Outcomes and quality of life in patients receiving mitral surgery for asymptomatic disease

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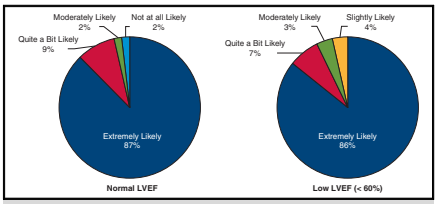
ABSTRACT

Objectives: We sought to characterize the demographics, outcomes, and quality of life of asymptomatic patients undergoing mitral valve surgery at our center over a 10-year period.

Methods: Adults undergoing mitral surgery were retrospectively reviewed between 2010 and 2019. Patients were included if deemed asymptomatic by review of referring cardiologist and surgeon consultation. Patients were administered a telephone survey consisting of the Kansas City Cardiomyopathy Questionnaire as well as free-response regarding satisfaction surrounding their operation. Outcomes included survival, Kansas City Cardiomyopathy Questionnaire metrics, and thematic analysis of free response questions.

Results: A total of 145 patients were identified who were deemed asymptomatic. Their average age was 60.3 ± 12.1 years, and 71% were male. No patients had endocarditis, and 34% had decreased ejection fraction (<60%). Repair was achieved in 95% of patients. Median length of stay was 6 (5-8) days. Ten-year survival was 91%, with no differences noted by ejection fraction. Composite Kansas City Cardiomyopathy Questionnaire score was 100 (96-100). The lowest component score was "Quality of Life," with 22% of patients reporting being "mostly satisfied" with present cardiac status. Most common themes expressed were gratitude with surgery results (58%), satisfaction with being able to stay active (23%), and happiness with early disease treatment (21%). Only 1 patient (0.7%) expressed regret with surgery choice.

Conclusions: Mitral surgery for asymptomatic disease can be performed with good long-term outcomes in select patients, and the majority experience excellent quality of life and satisfaction with current health. Continued assessments of quality of life are important in evaluating outcomes of mitral surgery as indications grow. (JTCVS Open 2024;18:43-51)



Responses of asymptomatic patients to "Would have mitral surgery again if in similar circumstances?"

CENTRAL MESSAGE

Mitral surgery for asymptomatic disease can be performed with excellent long-term outcomes in select patients, and the majority experience good QOL and satisfaction with current health.

PERSPECTIVE

Even in those with preserved ventricular function, the majority of patients report satisfaction with prophylactically addressing asymptomatic mitral disease with surgery, and most would be extremely likely to undergo surgery again in similar circumstances. Thus, a patient-centered approach may favor earlier intervention in asymptomatic patients to preserve good QOL.

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Mitral valve (MV) surgery remains the gold standard therapy for the treatment of significant MV regurgitation. Class I indications for surgical intervention include those patients with severe symptomatic primary disease and in asymptomatic patients with signs of left ventricular (LV) systolic dysfunction.[1] A lesser strength of recommendation (Class IIa) is made for asymptomatic disease without ventricular dysfunction in centers of excellence with high rates of repair for degenerative disease.[1] This decreased recommendation arises from less conclusive data surrounding the magnitude of benefit for asymptomatic patients presumably identified earlier in their disease course, in whom strict trials demonstrating survival benefit or improvements in hard clinical outcomes are lacking.

Although ongoing research is working to identify subsets of patients who may more clearly derive survival or physiologic

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Abbreviations and Acronyms

KCCQ = Kansas City Cardiomyopathy Questionnaire
LV = left ventricle
LVEF = left ventricular ejection fraction
MR = mitral regurgitation
MV = mitral valve
NYHA = New York Heart Association
QOL = quality of life
SF-36 = 36-Item Short-Form
TMVr = transcatheter mitral valve repair

benefit from early procedural intervention, there is a concomitant need to understand patient-centered outcomes with regard to early mitral surgical intervention. Quality of life (QOL) improvements with mitral surgery to date have largely focused on the symptomatic patient, in whom clear benefits of intervention can be readily demonstrated.[2,3] In the asymptomatic patient, although hard surgical morbidity may be relatively infrequent, the recovery from and impact of surgery on a patient's life may have a notable impact that could sway the decision to operate. Relatively little previous work has focused specifically on the asymptomatic patient or the outcomes on QOL in this patient cohort. This is increasingly relevant as burgeoning transcatheter interventional options are now being presented to patients as potential options without long-standing durability data. Thus, the current study was undertaken to better understand QOL in patients receiving surgery for asymptomatic mitral disease at our center.

MATERIAL AND METHODS

The University of Pennsylvania Institutional Review Board reviewed the study protocol and deemed it exempt of full review (#833301, approval date: 6/18/2019). We performed a retrospective cohort study using data from our prospectively maintained database for all patients undergoing MV surgery from 2010 to 2019 at the University of Pennsylvania hospital system. Patients were included if they were without symptoms of mitral disease including heart failure, shortness of breath, palpitations, exercise intolerance, new-onset atrial fibrillation, or cardiac-related hospitalizations. Secondary review of the electronic medical record was performed on all putative patients for review of both referring cardiologist and surgical consultation for confirmation of asymptomatic status, and those with unclear symptom history were excluded.

