Rethinking Mitral Valve Surgery During the Golden Years

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The benefit of mitral valve (MV) surgery in elderly patients remains a major area of controversy in the treatment of mitral regurgitation (MR). The article by Vassileva et al. in this issue of Circulation examines contemporary data from Medicare to determine how older patients fare after undergoing isolated MV surgery. This topic has important health and economic implications, given the high prevalence of hemodynamically significant MR in patients >75 years of age. Older studies have shown high mortality in elderly patients undergoing MV replacement in excess of 14%, even >20% in low-volume centers. However, concomitant coronary artery bypass graft surgery is common in older patients, and previous MV surgery studies in the elderly contained a mix of patients often needing coronary artery bypass graft surgery or interventions on other valves. In addition, the studies included both MV repair and MV replacement patients, undoubtedly skewing the risk profile because mortality and adverse outcomes for MV replacement have consistently been shown to be higher in most studies.

Because of this higher mortality, the most recent American College of Cardiology/American Heart Association valve guidelines suggest a different standard of care should be applied for elderly patients with asymptomatic or minimally symptomatic MR. The guidelines suggest a conservative, medical management approach in these patients. This recommendation is based on natural history studies and expert consensus rather than randomized trial data of surgical versus conservative management. In contrast to asymptomatic or mildly symptomatic patients, the recommendation is for operative repair in symptomatic patients, regardless of age, when the patient is a reasonable candidate.

Over the years, increasing numbers of patients have received MV repair as opposed to replacement, with a rate of 69% in the Society of Thoracic Surgeons (STS) database in 2007 for all surgeries for primary MR. Because complication rates are lower with repair for all patients and because repair has become more common, there is a need to determine whether there are increased repair rates and better outcomes in elderly patients undergoing MV surgery.

To illustrate the issues facing the clinician, we consider 2 patient scenarios in which the data from this analysis may inform our decision to operate. The first patient is an 82-year-old small Asian woman with chronic atrial fibrillation who has minimal symptoms, no comorbidities, and moderate to severe MR with MV prolapse and annular dilation. According to the STS Database calculator (http://www.sts.org), her 30-day mortality for MV repair is 3.8% and for replacement is 6.8%. The second patient is a 78-year-old averaged-sized white man with class II heart failure symptoms and atrial fibrillation with severe MR caused by MV prolapse. Given his history of hypertension and diabetes mellitus, his mortality for MV repair is 2.4% and for replacement is 3.9%. At a first analysis, the male patient would appear to have lower mortality than the female patient despite greater comorbidities. However, are these clinical data sufficient for making the decision to operate?

Vassileva et al. examine the relative mortality (operative and late) associated with MV surgery in Medicare beneficiaries, comparing MV repair with MV replacement. They examined a contemporary cohort of almost 184,000 patients who received surgery between 1999 and 2009. By limiting the analysis only to subjects with isolated MV surgery, with the exception of tricuspid valve repair or replacement, they initially included only 31% (≈57,000) of the patients who underwent MV replacement and repair during this period. Any patient with previous cardiac surgery or the need for other cardiovascular procedures was excluded. Further exclusions brought the ultimate sample size down to ≈47,000. Nevertheless, the strengths of this study are the large number of subjects included in the analysis and the fact that it reflects real-world practice. However, the use of an administrative database creates a number of important limitations, most of which the authors outlined in the Discussion. They have controlled for a number of important baseline characteristics.

Unique to this study, Vassileva et al. demonstrate the true mortality for isolated MV surgery in the elderly. This is both a strength and a detractor. It helps eliminate the confounding of outcomes that could be attributable to comorbidities in sicker patients such as those undergoing simultaneous coronary artery bypass graft surgery. However, isolated MV surgery in the elderly makes up a minority of all MV surgeries in this demographic; thus, the analysis has more confined clinical applicability.

