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Contemporary Management of Ischemic Mitral Regurgitation at Coronary Artery Bypass Grafting

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ABSTRACT

BACKGROUND Recent guidelines for the treatment of moderate or severe ischemic mitral regurgitation (IMR) in patients undergoing coronary artery bypass grafting (CABG) have changed. This study assessed the real-world impact of changing guidelines on the management of IMR during CABG over time. We hypothesized that the utilization of mitral valve repair for IMR would decrease over time, whereas mitral valve replacement for severe IMR would increase.

METHODS Patients undergoing CABG in a statewide collaborative database (2011-2020) were stratified by severity of IMR. Trends in mitral valve repair or replacement were evaluated. To account for differences of the patients, propensity score–matched analyses were used to compare patients with and without mitral intervention.

RESULTS A total of 11,676 patients met inclusion criteria, including 1355 (11.6%) with moderate IMR and 390 (3.3%) with severe IMR. The proportion of patients undergoing mitral intervention for moderate IMR decreased over time (2011, 17.7%; 2020, 7.5%; $P_{trend} = .001$), whereas mitral replacement for severe IMR remained stable (2011, 11.1%; 2020, 13.3%; $P_{trend} = .14$). Major morbidity was higher for patients with moderate IMR who underwent mitral intervention (29.1% vs 19.9%; $P = .005$). In a propensity analysis of 249 well-matched pairs, there was no difference in major morbidity (29.3% with mitral intervention vs 23.7% without; $P = .16$) or operative mortality (1.2% vs 2.4%; $P = .5$).

CONCLUSIONS Consistent with recent guideline updates, patients with moderate IMR were less likely to undergo mitral repair. However, the rate of replacement for severe IMR did not change. Mitral intervention during CABG did not increase operative mortality or morbidity.

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Ischemic mitral regurgitation (IMR) is a common consequence of coronary artery disease and myocardial infarction.[1,2] Mitral leaflet tethering and annular dilation secondary to ischemic ventricular

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Abbreviations and Acronyms

AHA/ACC = American Heart Association/American College of Cardiology
AATS = American Association for Thoracic Surgery
CABG = coronary artery bypass grafting
COR = Class of Recommendation
CTSN = Cardiothoracic Surgical Trials Network
IMR = ischemic mitral regurgitation
LOE = Level of Evidence
MSTCVS = Michigan Society of Thoracic and Cardiovascular Surgeons
STS = The Society of Thoracic Surgeons

remodeling lead to poor leaflet coaptation, consequent mitral regurgitation, volume overload, and further adverse ventricular remodeling.[3] Because of these factors, IMR is associated with poor functional capacity, heart failure, and increased mortality.[1,3,4] Given the prevalence of IMR and the negative sequelae associated with chronic mitral regurgitation, many surgeons consider treatment of IMR at the time of coronary artery bypass grafting (CABG).[5]

In May 2017, the American Association for Thoracic Surgery (AATS) released a 2016 update to the 2015 consensus guidelines on IMR based on then-recent results of randomized trials.[6] Specifically, the Cardiothoracic Surgical Trials Network (CTSN) moderate IMR trial demonstrated that patients with moderate IMR undergoing mitral valve repair at the time of coronary artery bypass had a higher neurologic event rate and a higher frequency of arrhythmias with no symptomatic benefit to concomitant mitral repair.[7] Therefore, the AATS guideline for mitral valve repair during CABG in patients with moderate IMR was updated to Class of Recommendation (COR) IIb, Level of Evidence (LOE) B ("may be considered").[6] Subsequently, the American Heart Association/American College of Cardiology (AHA/ACC) guideline for the management of patients with valvular heart disease was also updated, stating that for patients with moderate IMR undergoing CABG, the usefulness of mitral valve repair is uncertain (COR IIb, LOE B-R).[8]

In a separate study, the CTSN severe IMR trial demonstrated a higher frequency of recurrent IMR for patients receiving restrictive annuloplasty compared with patients undergoing chordal-sparing mitral replacement and no difference in adverse events or survival.[9] Therefore, the AHA/ACC guidelines were revised to state "it is reasonable to choose" chordal-sparing mitral valve replacement over downsized annuloplasty repair in patients with severe IMR (COR IIa, LOE B-R).[8]

The implementation of these updated guidelines on clinical practice is unclear. The purpose of this study was to assess the real-world impact of changing guidelines on the volume and management of IMR during CABG over time. We hypothesized that the utilization of mitral valve repair for IMR would decrease over time, whereas mitral valve replacement for severe IMR would increase.