The database was queried for patient demographic information, as well as preoperative risk profile and operative characteristics. The electronic medical record was reviewed for all patients to validate data and obtain follow-up information regarding mortality, morbidity, MV reinterventions, and valve status on postoperative echocardiograms. Patient mortality information was cross-referenced with the National Death Index—a national database of death records in the United States established by the National Center for Health Statistics—via identifying name and date of birth. Death information queried from the National Death Index included certificates through December 31, 2020. After initial query, all surviving patients were administered a telephone survey in September 2022 by 3 investigators not involved in the clinical care of these patients (N.W., C.S., D.R.). Survey consisted of the 12-item Kansas City Cardiomyopathy Questionnaire (KCCQ-12), a question pertaining to willingness to undergo surgery again if in repeat circumstances, and a free response question prompting individuals to share any additional information they wish regarding their mitral surgery experience. Full survey script is available in the Online Data Supplement. Telephone survey information was also used to secondarily confirm follow-up metrics as needed.

Subgroup analysis was performed on patients with a left ventricular ejection fraction (LVEF) less than 60%. Groups were compared using Kruskal–Wallis tests for nonparametrically distributed continuous variables, unpaired Student t tests for parametrically distributed continuous variables, and chi-square or Fisher exact tests for categorical variables, where appropriate. Variables with missingness greater than 10% are reported in the Online Data Supplement. Listwise deletion was used for missingness in analyses.

Primary outcomes of the study were death and composite KCCQ-12 score, with secondary analyses performed on component KCCQ-12 metrics. Time-to-event analyses were performed using Kaplan–Meier analyses, censored at 10 years postoperation. In addition, survey transcripts were independently reviewed by 4 investigators (A.I., N.W., C.S., D.R.), and themes from free-response questions were identified and pooled. Most commonly identified themes were noted and qualitatively compared throughout the population. All quantitative analyses were performed using Stata 15.0 (StataCorp LLC).

RESULTS

From 2010 to 2019, 4476 MV operations were performed at our institution. Of these, 145 patients were identified as asymptomatic (Figure 1). A total of 95 (65.5%) of these patients had normal or hyperdynamic function (LVEF $\geq$ 60%), and 50 patients (34.5%) had reduced function (LVEF < 60%). Baseline characteristics in the total cohort and stratified by LVEF group are summarized in Table 1. Median age was 62 years, and 71% of the total cohort were male. Rates of comorbidities were low, with no patients on preoperative dialysis. Only 2.8% of patients had diabetes, all of whom had normal LVEF. Furthermore, no patients had previous endocarditis or liver dysfunction. No differences in comorbidities were seen between LVEF subgroups.

Creatinine levels were statistically higher in patients with reduced LVEF (1.00 vs 0.82, $P = .006$), although of questionable clinical relevance. No other differences in preoperative laboratory values were noted between subgroups. Rates of previous cardiac interventions were low and trended toward increased in the reduced LVEF group, driven mostly by previous percutaneous coronary interventions. On preoperative echocardiogram, significant mitral regurgitation (MR) was the indication for operation in both groups, with a median LVEF of 55% in the reduced subgroup. Significant concomitant mitral stenosis was also present in 2.8% of patients. A majority of valves were classified as primarily Carpentier Class II dysfunction (91.7%).

Operative characteristics are summarized in Table 2. All cases were elective, and bypass times were a median of 115 minutes. Approximately 43% of cases were performed via sternotomy, with the remainder through a minimally invasive, limited right chest incision. Concomitant cases

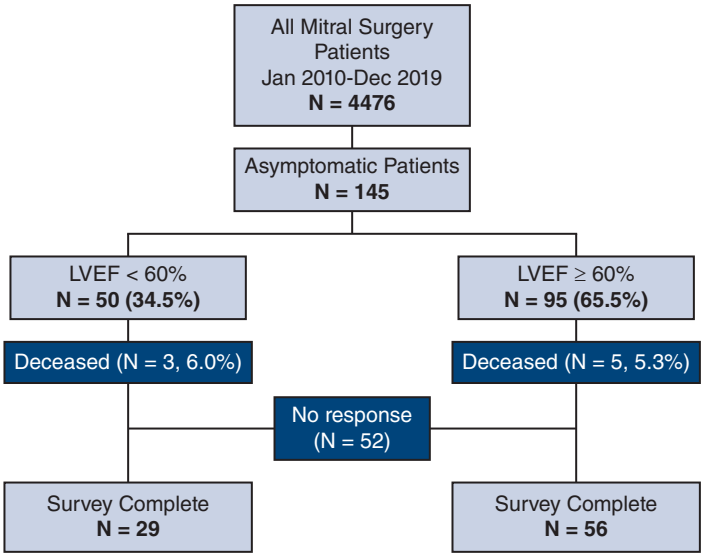

FIGURE 1. Patient inclusion and exclusion criteria. *LVEF*, Left ventricular ejection fraction.