In contrast to the overall trend showing that MV repair has come to dominate replacement for primary MR in this Medicare database of elderly patients, the trend was reversed: 64% underwent replacement. The lower rate of repair may be attributable to the higher prevalence of mitral annular calcification in the elderly that limits the use of ring annuloplasty, the presence of anterior or bileaflet degenerative MV disease, or a higher prevalence of Carpentier class IIIb, so-called functional, MR.

Perhaps the most dramatic and impactful finding of the study is the demonstration of very low mortality of 3.9% for
MV repair patients and only 5.1% for patients >75 years of age. This finding leads us to conclude that the occasional elderly patient with primary MR who meets current indications for MV surgery should not be denied MV repair on the basis of age alone.

Turning to the majority of patients who underwent replacement, the operative mortality was 8.9% overall and 10.6% for patients >75 years of age. This mortality is high, but not as high as in previous studies that did not limit inclusion to only isolated MR. What is it about MV replacement that makes mortality so much higher? This study shows that the patients are a sicker population with more heart failure, atrial fibrillation, and other comorbidities; are more likely to be female; and are more likely to have nonelective surgery done in low-volume centers. On a population level, predictors of repair were male sex, younger age, elective surgery, and most significantly, annual mitral procedure volume >40 cases per year.

However, the study could not predict the valvular anatomic features that determine repair versus replacement. Because there is such a divergence of risk between the repair and replacement groups, preoperative prediction of the likelihood of repair based on the echocardiographic valve appearance is of paramount importance. Such differentiation would be critical to advising elderly patients of their risk and in planning elective intervention. The echocardiograms from the 2 patients described above are shown in Figures 1 and 2. The female Asian patient had minimal calcification and an increased annular measurement, making repair likely (Figure 1). The white male patient had significant posterior annular calcification and a small annulus, likely necessitating replacement (Figure 2). Thus, after consideration of the valve morphology, the predicted 30-day mortality was nearly equal for the 2 patients, whereas the initial assessment predicted twice the mortality for the older woman. Unfortunately, even with excellent preoperative echocardiographic images, preoperative prediction of repair versus replacement is not always possible.12

A delay from symptom onset to valve surgery of >1 year was observed in this study.1 This finding is not surprising, given the misgivings that both physicians and patients may have about the risks of operating on patients of an older age. However, in these patients, even the high risk of operative mortality for MV replacement may be an acceptable risk to potentially reduce the symptoms and progression of heart failure.

Figure 1. Transthoracic echocardiographic apical 4-chamber view showing severe mitral regurgitation with mild posterior leaflet prolapse, annular dilation, and minimal mitral annular calcification.

Figure 2. Transthoracic echocardiographic long-axis view showing severe mitral regurgitation with severe mitral annular calcification and minimal annular dilatation.
It is said that in medicine we should strive to make patients either feel better or live longer, preferably both. Does MV surgery in older patients accomplish either of these aims? The durability of the repair and the long-term improvement in MR severity and, most important, patient symptoms could not be gleaned from this analysis of an administrative database. It cannot be understated how important symptom benefit (versus survival benefit) is in the elderly population, particularly in those >75 years of age. What remains to be determined is whether the elderly gain as much symptom benefit from MV surgery as younger patients and whether long-term symptom benefit outweighs the operative risk and recovery time. Although a survival advantage can be inferred from the Kaplan–Meier analysis, it remains unproven. After the initial mortality associated with surgery, survival in the population who received MV repair is equal to that of expected survival, whether the patients are <75 or >75 years of age. For replacement, the survival is less than expected in both age groups. There is no control group of medically managed patients.

Unfortunately, data on ejection fraction and left ventricular volumes were not available.1 In addition to symptoms, these variables form the basis of our current valve surgery guidelines. If there was a delay in referral for valve surgery, as would be inferred from the number of patients with heart failure symptoms for >1 year, it is possible that the MR was longstanding and that irreversible left ventricular remodeling may have occurred. If so, the presence of LV dysfunction may have skewed outcomes, particularly for MV replacement. The reasons for delay in surgical referral and the impact that these delays had on outcomes cannot be determined.