PATIENTS AND METHODS

This study was approved as Not Regulated by the University of Michigan institutional review board (HUM00194180) on February 17, 2021. Data were obtained from the Michigan Society of Thoracic and Cardiovascular Surgeons (MSTCVS) Quality Collaborative, which maintains a database of operative and outcomes data from all nonfederal hospitals performing cardiac surgery in the state of Michigan. The MSTCVS Quality Collaborative database employs standardized data fields and definitions consistent with The Society of Thoracic Surgeons (STS) Adult Cardiac Surgery Database.

All patients who underwent CABG from July 2011 to June 2020 were evaluated for inclusion (N = 49,919). Patients with left ventricular ejection fraction ≥50% (n = 34,079), concomitant tricuspid valve intervention (n = 329), degenerative mitral regurgitation (n = 4335), endocarditis (n = 74), or rheumatic etiology (n = 182) were excluded, with some patients fitting multiple exclusion criteria (Figure 1). The time period of this study incorporates data from STS version 2.73, 2.81, and 2.9 software. Mitral valve disease etiology was identified using *VDMitET* in STS version 2.73, *VDMiEt1* in STS version 2.81, and *VDMiPrimEt* in STS version 2.9 software. Patients were stratified according to severity of mitral regurgitation *VDInsufM* in STS version 2.73, 2.81, and 2.9 software.

OUTCOMES. The primary outcomes were operative mortality and STS major morbidity. Operative mortality was defined as 30-day or in-hospital death. Standard STS Adult Cardiac Surgery Database definitions were used for operative mortality and STS major morbidity (renal failure, prolonged ventilation, stroke, reoperation, and deep sternal wound infection). The proportion of patients undergoing mitral valve repair or replacement stratified by mitral regurgitation severity over time was evaluated as a secondary outcome. Patients were propensity score matched to account for differences in preoperative characteristics and to evaluate the impact of mitral intervention on operation on major morbidity and mortality.

STATISTICAL ANALYSIS. Continuous variables were presented as mean ± standard deviation. Categorical data were summarized as number (percentage). Continuous variables were compared by the Wilcoxon rank sum test. Categorical variables were compared by the χ^2 or Fisher exact test as appropriate. Trend over time was assessed with the Cochran-Armitage trend test.