were infrequent with an ablation/Maze procedure performed in approximately 22.8% of patients. No patients required perioperative balloon pumps (intra-aortic balloon pump) or extracorporeal membrane oxygenation. Postoperative outcomes are summarized in Table 3. Ventilator and intensive care unit times were short, with a median time of 6 hours and 29 hours, respectively. No perioperative strokes were noted, and 1 patient died within 30 days (0.7%). With a median echocardiographic follow-up time of 1735 days, 8 patients (7.2%) had recurrent MR necessitating reintervention in 3 (2.6%). Overall 1-, 5-, and 10-year survivals were 97.7%, 94.9%, and 91.0%, respectively. Kaplan–Meier curves, stratified by LVEF subcategory, are shown in Figure 2, with no statistically significant difference between groups (log-rank $P = .616$). Survival free from recurrent MR or reintervention is shown in Figure 3. The 1-, 5-, and 10-year survivals in the preserved LVEF group were 97.4%, 94.4%, and 90.3%, respectively. In the reduced LVEF group, the 1-, 5, and 10-year survivals were 96.7%, 92.5%, and 66.5%, respectively (log-rank $P = .083$).

The survey response rate overall was 62% of survivors at the time of survey administration (85/137). KCCQ-12 composite and component scores are shown in Table 4, stratified by LVEF category, where 100 is the highest achievable score. Median scores were 100 in all categories without differences between groups. When asked if "Knowing what you know now, would you have your mitral surgery again if in the same scenario?" the response distribution was similar between groups, with 95.2% of all patients responding "quite a bit" or "extremely" likely (Figure 4, $P = .697$).

On thematic analysis, most common themes reported were (1) generalized gratitude (N = 39); (2) satisfaction with ability to stay active (N = 17); (3) unclear expectations of postoperative course (N = 15); and (4) happiness with treatment before perceived illness (N = 11). No trends in responses were noted between LVEF groups. Excerpt quotes organized by major theme are provided in the Online Data Supplement. Explicit comments were made by many reporting satisfaction with their experience, with many perceiving their early treatment as positive. A relatively sizable portion of patients expressed that their immediate postoperative course misaligned with expectations regarding issues of pain, recovery/physical therapy, or complications. However, in a majority of these cases, resolution of issues with time coincided with their outlook improving.

DISCUSSION

In this analysis of asymptomatic patients undergoing elective mitral surgery, rates of short-term complications were low, and long-term survival and freedom from recurrent MR were excellent. Of note, the majority of patients kept and maintained a good QOL after surgery, lasting durably on follow-up survey. Many patients reported satisfaction with early treatment of their mitral disease and acknowledged peace of mind afforded by early intervention before disease progression. Even in those with preserved ventricular function, the majority of patients report satisfaction with prophylactically addressing asymptomatic mitral disease with surgery, and most would be extremely likely to undergo surgery again in similar circumstances. Thus, a patient-centered approach may favor earlier intervention in asymptomatic patients to preserve good QOL.

The 2020 American College of Cardiology/American Heart Association guidelines recommend surgical intervention in patients with asymptomatic severe MR at class I level

TABLE 1. Baseline characteristics of asymptomatic patients with mitral valve disease

Variable	Total cohort (N = 145)	LVEF ≥60% (N = 95)	LVEF <60% (N = 50)	*P* value
Age, y	62 (53-68)	63 (54-68)	58 (52-66)	.178
Male	103 (71.0%)	64 (67.4%)	39 (78.0%)	.180
Body mass index (kg/m^2)	25.4 (23.1-28.3)	26.0 (23.3-28.7)	25.3 (22.5-27.5)	.326
White race	136 (95.1%)	89 (93.7%)	47 (97.9%)	.586
Comorbidities				
Hypertension	71 (49.0%)	49 (51.6%)	22 (44.0%)	.386
Smoking history	52 (35.9%)	36 (37.9%)	16 (32.0%)	.482
Preoperative dialysis	0 (0%)	0 (0%)	0 (0%)	1.00
Diabetes mellitus	4 (2.8%)	4 (4.2%)	0 (0%)	.299
CVD	6 (4.1%)	2 (2.1%)	4 (8.0%)	.182
Chronic lung disease	3 (2.1%)	3 (3.2%)	0 (0%)	.551
Endocarditis	0 (0%)	0 (0%)	0 (0%)	1.00
Liver disease	0 (0%)	0 (0%)	0 (0%)	1.00
Preoperative laboratory tests				
Creatinine (mg/dL)	0.90 (0.79-1.02)	0.82 (0.75-0.97)	1.00 (0.80-1.10)	.006
WBC (10^9/L)	6.4 (5.4-7.6)	6.6 (5.9-7.7)	6.0 (4.9-7.5)	.082
Hemoglobin (g/dL)	14.1 (13.2-14.8)	14.3 (13.3-14.9)	13.8 (12.8-14.7)	.114
Platelets (10^9/L)	200 (163-231)	198 (166-229)	204 (159-234)	.748
Albumin (g/dL)	4.2 (4.0-4.5)	4.2 (4.0-4.4)	4.3 (4.1-4.5)	.880
Bilirubin (mg/dL)	0.8 (0.6-1.0)	0.8 (0.6-1.0)	0.7 (0.6-1.0)	.376
Hemoglobin A1c (%)	5.4 (5.2-5.6)	5.4 (5.2-5.6)	5.4 (5.3-5.6)	.617
Previous interventions				
Any cardiac	26 (17.9%)	13 (13.7%)	13 (26.0%)	.066
CABG	5 (3.5%)	2 (2.1%)	3 (6.0%)	.340
AVR	1 (0.7%)	0 (0%)	1 (2.0%)	.345
MV repair	6 (4.1%)	3 (3.2%)	3 (6.0%)	.415
PCI	9 (6.2%)	4 (4.2%)	5 (10.0%)	.275
Pacemaker	4 (2.8%)	3 (3.2%)	1 (2.0%)	1.00
Previous MI	6 (4.1%)	1 (1.1%)	5 (10.0%)	.019
Atrial fibrillation/flutter	45 (31.0%)	29 (30.5%)	16 (32.0%)	.853
NYHA Class I	145 (100%)	95 (100%)	50 (100%)	1.00
Preoperative echocardiography data				
LVEF	60 (55-65)	65 (60-65)	55 (50-55)	<.001
Mitral regurgitation (≥3+)	145 (100%)	95 (100%)	50 (100%)	1.00
Aortic stenosis (≥2+)	3 (2.1%)	2 (2.1%)	1 (2.0%)	1.00
Aortic regurgitation (≥3+)	6 (4.1%)	3 (3.2%)	3 (3.2%)	.415
Tricuspid regurgitation (≥3+)	9 (6.2%)	7 (7.4%)	2 (4.0%)	.719
Carpentier classification				1.00
Type I	6 (4.5%)	4 (4.7%)	2 (4.3%)	
Type II	122 (91.7%)	79 (91.9%)	43 (91.5%)	
Type IIIa	3 (2.3%)	2 (2.3%)	1 (2.1%)	
Type IIIb	2 (1.5%)	1 (1.2%)	1 (2.1%)	

