

Preoperative heart failure in the Medicare population undergoing mitral valve repair and replacement: An opportunity for improvement

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Background: Elderly patients are under-represented in most surgical series of mitral valve surgery. The impact of preoperative heart failure (HF) on the outcomes of this subset has not been extensively studied.

Methods and results: The study included 45,082 Medicare beneficiaries who underwent primary isolated mitral valve repair (MVP) (n = 16,850) or replacement (MVR) (n = 28,232) from 2000 to 2009. Medicare claims from the year before and the year of the index hospitalization were reviewed for documentation of HF to examine the operative mortality and long-term survival of patients with and without preoperative HF. Preoperative HF was present in 52.5% and 64.8% of patients who underwent repair and replacement, respectively. Duration of HF greater than 3 months was present in a significant proportion of patients (18.2% for MVP and 22.7% for MVR). Adjusted operative mortality was higher for patients with preoperative HF (MVP odds ratio [OR], 1.46; 95% confidence interval [CI], 1.21-1.78; MVR OR, 1.36; 95% CI, 1.23-1.51). Patients without preoperative HF had better long-term survival (MVP hazard ratio [HR], 2.23 [95% CI, 2.09-2.36]; MVR HR, 1.80 [95% CI, 1.73-1.86]). After adjustment, a preoperative HF diagnosis was still associated with 52% and 36% increased risk of death over the 10-year follow-up period for patients who underwent MVP and MVR, respectively. Preoperative HF duration greater than 3 months conferred an excess 28% higher risk of death on long-term follow-up compared with patients with HF less than 3 months.

Conclusions: Preoperative HF is present in a large number of elderly patients undergoing primary isolated mitral valve surgery and adversely affects their short-term and long-term survival, irrespective of procedure type (repair or replacement). The study supports the early identification of elderly patients with mitral valve disease and referral to surgery before the onset of HF. (*J Thorac Cardiovasc Surg* 2014;148:1393-9)

The incidence of valvular heart disease was once believed to be declining as a result of decreased incidence of rheumatic heart disease, but degenerative valvular disease has become highly prevalent in the developed world with the rapidly increasing aging population.¹ For example, the prevalence of mitral regurgitation (MR) in the general population is 1.7% but this increases substantially with age and affects 9.3% of adults older than 75 years of age.¹ Nevertheless, the management of mitral valve (MV) disease in the elderly remains an area of major controversy.

The established benefits of early surgical intervention in preventing left ventricular dysfunction and significant improvement in outcomes have led to the development of guidelines that support early intervention in general, but current American College of Cardiology (ACC)/American

Heart Association (AHA) guidelines still advise reserving surgery only for severely symptomatic elderly patients.² These contradictory recommendations mainly stem from reported mortality rates of the elderly undergoing MV surgery exceeding 14% and as high as 20% in low-volume centers.² However, the data from these studies mostly reflect combined coronary artery bypass grafting (CABG) and MV surgery. Moreover, these outcomes come from an era when MV repair was performed less frequently. More recent studies have shown a significant decline in morbidity and mortality among the elderly. In a large nationwide study of Medicare beneficiaries with a median age of 75 years who underwent primary isolated MV surgery between 2000 and 2009, Vassileva and colleagues³ demonstrated operative mortality for isolated MV repair to be as low as 3.9% and that of MV replacement to be 8.9%, which is substantially lower than previously reported data.

Delaying surgical intervention for MV disease has several consequences. The development of heart failure (HF) in this setting is predictive of poor outcome, even after surgical correction. Within the elderly patient subset, which is already characterized by higher surgical risk because of the frequent coexistence of associated comorbidities, the presence of HF, a potentially preventable occurrence, further contributes to worse surgical outcomes. We sought to quantify the impact of HF on the outcomes among elderly

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Abbreviations and Acronyms

AHA	= American Heart Association
BASF	= Beneficiary Annual Summary Files
CABG	= coronary artery bypass grafting
CI	= confidence interval
CMS	= Centers for Medicare and Medicaid Services
COPD	= chronic obstructive pulmonary disease
ESRD	= end-stage renal disease
HF	= heart failure
HR	= hazard ratio
IQR	= interquartile range
LOS	= length of stay
LV	= left ventricular
MEDPAR	= Medicare Provider Analysis and Review
MV	= mitral valve
MVP	= mitral valve repair
MVR	= mitral valve replacement
NYHA	= New York Heart Association

patients undergoing MV surgery before and after the clinical symptoms of HF ensued. Here, we report and compare the operative mortality and 10-year survival of a large cohort of Medicare beneficiaries with and without a preoperative diagnosis of HF at the time of undergoing primary isolated MV surgery.

