cardiovascular morbidity was significantly higher for patients ≥50 years of age than for those <50 years old at diagnosis (45±4% versus 10±2%). The present study also showed that age was significantly related to the development of surgical indications or CHF in the conventional treatment group. Although the natural history of asymptomatic MR varies considerably,4 it is likely that aging affects the prognosis of severe degenerative MR. Degenerative changes of MV tend to be more severe in elderly patients, and aggravation of prolapse and chordal rupture may occur easily in degenerative leaflets and chords, resulting in progression of MR.26 In addition, aging decreases LV compliance, which is important for compensation of severe MR. Thus, the LV would have difficulty in compensating for volume overload, which would lead to LV dilation or an increase in LV diastolic pressure, and ultimately to CHF.23,27 For these reasons, vigilant surveillance is required for elderly patients. Because the benefits of surgical intervention, as well as the operative risks, tend to increase in elderly patients,28 it is difficult to determine age criteria that favor early surgery. A prospective, randomized comparison is required to confirm the efficacy of early surgery in elderly patients.

**Prognostic Impact of Larger ERO and Mild Pulmonary Hypertension**

Previous studies have reported that age, symptoms, EF, and severity of MR were independent significant variables related to survival and CHF,29,30 and it is important to identify patients in whom clinical end points are likely to develop and who will require surgery. In asymptomatic patients with preserved LV function, symptoms and EF do not affect clinical outcomes, whereas severity of MR can be suggested as an independent predictor that identifies a subgroup of patients who may benefit from early surgery. Echocardiographic evaluation of degenerative MR can reliably differentiate very severe MR from severe MR by quantitative measurement of ERO4,14 or documentation of the flail leaflet. In the conventional treatment group in the present study, larger ERO was an independent variable that predicted development of surgical indications or CHF. Previous studies also reported that MR due to flail leaflet was associated with excess mortality and morbidity and that early surgery was associated with an improved long-term survival rate and decreased cardiac mortality rate in these patients.20,21,31 We suggest that the presence of very severe MR associated with a larger ERO should be a criterion in favor of surgical intervention if the likelihood of valve repair is high, because volume overload induced by very severe MR will eventually lead to LV enlargement or the development of symptoms.32

Pulmonary hypertension occurs frequently in patients with chronic severe MR and preserved LV systolic function.33 Because pulmonary hypertension is associated with a severe increase in pulmonary capillary wedge and left atrial pressure,32,33 echocardiographic measurement of PAP is essential for evaluation of the hemodynamic effects of severe MR and for follow-up of patients with severe MR.3,3 However, the prognostic significance of pulmonary hypertension in severe MR has not been evaluated sufficiently in previous studies, and current guidelines recommend only significant pulmonary hypertension (PAP >50 mm Hg) as a class IIa surgical indication with level of evidence C.2,3 Although we excluded patients with significant pulmonary hypertension in the present study, the presence of mild to moderate pulmonary hypertension was still an independent predictor of CHF or development of surgical indications. In addition, right ventricular dysfunction secondary to pulmonary hypertension has been associated with increased risk of sudden death in severe MR.34 Because development of even mild pulmonary hypertension can be an early sign of failure to compensate for chronic MR, early MV repair should also be considered in patients with mild to moderate pulmonary hypertension (PAP 40 to 50 mm Hg).

**Study Limitations**

The present study was subject to the limitations inherent in a nonrandomized study. The incidence of flail leaflet was significantly higher and ERO of MR, LV end-systolic diameter, and end-diastolic dimension were significantly larger in the early surgery group. However, study patients were enrolled consecutively in a prospectively designed registry for annual clinical and echocardiographic follow-up, and other baseline characteristics were similar in the operated and conventional treatment groups. To minimize selection bias and confounding, we used propensity score matching, which has been shown to eliminate a greater proportion of baseline differences than stratification or covariate adjustment.35 In the propensity score–matched cohort, the early surgery group persistently had a significantly lower rate of composite end points.

We included only patients with severe degenerative MR, and the results of the present study are not applicable to severe MR of other causes with lower rates of successful MV repair. In the present study, ERO of MR was 0.79±0.39 cm², which was larger than the ERO of 0.64±0.21 cm² reported in an earlier outcome study.4 The PISA method used in the present study tended to overestimate ERO in patients with degenerative MR compared with that measured by quantitative Doppler and 2D echocardiography,14 but the overall incidence of flail leaflet was 39%, which suggests that patients with more severe MR might be included in the present study.

Because American College of Cardiology/American Heart Association guidelines do not recommend coronary angiography in asymptomatic patients with valvular heart disease when valve surgery is not being considered,1,2 coronary angiography was performed only before valve
surgery or in patients with development of angina, myocardial ischemia, or left ventricular dysfunction in the present study. Although the presence and extent of coronary artery disease are important prognostic factors, clinical diagnosis of coronary artery disease is difficult because of the low specificity of noninvasive diagnostic tests in patients with valvular heart disease. The appropriate diagnostic methods and treatment strategy for coronary artery disease associated with degenerative MR need to be evaluated in further studies.

Conclusions

Compared with conservative management, a strategy of early surgery is associated with an improved long-term event rate by more effectively decreasing cardiac mortality and CHF hospitalization in patients with severe degenerative MR. This result suggests that early surgery can be a therapeutic option to further improve clinical outcomes in asymptomatic patients with preserved LV systolic function and a high likelihood of MV repair.

None.

Disclosures

References


CLINICAL PERSPECTIVE

The optimal timing of surgical intervention in patients with asymptomatic severe mitral regurgitation remains controversial, because the potential benefits of early surgery need to be balanced against the operative risks. As prediction of mitral valve repair has become clinically feasible, and mitral valve repair has shown excellent long-term results, there is an increasing need for direct comparison between watchful waiting and early mitral valve repair. We prospectively evaluated 447 consecutive asymptomatic patients with severe degenerative mitral regurgitation and preserved left ventricular function to compare clinical outcomes of early surgery with those of the conventional treatment strategy. Early surgery was performed on 161 patients and the conventional treatment strategy on 286 patients. In the early surgery group, mitral valve repair and replacement were performed successfully in 151 (94%) and 10 (6%) patients, respectively, without operative mortality. This study demonstrates that in asymptomatic patients with severe degenerative mitral regurgitation and preserved left ventricular function, early surgery is associated with improved long-term clinical outcomes compared with the conventional treatment strategy by decreasing cardiac mortality and hospitalization due to congestive heart failure. We therefore suggest that early surgery may further improve clinical outcomes in asymptomatic severe mitral regurgitation with a high likelihood of mitral valve repair. Further prospective, randomized studies are needed to confirm the efficacy of early surgery.

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