Categorical data are expressed as n (%), and continuous data are expressed as medians (first-third quartile). *LVEF*, Left ventricular ejection fraction; *CVD*, cardiovascular disease; *WBC*, white blood cell; *CABG*, coronary artery bypass grafting; *AVR*, aortic valve replacement; *MV*, mitral valve; *PCI*, percutaneous coronary intervention; *MI*, myocardial infarction; *NYHA*, New York Heart Association.

in those with LV systolic dysfunction and class 2a in those with preserved LV systolic function undergoing surgery at a valve center of excellence.[1] In 2 comparisons of early surgery versus conservative treatment or watchful waiting in asymptomatic severe MR, early intervention was associated with superior long-term outcomes, including lower cardiac mortality and fewer heart failure hospitalizations.[4,5] Elective mitral surgery, performed early on stable, asymptomatic patients, is associated with lower operative morbidity and mortality than urgent/emergency mitral intervention.[4,6] The low rate of short-term complications and excellent long-term survival and freedom from recurrent MR in our cohort

TABLE 2. Operative characteristics of asymptomatic patients with mitral valve disease

Variable	Total cohort (N = 145)	LVEF ≥60% (N = 95)	LVEF <60% (N = 50)	*P* value
Operation status				
Elective	145 (100%)	95 (100%)	50 (100%)	1.00
Urgent/emergency	0 (0%)	0 (0%)	0 (0%)	1.00
MV operation				.178
Repair	137 (94.5%)	88 (92.6%)	49 (98.0%)	
Replacement	8 (5.5%)	7 (7.4%)	1 (2.0%)	
CPB time (min)	115 (95-150)	114 (96-151)	117 (83-137)	.721
Crossclamp time (min)	84 (61-107)	83 (63-113)	87 (55-105)	.628
Primary incision type				.103
Full sternotomy	62 (42.8%)	36 (37.9%)	26 (52.0%)	
Alternative access	83 (57.2%)	59 (62.1%)	24 (48.0%)	
Concomitant surgery				
CABG	7 (4.8%)	3 (3.2%)	4 (8.0%)	.234
AVR repair	11 (7.6%)	7 (7.4%)	4 (8.0%)	1.00
Root replacement	2 (1.4%)	0 (0%)	2 (4.0%)	1.00
Tricuspid surgery	8 (5.5%)	6 (6.3%)	2 (4.0%)	.715
PFO closure	23 (16.0%)	19 (20.2%)	4 (8.0%)	.061
Ablation/Maze	33 (22.8%)	23 (24.2%)	10 (20.0%)	.565
IABP	0 (0%)	0 (0%)	0 (0%)	1.00
ECMO	0 (0%)	0 (0%)	0 (0%)	1.00

Categorical data are expressed as n (%) and continuous data as medians (first-third quartile). *LVEF*, Left ventricular ejection fraction; *MV*, mitral valve; *CPB*, cardiopulmonary bypass; *CABG*, coronary artery bypass grafting; *AVR*, aortic valve replacement; *PFO*, patent foramen ovale; *IABP*, intra-aortic balloon pump; *ECMO*, extracorporeal membrane oxygenation.