METHODS

The data for this analysis were obtained from the Center for Medicare and Medicaid Services and included the Medicare Provider Analysis and Review (MEDPAR) files and corresponding Beneficiary Annual Summary Files (BASF) for all Medicare beneficiaries aged 65 years and older who underwent mitral valve repair (MVP; ICD-9 code 35.12) or replacement (MVR; ICD-9 codes 35.23 or 35.24) from 2000 to 2009. The MEDPAR files contain institutional claims for inpatient services covered under Part A. The BASF contain information on patient demographics, eligibility, enrollment, summarized service utilization and payment, and chronic condition flags for eligible beneficiaries. The current Vital Status File (February 2012) was used to provide the most recent death information for the study cohort. The study was approved by the Institutional Review Board, which waived the requirement for informed consent. Because the files used for this study are considered Research Identifiable Files and contain patient-specific information, beneficiary confidentiality data was protected through a rigorous data use agreement with Centers for Medicare and Medicaid Services (CMS).

Exclusion Criteria

Patients were excluded if they had concomitant CABG, other valvular repair or replacement (except tricuspid), closed heart valvuloplasty, surgery for congenital anomalies, heart transplant, awaiting organ transplant status or history of heart transplant, history of surgery to heart and great vessels, history of valve replacement, history of CABG, history of previous myocardial infarction, left ventricular, right ventricular, or biventricular circulatory support implantation or removal, implantation of an external cardiac support device, history of ventricular assist device or artificial

heart, excision of ventricular aneurysm, replacement of thoracic aorta, aortic fenestration, or concomitant carotid endarterectomy (same hospitalization). Patients with missing gender information, unspecified valve repair or replacement, Medicare status codes 20 (disabled without end-stage renal disease [ESRD]), 21 (disabled with ESRD), and 31 (ESRD only, not aged), and emergency admission status, as well as those who were recorded as having had MVP and MVR during the same hospital stay, were also excluded from the analysis. Patients were also excluded if they did not have 12 months of Medicare Part A and Part B coverage in the year preceding their operation or if they had a period of enrollment under a Medicare-managed plan at any point in the year before their index admission. Urgent admission status was defined as those patients who were operated on during the same hospital stay; elective admission was defined as those who came from home and were operated on the same day. For the purposes of exclusion, emergency admissions were defined as those patients who were operated on the same day of admission if they were transferred from a hospital, skilled nursing facility, another health care facility, or came through the emergency room.

Definitions and Outcomes

This study is a descriptive analysis of operative mortality and long-term survival of elderly patients undergoing primary isolated MV surgery according to history and duration of preoperative HF diagnosis. Operative mortality was defined as hospital mortality or 30-day mortality, whichever was longer. Long-term survival was calculated using data from the Vital Status File and reflects all-cause mortality. Comorbidities were determined using the ICD-9-CM diagnostic codes from both the index admission and any hospitalizations during the 12-month period before the index admission.

Statistical Analysis

All results are reported as median and interquartile range (IQR) or percentages as appropriate. Chi-squared tests of independence and Wilcoxon rank sum tests were used to compare patients with and without preoperative HF. Comparisons were performed across all patients and separately for the repair and replacement subgroups. Groups were initially compared on hospital mortality using chi-squared and then logistic regressions were performed to adjust for baseline differences. Postoperative survival time was computed using the Vital Status File from CMS. Kaplan-Meier estimates were used to generate survival curves for patients with and without a preoperative history of HF. Log-rank tests were used to assess group differences on survival curves. Cox proportional hazards models were used to compare the groups on long-term survival after adjusting for baseline differences. All analyses were performed using SAS v9.2 or v9.3 (SAS Institute, Inc, Cary, NC). Expected mortality rates were calculated using the National Vital Statistics Reports (2007) from the Centers for Disease Control and Prevention.⁴ These rates reflect the expected mortality, based on the US population, within our patient subsets when adjusting for age and gender distribution.

RESULTS**Patient Characteristics**

The patient characteristics of the study cohort have been described previously.³ Briefly, 45,082 patients were identified who underwent isolated MV surgery from 2000 to 2009 (Table 1). MVR was performed in 62.6% and the remaining 37.4% underwent MVP. Median age of the patients was 75 years; 61.4% of the patients were women and 91.8% were white. Sixty percent of the patients had a diagnosis of HF in the year preceding the surgery, including

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