Survival After Coronary Revascularization, With and Without Mitral Valve Surgery, in Patients With Ischemic Mitral Regurgitation

Benjamin H. Trichon, MD; Donald D. Glower, MD; Linda K. Shaw, MS; Christopher H. Cabell, MD; Kevin J. Anstrom, PhD; G. Michael Felker, MD; Christopher M. O’Connor, MD

Background—The most appropriate treatment for patients with ischemic mitral regurgitation (IMR) is often debated. We compared the survival rates of patients with IMR undergoing different treatment strategies, namely: medical therapy, percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), and CABG + mitral valve (MV) surgery.

Methods and Results—Patients undergoing catheterization between 1986 and 2001 were included. IMR was defined as: grade 2+ mitral regurgitation (MR) and significant coronary artery disease (CAD) without primary mitral valve disease. Patients undergoing catheterization for the evaluation of congenital or other valvular heart disease were excluded. Multivariable Cox proportional hazards modeling was utilized to assess the independent relation between treatment and survival. Propensity score methods were used to correct for the nonrandom assignment of treatment. Of the 2,757 patients who met study criteria: 1,305 were treated medically, 537 underwent PCI, 687 underwent CABG, and 228 underwent CABG + MV surgery. The median duration of follow-up was 3.2 (0.9, 7.1) years. Patients undergoing CABG + MV surgery had more severe MR and more severe heart failure than those treated by other modalities. After adjusting for differences in baseline characteristics, patients undergoing PCI, CABG, and CABG + MV surgery had a 31% (hazards ratio [HR] 0.69; P = 0.0001), 42% (HR 0.58; P = 0.0001), and 42% (HR 0.58; P = 0.0001) reduction in the risk of death, respectively, compared with those undergoing medical therapy. The performance of mitral valve surgery with CABG was not associated with improved survival versus CABG alone (P = 0.258).

Conclusions—Among patients with IMR, treatment with PCI, CABG, or CABG + MV surgery is associated with improved survival compared with medical therapy. (Circulation. 2003;108[suppl II]:II-103-II-110.)

Key Words: mitral valve ■ coronary artery disease ■ mitral regurgitation

I

MR is defined as mitral regurgitation complicating the manifestations of CAD in the absence of primary leaflet or chordal pathology.1 The presence of IMR is independently related to death after myocardial infarction,2 and in patients with ischemic left ventricular (LV) dysfunction.3 The pathophysiology of ischemic MR is complex, and its presence may be related to several underlying processes that are often difficult to separate in a given patient.4 Because of its complex pathophysiology and heterogeneous clinical presentation, the proper treatment of ischemic MR is often debated, and the relative utility of revascularization— with and without concomitant mitral valve surgery—is uncertain.5

In this study, we sought to compare the survival rate of patients with IMR undergoing various treatment strategies, namely: medical therapy, PCI, CABG, or CABG + MV surgery. We also sought to identify other clinical predictors of survival in this patient group.

Methods

Patient Selection and Definition of IMR

We analyzed prospectively collected data from the Duke Cardiovascular Databank on patients who underwent diagnostic cardiac catheterization at Duke University Medical Center for the evaluation of CAD between the years of 1986 and 2001. Patients were qualified as having IMR if the following criteria were present: ≥2+ MR by left ventriculography, significant CAD (≥75% lesion in 1 or more coronary vessels), and the absence of intrinsic mitral valve disease. Patients with known or suspected congenital heart disease, primary disease of another cardiac valve, prior CABG, or prior PCI within the previous 12 months were excluded, as were patients who had undergone previous valve surgery. Baseline variables were stored in the Duke Cardiovascular Databank using methods described previously.6

Cardiac Catheterization

Data from index catheterization were prospectively collected. Coronary angiography was performed using standard techniques. Ste-notic lesions were graded subjectively by visual consensus of at least
2 experienced observers on an ordinal scale of 0%, 25%, 50%, 75%, 95%, or 100%. The extent of CAD was characterized by the traditional 1, 2, or 3-vessel disease classification and by the Duke Coronary Artery Disease Index.7

Biplane views were obtained during all ventriculograms. Angiographic LV ejection fraction and regional wall motion were determined by centerline regional wall motion analysis.8 In the presence of excessive ventricular ectopy or catheter-induced MR, ventriculography was repeated until technically adequate. Interpretation of all ventriculography data was performed by at least 2 experienced observers.