corroborate the safety and durability of mitral surgery as a prophylactic intervention against the development of symptomatic valvular heart failure in asymptomatic patients. Indeed, prophylactic intervention may prevent the increasingly understood poorer outcomes of mitral operations in the face of LV dysfunction and advanced heart failure,

TABLE 3. Postoperative outcomes of asymptomatic patients with mitral valve disease

Variable	Total cohort (N = 145)	LVEF ≥60% (N = 95)	LVEF <60% (N = 50)	*P* value
Perioperative				
Ventilator time (h)	6 (4-9)	6 (4-9)	5 (3-9)	.238
ICU stay (h)	29 (24-54)	30 (24-52)	28 (23-56)	.522
Length of stay (d)	6 (5-8)	6 (5-8)	6 (5-8)	.204
Reoperation for bleeding	5 (3.5%)	5 (5.3%)	0 (0%)	.164
Need for pacemaker	7 (4.9%)	4 (4.3%)	3 (6.0%)	.694
Cerebrovascular accident	0 (0%)	0 (0%)	0 (0%)	1.00
30 d mortality	1 (0.7%)	1 (1.1%)	0 (0%)	1.00
Total follow-up time (d)	2481 (1168-3408)	2634 (1596-3591)	1647 (149-3059)	.015
Mitral reintervention	3 (2.6%)	2 (2.7%)	1 (2.4%)	1.00
Postoperative echocardiogram, most recent				
Follow-up time (y)	1735 (61-2786)	2124 (308-2986)	989 (11-2564)	.038
LVEF ≤ 35%	58 (55-63)	60 (55-63)	55 (48-60)	<.001
Moderate or greater mitral stenosis	2 (1.9%)	1 (1.5%)	1 (2.6%)	1.00
Moderate or greater MR	8 (7.2%)	4 (5.6%)	4 (10.0%)	.456

Categorical data are expressed as n (%) and continuous data as medians (first-third quartile). *LVEF*, Left ventricular ejection fraction; *ICU*, intensive care unit; *MR*, mitral regurgitation.

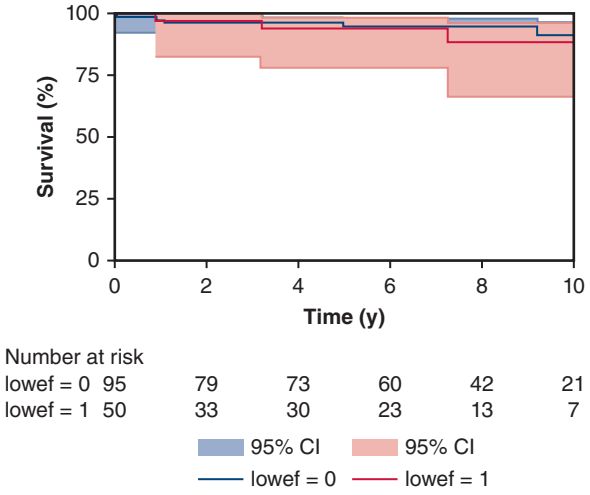

FIGURE 2. Unadjusted survival by ejection fraction category. *CI*, Confidence interval.

recently highlighted by David and colleagues.[7] However, little work has been done to corroborate these safety metrics to patient-perceived health status.

Because complications after routine mitral surgery are rare but non-zero and improvement in patient-perceived health status is a key goal of these procedures, QOL is an important patient-centered outcome that has been increasingly recognized and studied. Commonly used QOL metrics in mitral research include the KCCQ, a heart failure-specific measure that evaluates 4 health status domains (physical limitation, symptom frequency, QOL, and social limitation) and reports a summary score ranging from 0 to 100. Changes in the summary score by 5, 10, and 20 points correspond to small, moderate, or large clinical changes, respectively, experienced by an individual patients. The KCCQ, which we chose to use in our study, is well validated and regarded as a reliable prognostic indicator in valvular patient populations.[8-10] The Medical Outcomes Study 36-Item Short-Form (SF-36) Health Survey, a generic health status measure reporting physical and mental summary scores that are scaled to a population mean of 50 and SD of 10, has been applied to patients with MV disease.[10] The ease of administration of the KCCQ-12 facilitated administration over the phone in the present study and could be completed in as quickly as 5 minutes. Although survey administration is relatively remote to intervention (median follow-up time 6.8 years), equipoise for administration and interpretation of QOL instruments remote from intervention exists and can provide important insight into patients' experiences.[11-16]

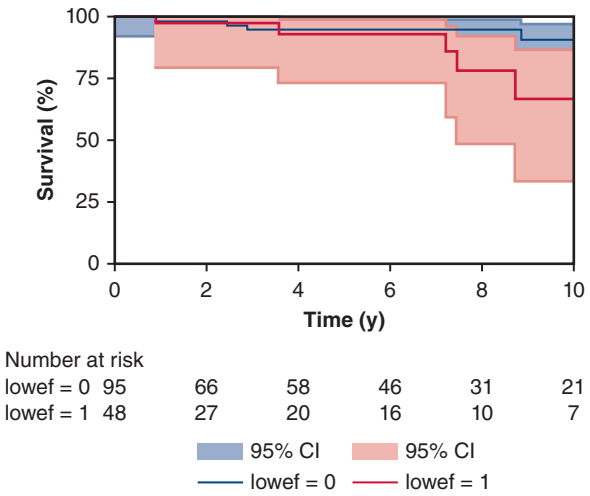

FIGURE 3. Survival free from recurrent MR by ejection fraction category. *CI*, Confidence interval.