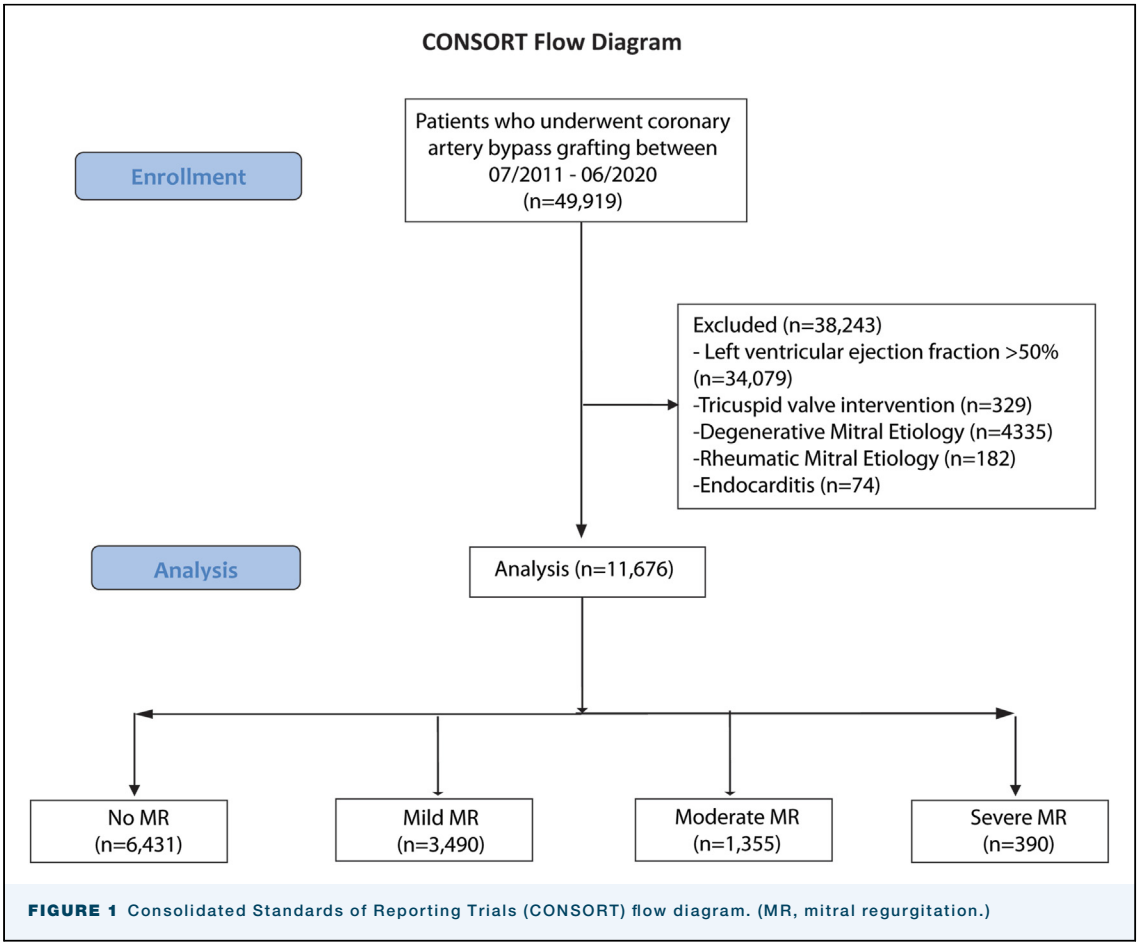

FIGURE 1 Consolidated Standards of Reporting Trials (CONSORT) flow diagram. (MR, mitral regurgitation.)

Propensity scores were estimated through logistic regression for each patient's propensity of undergoing mitral intervention. Greedy matching with the caliper of width 0.2 of the standard deviation of the logit of the propensity score was explored to match patients between groups with and without mitral valve intervention using the following preoperative variables: age, body mass index, race, sex, hypertension, previous stroke, diabetes, preoperative creatinine concentration, atrial fibrillation, chronic lung disease, heart failure, previous myocardial infarction, peripheral vascular disease, previous valve surgery, previous coronary artery bypass, cerebrovascular disease, dialysis, ejection fraction, mitral regurgitation, cross-clamp time, and cardiopulmonary bypass time. The balance in baseline characteristics between matched pairs was assessed with standardized difference for continuous and categorical variables. Nonparametric density estimates of the distribution of the propensity score were explored to assess how comparable propensity scores were between the groups with and without mitral valve intervention. For each matched pair, Wilcoxon signed rank test or McNemar test was used to compare continuous and categorical outcomes, respectively. Statistical analyses were performed with SAS version 9.4 software (SAS Institute).

RESULTS

A total of 11,676 patients underwent CABG, including 6431 (54.9%) with no mitral regurgitation, 3518 (30.1%) with mild mitral regurgitation, 1355 (11.6%) with moderate mitral regurgitation, and 390 (3.3%) with severe mitral regurgitation (Table 1; Figure 2). A mitral valve intervention was performed in 522 patients (421 repair, 101 replacement), including 0.1% of patients with no mitral regurgitation, 0.8% of patients with mild mitral regurgitation, 12.7% of patients with moderate mitral regurgitation, and 80.3% of patients with severe mitral regurgitation. Among patients with moderate IMR, patients undergoing mitral repair or replacement at the time of CABG were younger (65.4 ± 10.4 years vs 67.3 ± 10.1 years; $P = .02$), had a higher prevalence of heart failure (65.7% vs 56.2%; $P = .02$), and were more likely to undergo an elective procedure (32.6% vs 25.4%; $P = .04$; Table 2).