Assessment of MR
The degree of MR was graded visually by the following criteria: 0 = no systolic regurgitation of contrast into left atrium; 1+ = minimal regurgitation, clearing rapidly with the subsequent beat; 2+ = moderate opacification of left atrium, clearing within several beats; 3+ = intense opacification of the left atrium, becoming equal to that of the left ventricle; and 4+ = dense opacification of left atrium to a greater degree than the left ventricle, with reflux of contrast material into the pulmonary veins.2

Treatment Strategies
Patients were assigned to a treatment strategy based on whether they underwent PCI, CABG, or CABG + MV surgery within 90 days of catheterization. To minimize the influence of waiting-time bias, patient deaths in the medical treatment group occurring <5 days from the time of catheterization were excluded. When patients were treated with one of the above strategies, their medical follow-up was censored, and their follow-up was restarted at time zero in the appropriate treatment group.

Operative strategies for PCI and CABG were left to the discretion of the attending physician. Similarly, the decision to perform mitral valve repair or replacement, and the choice of mitral prosthesis, was at the discretion of the attending surgeon. Once a patient was assigned to treatment with PCI or surgery, he or she was maintained in that group until death or the end of the follow-up period, regardless of therapeutic crossovers.

Clinical Follow-Up
Follow-up contact for survival status was conducted at 6 months and 1 year, then annually thereafter, using self-administered questionnaires and telephone follow-up to nonresponders. Patients not contacted through this mechanism had vital status determined through a search of the National Death Index. Survival status is complete on 99% of the patients.

Statistical Analysis
Baseline characteristics are described using medians and 25th and 75th percentiles for continuous variables, and proportions for discrete variables. Comparisons among groups were made with the Pearson χ² test for discrete variables, and the Kruskal-Wallis test for continuous variables. Survival curves for various groups were constructed using the Kaplan-Meier method, and comparisons were made using the log-rank test. Cox proportional hazards regression modeling was used to adjust for differences in demographic and clinical variables, and to assess the independent effect of treatment strategy on survival. Variables thought to have clinical importance, and those with P<0.10 in the univariable analysis, were included in the stepwise multivariable model to determine those that were independently associated with survival. The variables included: age, ejection fraction, race, history of angina, gender, diabetes mellitus, tobacco use, hypertension, New York Heart Association (NYHA) class, peripheral vascular disease, cerebral vascular disease, noncardiac comorbidities (Charlson co-morbidity index), myocardial infarction within 48 hours, grade of MR, Duke CAD Index, and treatment strategy. A stepwise selection process was used to determine significant predictors of outcome. Adjusted survival curves were generated for patients in the various treatment arms. We checked for interactions between treatment strategy and the follow-up modalities, and the median ejection fraction was lowest among patients undergoing PCI. LV systolic dysfunction was present among patients treated by all of the modalities, and the median ejection fraction was lowest among patients receiving medical therapy. Severe (NYHA III/IV) heart failure symptoms were also more common among patients in this group. Patients treated medically were significantly older, and had a higher frequency of diabetes mellitus and renal insufficiency, than those undergoing either percutaneous or surgical therapy.

Figure 1 shows the severity of MR among patients in each treatment group. Patients treated with CABG + MV surgery had a higher frequency of grade 3+ or 4+ MR, and a lower frequency of grade 2+ MR than other treatment groups. The severity of grade 4+ MR was lowest among patients undergoing CABG alone.

Survival
Table 2 shows the unadjusted survival estimates at 1, 3, and 5 years for patients stratified by treatment. Patients receiving medical therapy had the lowest survival rate at all of the time points, with a 5-year survival rate of just >40%. Among patients undergoing PCI or surgical therapy, the 5-year survival rates were >60%.