In symptomatic MV patient cohorts, QOL has been extensively reported to improve after intervention, particularly emphasized in more recent trials of transcatheter MV repair (TMVr) strategies. Tan and colleagues'[11] systematic review of QOL after MV intervention included 23 studies reporting outcomes from conventional MV surgery, which overall demonstrated improved health-related QOL after open surgical MV repair or replacement. In the recent UK Mini Mitral Trial, patients were randomized to minithoracotomy or sternotomy for degenerative MV repair.[17] Equal improvements in physical function, as measured by the SF-36, were noted with either surgical approach (mean 7.62 ± 2.13 in minithoracotomy group, 7.20 ± 2.16 in sternotomy group) after 12 weeks. Of the cohort, only 11.6% (38/329) were deemed New York Heart Association (NYHA) class I at baseline; subgroup analysis for the asymptomatic cohort was not performed.[17] This nondifference in postoperative QOL between minimally invasive and conventional surgical approaches is consistent with studies included in Tan and colleagues' systematic review, where 2 of 4 studies reported transiently better short-term QOL improvements with minimally invasive surgery that were no longer significant at 1 year, and the other 2 studies demonstrated no difference in QOL between surgical approach.[11]

Among patients with secondary MR that remained symptomatic despite maximal application of guideline-directed medical therapy in the Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation trial, overall KCCQ scores improved by 18.6 points (from 53.2 ± 22.8 to 71.8 ± 22.2) at 12 months postintervention in the TMVr arm, compared with a paired difference of only 5.1 with medical therapy, arguing for sustained improvements in QOL with intervention.[10] The Endovascular Valve Edge-to-Edge Repair Study II, which randomized patients to MitraClip TMVr or mitral surgery, included both symptomatic and asymptomatic patients with chronic MR.[18] At 12-month follow-up, both TMVr and surgery groups experienced significant improvements in physical (4.4 ± 9.8 in TMVr group; 4.4 ± 10.4 in surgery group)

TABLE 4. Kansas City Cardiomyopathy Questionnaire-12 Scores

Variable	Total cohort (N = 85)	LVEF ≥60% (N = 56)	LVEF <60% (N = 29)	*P* value
Composite Score	100 (97-100)	100 (95-100)	100 (97-100)	.945
Physical Limitation	100 (100-100)	100 (100-100)	100 (100-100)	.820
Symptom Frequency	100 (92-100)	100 (92-100)	100 (96-100)	.532
Quality of Life	100 (88-100)	100 (88-100)	100 (88-100)	.923
Social Limitation	100 (100-100)	100 (100-100)	100 (100-100)	.673

Metrics reported on a scale of 0 to 100, where 100 indicates good QOL without limitation in each domain. Data presented as medians (first-third quartile). *LVEF*, Left ventricular ejection fraction.

and mental (5.7 ± 9.9 in TMVr group; 3.8 ± 10.3 in surgery group) summary SF-36 scores from baseline that were not different between trial arms. No subgroup analysis based on baseline symptom level was performed.[18] In the EXPAND study, a contemporary single-arm study of third-generation MitraClip real-world outcomes, only 21.5% of participants had NYHA functional class I/II symptoms at baseline compared with 80.3% of surviving patients at 1 year.[3] Improvement in overall KCCQ score postintervention was significant and sustained, with a mean improvement of 19.3 ± 1.6 points from baseline at 30 days and 21.6 ± 2.0 points at 1 year postintervention. No dedicated subgroup analysis for asymptomatic (NYHA class I) patients was performed.[3]

Compared with the extensive evidence demonstrating improved QOL after both open surgical and transcatheter-based mitral intervention in the symptomatic patient, there are less data regarding postintervention QOL in asymptomatic cohorts. One study reported excellent QOL in 46 asymptomatic patients undergoing MV repair at a single center in The Netherlands from 1991 to 2006.[19] QOL data were available for 78% (36/46) of participants with a mean follow-up of 8.4 ± 3.9 years and comparable to the general age-matched Dutch population. In fact, individual physical function domain scores in the MV repair cohort were significantly better than controls.[19] A comparable report from another Dutch group using similar comparative strategy also found similar findings at a median follow-up of 7.6 (4.1-11.9) years.[13] The duration of follow-up is notable in these reports and mimics that of the current study. No similar study focusing on asymptomatic patients has been conducted in the United States to date. Although retrospective series, the UK Mini Mitral, Endovascular Valve Edge-to-Edge Repair Study II, and EXPAND trials have included a minority of patients who were asymptomatic at baseline, none included a dedicated subgroup analysis for asymptomatic patients.[3,17,18]