Comparison With Previous Studies
A recent study linked the STS database to longitudinal claims data from the Centers for Medicaid and Medicare Services and examined outcomes in 14604 patients with isolated MV repair performed between 1991 and 2007.13 Patients with previous surgery, endocarditis, and emergency operations were excluded. Operative mortality was 2.59%, lower than the repair cohort in the Vassileva et al report. The mean follow-up was 5.9 years (range, 1–18 years), with survival during follow-up of 74.9%. The 10-year event rates for mitral reoperation, heart failure, bleeding, and stroke were 6.2%, 30.1%, 15.3%, and 16.4%, respectively. The 10-year actuarial survival of 57.4% was equivalent to the matched US population and similar to the 53% in the Vassileva et al report. Unlike the present study, data on ejection fraction were available, and the mean ejection fraction for the population was 53%. This study did not compare isolated MV repair with replacement, and a similar analysis would be very useful based on the power of these linked databases.

A recent meta-analysis of 24 studies examined MV surgery in octogenarians and showed a much lower mortality with repair (7.3%) compared with replacement (14.2%).14 Many of the included studies were not confined to isolated MV surgery. However, in the subset with isolated MV surgery, the 5-year survival was 56%, impressive in a cohort of octogenarians.

Notably missing in all of these studies is a comparison with conservative medical management in elderly patients. However, substantial data suggest that MR, independently of mechanism, confers excess morbidity and mortality.

Because the elderly constitute a rapidly growing segment of the population, contemporary studies such as this are essential to challenge assumptions about negative surgical outcomes based on age alone. Using a patient group with a median age of 75 years, almost one quarter of whom were >80 years of age, this study helps guide our management of elderly patients with MV regurgitation.

The major finding of this study is the very low operative mortality for isolated MV repair.1 Patients who are candidates for an isolated MV repair who are otherwise expected to have a normal life expectancy, regardless of age or severity of symptoms, should be offered repair. Unfortunately, isolated MV repair in a contemporary Medicare population still accounts for only 1/10th of all MV surgeries. The patient is most likely to receive a repair if surgery is performed under elective circumstances in a center with a large volume of MV surgery. However, specific patient characteristics cannot be ignored, especially those related to morphology of the valvular apparatus such as leaflet thickening and calcification, annular dilation and calcification, and the anatomy of the subvalvular apparatus. Many elderly patients have several mechanisms contributing to the valvular dysfunction, and standard repair techniques with predictable durability are often not possible.15

In the United States, the only alternative to surgical MV repair is currently MV replacement, which carries greater morbidity and mortality in the elderly, although this study suggests that mortality is lower than previously shown. The benefits and risks of MV replacement in the elderly should still be carefully weighed, but not at the expense of delaying an inevitable procedure and incurring the even higher risks attendant with nonelective surgery and surgery in patients who have developed heart failure as a result of their MR. As percutaneous treatments become available for MR, it is hoped that high-risk patients can be treated with lower morbidity and mortality.16

Should the guidelines be revised to remove the statement urging a conservative approach in asymptomatic or minimally symptomatic patients? This study, along with other recent studies, suggests that when the valvular and clinical characteristics are propitious for repair, the same criteria should be applied across all age groups. When MV replacement is likely, the outlook remains murky. The high operative risk may not be justified for an asymptomatic patient, unless it could be shown that early surgery could reduce later development of symptoms such as heart failure.

As our patients get older and perhaps wiser, it is imperative that our research advances. We need additional options for treating common problems such as MR and more effective decision analysis for the elderly who are considering cardiac interventions. We must consider quality and quantity of life, as well as interventional risk, as we assist patients in making the best choices for their golden years.

Disclosures
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References
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