Table 3 shows the variables associated with survival in the unadjusted analysis. Characteristics with the strongest association with mortality included decreasing ejection fraction, increasing age, symptoms or signs of heart failure, and greater numbers of medical comorbidities (as measured by the Charlson index; P=0.0001 for all). Treatment with any strategy other than medical therapy (PCI, CABG, or CABG + MV surgery) was significantly associated with improved survival (P=0.0001). The Kaplan-Meier curves illustrating the survival of patients undergoing the various treatment strategies are shown in Figure 2.
The results of the Cox-proportional hazards analysis identifying the independent relation between clinical variables and mortality are shown in Table 4. Increasing age, decreasing ejection fraction, and the Charlson index were strong predictors of mortality.

After adjustment for other important clinical characteristics, patients with ischemic MR treated with PCI had a 31% reduced risk of death compared with those receiving medical therapy ($P=0.0001$). Patients treated with CABG or CABG + MV surgery had a 42% reduction in the risk of death compared with medical therapy ($P=0.0001$; Figure 3). The performance of MV surgery at the time of CABG was not associated with an additional survival benefit beyond CABG alone ($P=0.258$). Adjusted survival curves for patients in all of the treatment groups are shown in Figure 4.

### Table 1. Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Medicine (n=1305)</th>
<th>PCI (n=537)</th>
<th>CABG (n=687)</th>
<th>CABG + MVR (n=228)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>51.7</td>
<td>57.9</td>
<td>47.0</td>
<td>47.8</td>
<td>0.001</td>
</tr>
<tr>
<td>Race: caucasian</td>
<td>75.5</td>
<td>79.4</td>
<td>83.2</td>
<td>85.7</td>
<td>0.001</td>
</tr>
<tr>
<td>History of MI</td>
<td>59.3</td>
<td>80.3</td>
<td>69.1</td>
<td>48.3</td>
<td>0.001</td>
</tr>
<tr>
<td>History of CHF</td>
<td>61.1</td>
<td>24.2</td>
<td>32.5</td>
<td>67.7</td>
<td>0.001</td>
</tr>
<tr>
<td>CHF class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>None</td>
<td>39.8</td>
<td>77.7</td>
<td>69.6</td>
<td>32.3</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>10.8</td>
<td>8.3</td>
<td>9.3</td>
<td>10.6</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>11.4</td>
<td>3.1</td>
<td>5.3</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>19.0</td>
<td>6.5</td>
<td>9.2</td>
<td>21.7</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>19.0</td>
<td>4.4</td>
<td>6.6</td>
<td>16.4</td>
<td></td>
</tr>
<tr>
<td>Carotid bruits</td>
<td>15.1</td>
<td>9.1</td>
<td>15.9</td>
<td>11.5</td>
<td>0.002</td>
</tr>
<tr>
<td>Number diseased vessels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30.3</td>
<td>43.8</td>
<td>4.7</td>
<td>19.7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>28.0</td>
<td>37.6</td>
<td>20.8</td>
<td>34.2</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>70 (61, 76)</td>
<td>67 (59, 74)</td>
<td>68 (61, 74)</td>
<td>68 (62, 74)</td>
<td>0.0001</td>
</tr>
<tr>
<td>CAD duration (mos)</td>
<td>25 (1, 101)</td>
<td>2 (0.1, 53)</td>
<td>13 (0.5, 85)</td>
<td>12 (0.5, 72)</td>
<td>0.0001</td>
</tr>
<tr>
<td>EF</td>
<td>34 (25, 47)</td>
<td>47 (37, 57)</td>
<td>42 (33, 52)</td>
<td>45 (35, 55)</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

### Table 2. Unadjusted Survival Estimates

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1-year</th>
<th>3-year</th>
<th>5-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical therapy</td>
<td>62.3%</td>
<td>51.8%</td>
<td>41.2%</td>
</tr>
<tr>
<td>PCI</td>
<td>82.2%</td>
<td>75.0%</td>
<td>68.8%</td>
</tr>
<tr>
<td>CABG</td>
<td>83.3%</td>
<td>73.7%</td>
<td>64.5%</td>
</tr>
<tr>
<td>CABG + MVR/R</td>
<td>79.1%</td>
<td>68.4%</td>
<td>61.6%</td>
</tr>
</tbody>
</table>

Interactions

We found a significant interaction between treatment strategy and the severity of CAD as measured by the Duke CAD Index. Coronary artery bypass grafting, with or without MV surgery, was associated with improved survival among patients with more severe CAD (higher Duke index), while PCI was the preferred strategy among patients with less severe CAD (lower Duke Index). There was no incremental advantage of CABG/MV surgery beyond CABG alone regardless of CAD severity. We found no significant interaction between the severity of MR and treatment strategy.