Our study sought to fill this gap in our understanding of how early mitral intervention before symptomatic disease progression impacts health-related QOL. We demonstrate excellent postoperative QOL in our asymptomatic cohort undergoing open mitral surgery, with median overall KCCQ scores of 100 regardless of baseline LV function. On free response, many survey respondents (N = 11) noted feeling "fortunate to have been diagnosed early" and happy with the "opportunity to have had [their valve] fixed earlier" before "having issues." Quick recovery,

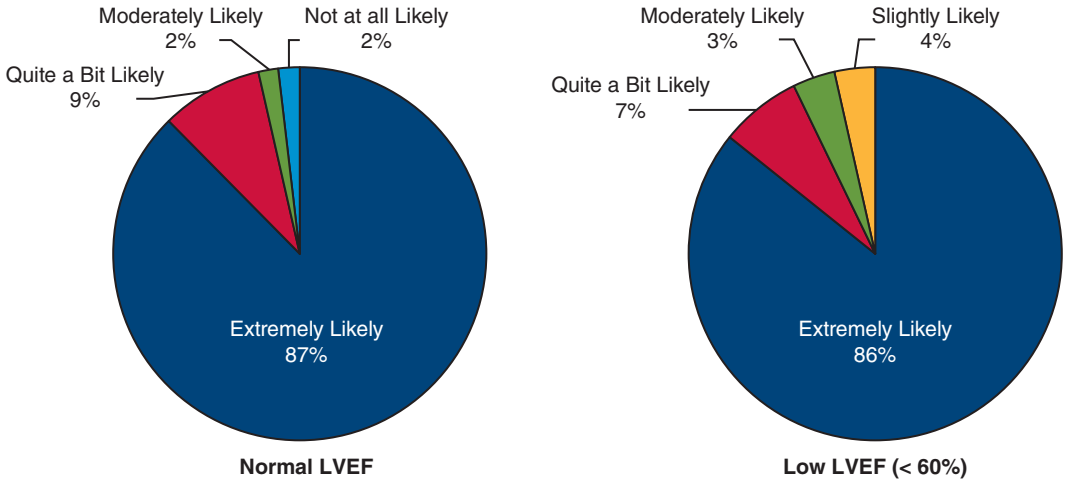

FIGURE 4. Responses to question "Knowing what you know now, would have your mitral surgery again if in similar circumstances?" by ejection fraction category. *LVEF*, Left ventricular ejection fraction.

ability to stay active without physical limitations, and ease of mind after the surgery ("I haven't given a second thought to my heart since 3 months after the surgery—it's been a complete nonissue for years") were common reasons that patients felt satisfied with their surgical results. Evidently, early intervention holds a multitude of benefits from the patient perspective. One patient who mentioned feeling disappointed with his surgical outcome had a postoperative recurrence of moderate MR, highlighting the critical importance of repair durability. Given that the patient-perceived benefit of early intervention centers around preventing the need for future surgery, it is imperative that any transcatheter or other minimally invasive mitral repair device be evaluated for long-term MR recurrence and QOL outcomes before being implemented in asymptomatic patients.

Although a majority of patients in our cohort reported satisfaction, gratitude, and willingness to undergo surgery again if in repeat circumstances, a not insignificant portion (N = 15) recalled unexpected postoperative complications, such as pleural effusions or temporary rhythm disorders, and more difficult recovery than anticipated. One patient in particular suggested that it would have been easier to assess their recovery progress if they had been provided more information before surgery to "better understand what the recovery process was going to be like." Although our center constantly strives to improve surgical outcomes and complication rates from a technical standpoint, these responses represent a clear message that our institution must do a more comprehensive job addressing patient expectations surrounding postoperative recovery and potential complications. Patient expectations of surgical outcomes, symptom resolution, and recovery timelines are often misaligned with the actual recovery process.[20] Better discussion and conversation focused on the postoperative period with a realistic management of expectations can serve as an important strategy for improving the patient experience in the setting of unexpected setbacks or outcomes.

Study Limitations

The limitations of our study are inherent to those associated with a retrospective study performed at a single center. In particular, the retrospective study design did not allow for comparison of QOL with a preintervention baseline. An important limitation of this report is the definition of "asymptomatic." Although we relied on concurrent assessments from referring cardiologist and surgeon as documented in the electronic medical record, no functional/exercise testing was done in patients, and therefore this may represent a bias toward over-inclusion. Perhaps most important, with our design, we were unable to compare QOL outcomes to asymptomatic patients who did not undergo intervention and instead received medical therapy alone. The study is also biased toward those who had received surgical referral, and the comparative outcomes of other patients who otherwise may have been candidates for intervention but not yet referred are unknown. QOL measurements were incomplete (62% survey response rate) and obtained at different timepoints for each patient, which may impact interpretation of the results, although follow-up time is reported. Furthermore, the small sample size reduces both the statistical power and real-world interpretability of comparative analyses between subgroups; however, given that the focus of our work was largely a cross-sectional survey of outcomes, the excellent QOL after mitral surgery and willingness to undergo repeat surgery in our cohort remain apparent.