TABLE 1 Patients' Characteristics

Characteristic	Total	CABG	CABG + MVR/r	*P* Value
Male sex	9102 (77.9)	8748 (78.43)	354 (67.8)	<.0001
Age, y		65 ± 10.3	65.6 ± 9.9	.27
White	10,410 (89.2)	9957 (89.3)	453 (86.8)	.03
Black	972 (8.3)	9.13 (8.2)	59 (11.3)	
Other	294 (2.5)	8748 (78.4)	354 (67.8)	
Body mass index, kg/m^2		30.6 ± 11.1	29.0 ± 5.4	.001
Hypertension	10,494 (89.9)	10,040 (90.1)	454 (86.9)	.02
Peripheral vascular disease	2119 (18.2)	2010 (18.2)	109 (20.9)	.09
Diabetes	6013 (51.5)	5771 (51.7)	242 (4.4)	.02
Preoperative dialysis	390 (3.3)	364 (3.3)	26 (4.9)	.03
Atrial fibrillation	1553 (13.3)	1419 (12.7)	134 (25.7)	<.0001
Heart failure	4505 (38.6)	4207 (37.7)	28 (47.5)	<.0001
Ejection fraction, %		37.2 ± 8.5	32.7 ± 9.1	<.0001
Previous MI	8583 (73.5)	8214 (73.6)	369 (70.7)	.14
Previous valve surgery	29 (0.25)	23 (0.21)	6 (1.15)	<.0001
Previous CABG	244 (2.1)	224 (2.1)	20 (3.8)	.004
Elective	3667 (31.4)	3467 (31.1)	200 (38.3)	.001
Mitral regurgitation				
None/trivial	6413 (54.9)	6404 (57.4)	9 (1.7)	<.0001
Mild	3518 (30.1)	3490 (31.3)	28 (5.4)	
Moderate	1355 (11.6)	1183 (10.6)	172 (32.9)	
Severe	390 (3.3)	77 (0.7)	313 (59.9	
Cardiopulmonary bypass time, min		98.3 ± 46.8	168.9 ± 59.2	<.0001
Aortic cross-clamp time, min		71.3 ± 39.8	128.9 ± 45.8	<.0001

Categorical variables are presented as number (percentage). Continuous variables are presented as mean ± standard deviation. CABG, coronary artery bypass grafting; MI, myocardial infarction; MVR/r, mitral valve repair or replacement.

Among patients with severe IMR, patients undergoing CABG with mitral repair or replacement were less likely to have diabetes (43.1% vs 57.1%; $P = .02$), more likely to have heart failure (71.3% vs 59.7%; $P = .05$), and more likely to have an elective procedure (40.9% vs 16.9%; $P < .001$). STS predicted major morbidity was higher for patients with both moderate and severe IMR undergoing mitral surgery.

Overall, the proportion of patients undergoing mitral valve surgery at the time of CABG remained stable ($P_{trend} = .96$) from 2011 to 2020. However, the proportion of patients undergoing mitral intervention for moderate mitral regurgitation decreased over time (2011, 17.7%; 2020, 7.5%; $P_{trend} = .001$), with 93.6% of patients undergoing mitral repair. The overall proportion of patients undergoing mitral repair or replacement for severe IMR was unchanged over time (2011, 85.2%; 2020, 80%; $P_{trend} = .68$). The distribution of procedures among patients with severe IMR did not change significantly over time (repair: 2011, 74.1%; 2020, 66.7%; $P_{trend} = .38$; replacement: 2011, 11.1%; 2020, 13.3%; $P_{trend} = .14$; Figure 3).

UNADJUSTED OUTCOMES. Among patients with moderate IMR, the addition of mitral valve repair or replacement was associated with a higher frequency of prolonged ventilation (23.8% vs 15.1%; $P = .004$), which contributed to a higher incidence of STS major morbidity (29.1% vs 19.9%; $P = .005$). However, there was no difference in operative mortality (CABG with mitral repair or replacement, 0.58%; CABG, 1.01%; $P \geq .99$; Table 3). In patients with severe IMR, there was no difference in the incidence of STS major morbidity (CABG with mitral repair or replacement, 28.4%; CABG, 20.8%; $P = .17$) or operative mortality (CABG with mitral repair or replacement, 2.2%; CABG, 2.6%; $P = .69$).