Propensity Score Analysis

The results of the propensity score analysis are shown in Figure 5. When CABG is compared with medical therapy (Figure 5a), patients more likely to receive CABG (quintile 4 and 5) had an improved survival with that strategy (P<0.001)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Wald X²</th>
<th>P</th>
<th>HR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI</td>
<td>20.0</td>
<td>0.0001</td>
<td>0.689</td>
<td>0.586, 0.811</td>
</tr>
<tr>
<td>CABG</td>
<td>59.5</td>
<td>0.0001</td>
<td>0.578</td>
<td>0.503, 0.664</td>
</tr>
<tr>
<td>CABG + MVR/R</td>
<td>25.7</td>
<td>0.0001</td>
<td>0.581</td>
<td>0.471, 0.716</td>
</tr>
<tr>
<td>Age (HR per 10 year ↑)</td>
<td>160.6</td>
<td>0.0001</td>
<td>1.415</td>
<td>1.341, 1.493</td>
</tr>
<tr>
<td>MR grade (2, 3, 4 +)</td>
<td>15.3</td>
<td>0.0001</td>
<td>1.160</td>
<td>1.077, 1.249</td>
</tr>
<tr>
<td>CHF class</td>
<td>28.9</td>
<td>0.0001</td>
<td>1.104</td>
<td>1.065, 1.145</td>
</tr>
<tr>
<td>Duke CAD index</td>
<td>45.6</td>
<td>0.0001</td>
<td>1.009</td>
<td>1.006, 1.011</td>
</tr>
<tr>
<td>Charlson</td>
<td>64.8</td>
<td>0.0001</td>
<td>1.221</td>
<td>1.163, 1.282</td>
</tr>
<tr>
<td>History of renal disease</td>
<td>11.7</td>
<td>0.0006</td>
<td>1.292</td>
<td>1.115, 1.497</td>
</tr>
<tr>
<td>EF (HR per 5 unit ↓)</td>
<td>91.6</td>
<td>0.0001</td>
<td>1.102</td>
<td>1.080, 1.124</td>
</tr>
<tr>
<td>AMI (same or previous day)</td>
<td>18.7</td>
<td>0.0001</td>
<td>1.408</td>
<td>1.206, 1.644</td>
</tr>
</tbody>
</table>

PCI=percutaneous coronary intervention. CABG=coronary artery bypass graft.
Percutaneous Revascularization and IMR

We found that percutaneous revascularization was associated with improved survival in our cohort of patients with IMR. The shape of the adjusted survival curve of patients undergoing PCI reveals an early drop in survival within the first several months of catheterization (Figure 5). This phenomenon is likely related to the higher frequency of MI (80.3%) among patients in the PCI group compared with those treated medically (59.3%) or surgically (69.1% CABG, 48.3% CABG + MV surgery). When these curves are plotted excluding patients with recent (<48 hours) MI, the early dip in the survival curve is no longer present (data not shown).

Few investigators have specifically assessed the effect of PCI on outcome among patients with IMR. Ellis et al examined the impact of IMR on survival in >4,200 patients undergoing elective PCI at their institution over a 3-year period. Three-year survival was lower among patients with more severe grades of IMR compared with those with no or mild IMR; with the lowest survival rate among patients with severe IMR and LV ejection fraction ≤40% (46.5%). These results suggest that IMR is an important predictor of adverse prognosis after PCI, especially among patients with LV systolic dysfunction. In contrast, several investigators have suggested that patients with severe CAD, LV systolic dysfunction, and ≥3+ MR may benefit from PCI with concomitant intra-aortic balloon pumping.10,11 Additionally, primary angioplasty in the setting of ST-segment elevation MI may reduce the severity of MR as assessed at subsequent catheterization.12 However, in a large series from our institution, primary reperfusion therapy with PCI (or fibrinolytic therapy) during ST-segment elevation MI did not reliably reverse valve incompetence.2 Our results suggest that a strategy of PCI alone, when performed in the appropriate patient, is associated with improved survival versus medical therapy.