CONCLUSIONS

We report the safety, efficacy, and high QOL associated with mitral surgery for asymptomatic MR based on postoperative survival and KCCQ metrics, irrespective of LV systolic function at the time of surgery. A majority of patients reported satisfaction with their decision to undergo prophylactic surgery to address asymptomatic disease and prevent the development of valvular degeneration and associated heart failure symptoms. Thus, an approach with continued emphasis on patient-reported quality of life assessments may favor earlier intervention in asymptomatic patients at a time that affords greater clinical benefit with minimal risk.

Webcast

You can watch a Webcast of this AATS meeting presentation by going to: https://www.aats.org/resources/outcomes-and-quality-of-life-in-patients-receiving-mitral-surgery-for-asymptomatic-disease.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References

1. Otto CM, Nishimura RA, Bonow RO, et al. 2020 ACC/AHA guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Joint Committee on clinical practice guidelines. *Circulation*. 2021;143:e72-e227.
2. Stone GW, Lindenfeld J, Abraham WT, et al. Transcatheter mitral-valve repair in patients with heart failure. *N Engl J Med*. 2018;379:2307-2318.

3. Kar S, von Bardeleben RS, Rottbauer W, et al. Contemporary outcomes following transcatheter edge-to-edge repair: 1-year results from the EXPAND Study. *JACC Cardiovasc Interv*. 2023;16:589-602.
4. Kang D-H, Kim JH, Rim JH, et al. Comparison of early surgery versus conventional treatment in asymptomatic severe mitral regurgitation. *Circulation*. 2009; 119:797-804.
5. Suri RM, Vanoverschelde JL, Grigioni F, et al. Association between early surgical intervention vs watchful waiting and outcomes for mitral regurgitation due to flail mitral valve leaflets. *JAMA*. 2013;310:609-616.
6. LaPar DJ, Hennessy S, Fonner E, Kern JA, Kron IL, Ailawadi G. Does urgent or emergent status influence choice in mitral valve operations? An analysis of outcomes from the Virginia Cardiac Surgery Quality Initiative. *Ann Thorac Surg*. 2010;90:153-160.
7. David TE, David CM, Tsang W, Lafreniere-Roula M, Manlhiot C. Long-term results of mitral valve repair for regurgitation due to leaflet prolapse. *J Am Coll Cardiol*. 2019;74:1044-1053.
8. Hejjaji V, Cohen DJ, Carroll JD, et al. Practical application of patient-reported health status measures for transcatheter valve therapies: insights from the Society of Thoracic Surgeons/American College of Cardiology Transcatheter Valve Therapies Registry. *Circ Cardiovasc Qual Outcomes*. 2021;14:e007187.
9. Hejjaji V, Tang Y, Coles T, et al. Psychometric evaluation of the Kansas City Cardiomyopathy Questionnaire in men and women with heart failure. *Circ Heart Fail*. 2021;14:e008284.
10. Arnold SV, Chinnakondepalli KM, Spertus JA, et al. Health status after transcatheter mitral-valve repair in heart failure and secondary mitral regurgitation: COAPT Trial. *J Am Coll Cardiol*. 2019;73:2123-2132.
11. Tan MK, Jarral OA, Thong EH, et al. Quality of life after mitral valve intervention. *Interact Cardiovasc Thorac Surg*. 2017;24:265-272.
12. Ruel M, Kulik A, Lam BK, et al. Long-term outcomes valve replacement with modern prosthesis in young adults. *Eur J Cardiothorac Surg*. 2005;27:425-433.
13. Tomsic A, Hiemstra YL, van Hout FMA, et al. Long-term results of mitral valve repair for severe mitral regurgitation in asymptomatic patients. *J Cardiol*. 2018; 72:473-479.
14. Grady KL, Lee R, Subacius H, et al. Improvements in health-related quality of life before and after isolated cardiac operations. *Ann Thorac Surg*. 2011;91:777-783.
15. Makkar RR, Thourani VH, Mack MJ, et al. Five year outcomes of transcatheter or surgical aortic-valve replacement. *N Engl J Med*. 2020;382:799-809.
16. Mattsson G, Wallhagen M, Magnusson P. Health status measured by Kansas City Cardiomyopathy Questionnaire-12 in primary prevention implantable cardioverter defibrillator patients with heart failure. *BMC Cardiovasc Disord*. 2021; 21:411.
17. Akowuah EF, Maier RH, Hancock HC, et al. Minithoracotomy vs conventional sternotomy for mitral valve repair: a randomized clinical trial. *JAMA*. 2023; 329:1957-1966.
18. Feldman T, Foster E, Glower DD, et al. Percutaneous repair or surgery for mitral regurgitation. *N Engl J Med*. 2011;364:1395-1406.
19. van Leeuwen WJ, Head SJ, de Groot-de Laat LE, et al. Single-centre experience with mitral valve repair in asymptomatic patients with severe mitral valve regurgitation. *Interact Cardiovasc Thorac Surg*. 2013;16:731-737.
20. Gehring MB, Lerret S, Johnson J, et al. Patient expectations for recovery after elective surgery: a common-sense model approach. *J Behav Med*. 2020;43: 185-197.

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