Surgical Revascularization for IMR

The optimal surgical treatment of IMR in patients with varying degrees of regurgitation and manifestations of CAD is controversial. An important reason for this controversy is the complex pathophysiology and heterogeneous clinical presentation of these patients. Most reports in the current literature focus on the question of whether mitral valve repair or mitral valve replacement is the more appropriate strategy and mortality.

Discussion

The primary goal of our study was to investigate the relation between various treatment strategies and survival among a cohort of patients with IMR. We found that revascularization, with either PCI or CABG, was associated with improved survival as compared with medical therapy alone. Among the patients in our cohort, MV surgery in addition to CABG was not associated with an incremental reduction in mortality beyond CABG alone. We also identified several independent predictors of mortality in patients with IMR, including increasing patient age, decreasing ejection fraction, more severe medical comorbidities, and more severe heart failure.

Figure 3. HR plot of the independent relation between treatment strategy and mortality.

Figure 4. Adjusted survival curves: medical/PCI/CABG/CABG + MV surgery.
mitral valve procedure. Revascularization, as opposed to placement of a mitral annular ring, may more directly address the underlying processes described above that led to the development of IMR. Though patients with IMR may have residual regurgitation after CABG during short-term follow-up, its relation to long-term survival is less certain. The magnitude of this residual regurgitation may decrease over time with favorable reverse remodeling of the LV after successful revascularization.

Several small studies have compared outcomes among patients with and without IMR undergoing CABG alone.

Figure 5. Comparison of each treatment strategy stratified by propensity scoring (*<15 patients in quintile; †P<0.05. See text for details).
Duarte et al\textsuperscript{19} have reported their experience with 58 patients undergoing CABG alone with moderate MR (grade 3+) from 1977 to 1983 whose 5- and 10-year actuarial survival was nearly identical to a control group without preoperative MR. They conclude that moderate ischemic MR need not be corrected at the time of CABG. In contrast to our cohort, the patients in their study had relatively preserved LV systolic function (mean EF\textsuperscript{}% = 53\%), and only 10\% had NYHA class III or IV heart failure symptoms. Additionally, \approx 25\% of their patients had intrinsic structural abnormalities of their mitral valves (leaflet prolapse or rheumatic heart disease) and not solely ischemic MR. The outcome of patients with a similar degree of IMR undergoing CABG + MV surgery was not considered.

Christenson et al\textsuperscript{20} recently reported the clinical outcomes of a cohort of 56 patients with mild to moderate IMR undergoing CABG alone. Almost 90\% had either grade 1 or 2+ MR. Five patients had coexistent repair of a LV aneurysm. The 54 hospital survivors were followed for a mean period of 12 months, and there was only 1 death (8 months postoperatively). While the duration of follow-up was short, the severity of MR was mild, and 10\% had LV aneurysm repair, these results suggest that CABG alone may be appropriate therapy in some patients. Again, the outcomes of these patients were not directly compared with similar individuals undergoing CABG + MV surgery.

Ryden et al\textsuperscript{21} compared the outcomes among 89 patients with grade 2+ IMR undergoing CABG alone to 4,709 patients without IMR undergoing CABG over a 3-year period. When patients with and without ischemic MR were matched for baseline characteristics, there were no differences in survival at 30 days, 1 year, or 3 years.

Additional evidence supporting the role of revascularization among patients with IMR can be extracted from the recent study by Gillinov et al comparing outcomes after MV repair and MV replacement in a cohort of 482 patients with IMR.\textsuperscript{13} After subdividing their cohort based on risk, they concluded that \textgreater 70\% of patients would benefit from a strategy of repair over replacement. However, the benefit of valve repair was negated if an internal thoracic artery was not used for revascularization. These, and other studies\textsuperscript{22,23} reaffirm the central role of revascularization for patients with IMR and suggest that CABG alone may be appropriate therapy in select patients.

Our results support the belief that revascularization, via either percutaneous or surgical means, is an important therapeutic goal in patients with IMR and is associated with an improved survival compared with medical therapy. Restoration of epicardial coronary flow, attenuation of adverse LV remodeling and the progression of LV dysfunction, and improvement in MV leaflet coaptation are possible mechanisms to explain this apparent benefit.

**Role of Mitral Valve Surgery**

Our results, which suggest that mitral valve surgery provides little additional survival benefit beyond CABG alone, deserve additional exploration. This finding could be explained by several factors inherent to our observational analysis. As in any study of this nature, assignment to treatment was not randomized, and imbalances in the baseline characteristics between patients receiving CABG and CABG + mitral valve surgery were present. Most notably, 24\% of patients undergoing CABG had 3+ or 4+ MR, compared with 81\% undergoing CABG + MV surgery. Additionally, patients undergoing CABG + MV surgery had more severe (NYHA III/IV) heart failure (39\%) than those undergoing CABG alone (16\%). In our propensity score analysis, patients with more severe IMR and more severe heart failure were more likely to be treated with CABG + MV surgery than CABG alone (c-statistic=0.89). Residual selection bias, not accounted for by our observational technique, is likely present. This may obscure an additional survival benefit of mitral valve surgery beyond CABG alone.

In addition, the relatively small sample size may be obscuring true differences in outcomes between those undergoing CABG alone or CABG + MV surgery. For instance, in our propensity model, there was a trend toward improved survival with CABG + MV surgery (Figure 5b). If accurate prediction models can be developed, then CABG + MV surgery might be a superior strategy in the appropriate patient population.

Alternatively, mitral valve surgery in patients with IMR may primarily affect other important end points. This treatment strategy may very well have significant effects on the frequency of heart failure hospitalizations, the progression of LV dysfunction, and overall functional status. Several reports have demonstrated that residual MR after CABG is associated with more frequent episodes of severe angina and more severe symptoms of heart failure.\textsuperscript{16} Others have shown that mitral valve repair in patients with severe, ischemic cardiomyopathy can improve NYHA class dramatically.\textsuperscript{24,25}

Among patients receiving CABG + MV surgery, we did not consider those undergoing MV repair and MV replacement separately in order to minimize the number of treatment comparisons among small groups of patients. These patients likely have different baseline characteristics, different clinical presentations of IMR, and different survival rates. Several reports have suggested that MV repair should be the preferred strategy when possible, though the magnitude of benefit is very dependent on the severity of illness of the patient with IMR.\textsuperscript{13-15}

**Study Limitations**

The limitations of our study related to its observational nature are discussed above. Additionally, with the data available for this analysis, we were unable to characterize the predominant mechanism of IMR in patients included in our cohort. Studies utilizing novel imaging technologies, such as 3-dimensional echocardiography, aim to more precisely characterize the mechanism, and, therefore, the most appropriate therapy, of IMR.\textsuperscript{26} Alternative surgical strategies beyond the placement of an annular ring may have a more profound effect on outcome than observed in our study.\textsuperscript{16} A limitation of our study is the use of ventriculography to estimate the presence and severity of MR. The assessment of MR in this manner is qualitative and subject to interobserver variability. We attempted to minimize this through simultaneous interpretation by several operators. Echocardiographic
data were not routinely obtained and reported in this cohort, thus the correlation between the degree of MR by ventriculography and echocardiography in our patient sample is unknown. Others have demonstrated that these two methods are comparable with regard to their assessment of the mitral apparatus and the degree of regurgitation.27 We attempted to minimize the possibility of “catheter-induced” MR by ensuring proper catheter position and mandating a repeat ventriculogram when initially accompanied by excess ectopy. A small proportion of patients received conscious sedation during the catheterization; this may have led to an underestimation of the severity of MR visualized by ventriculography.

Conclusions

Among patients in our cohort, percutaneous or surgical revascularization, with or without concomitant mitral valve surgery, was associated with improved survival compared with medical therapy in patients with ischemic MR. Acknowledging the limitations of our observational analysis, we could not detect a survival benefit in patients with IMR receiving CABG + MV surgery beyond CABG alone. A randomized controlled trial is needed to assess the efficacy of mitral valve surgery in patients with ischemic MR.

References

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