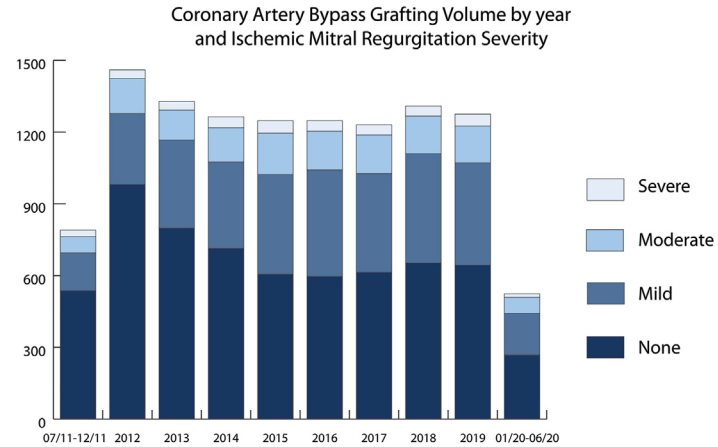

FIGURE 2 Yearly volume of coronary artery bypass grafting, stratified by severity of ischemic mitral regurgitation.

TABLE 2 Characteristics of Patients Undergoing CABG or CABG With Mitral Repair or Replacement Stratified by Mitral Regurgitation Severity

	Moderate IMR			Severe IMR		
Characteristic	CABG	CABG + MVR/r	*P* Value	CABG	CABG + MVR/r	*P* Value
Male sex	842 (71.2)	125 (27.3)	.68	53 (68.8)	199 (63.6)	.38
Age, y	67.3 ± 10.1	65.4 ± 10.4	.02	67.8 ± 10.4	65.5 ± 9.9	.07
Race						
Black	123 (10.4)	14 (8.1)	.68	10 (13.0)	42 (13.4)	.53
White	1023 (86.5)	153 (88.9)		67 (87.0)	266 (84.9)	
Hypertension	1059 (89.5)	151 (87.8)	.49	71 (92.2)	270 (86.3)	.15
Diabetes	609 (51.5)	88 (51.2)	.93	44 (57.1)	135 (43.1)	.02
Preoperative dialysis	55 (4.6)	6 (3.5)	.49	5 (6.5)	17 (5.4)	.16
History of stroke	128 (10.8)	14 (8.1)	.28	9 (11.7)	23 (7.4)	.2
Chronic lung disease	524 (44.3)	87 (50.6)	.12	40 (51.9)	142 (45.4)	.30
Atrial fibrillation	236 (19.9)	45 (26.2)	.06	16 (20.8)	80 (25.6)	.38
Heart failure	665 (56.2)	113 (65.7)	.02	46 (59.7)	223 (71.3)	.05
Ejection fraction, %	34.0 ± 9.6	31.7 ± 8.9	.003	31.9 ± 8.9	33.0 ± 9.1	.38
Previous MI	882 (74.6)	121 (21.5)	.71	60 (77.9)	222 (70.9)	.21
Previous valve surgery	4 (0.3)	1 (0.6)	.6	2 (2.6)	4 (1.3)	.39
Previous CABG	22 (1.9)	4 (2.3)	.67	1 (1.3)	15 (4.8)	.16
Elective procedure	301 (25.4)	56 (32.6)	.04	13 (16.9)	128 (40.9)	<.001
STS PROMM	26 ± 17	37 ± 15	<.001	32 ± 17	38 ± 7	.005
STS PROM	5 ± 6	7 ± 5	<.001	6 ± 8	8 ± 6	.2
Cardiopulmonary bypass time, min	98.5 ± 47.3	170.8 ± 58	<.001	97.9 ± 54.8	167.1 ± 59.6	<.001
Aortic cross-clamp time, min	70.1 ± 39.6	130.5 ± 42.6	<.001	68.1 ± 46.5	128.3 ± 48	<.001

Categorical variables are presented as number (percentage). Continuous variables are presented as mean ± standard deviation. CABG, coronary artery bypass grafting; IMR, ischemic mitral regurgitation; MI, myocardial infarction; MVR/r, mitral valve repair or replacement; PROM, predicted risk of mortality; PROMM, predicted risk of major morbidity; STS, The Society of Thoracic Surgeons.

OUTCOMES OF PROPENSITY SCORE–MATCHED PAIRS. Propensity score matching yielded 249 well-matched pairs. Characteristics were similar in patients with and without mitral intervention (Supplemental Table 1). Standardized difference for all baseline characteristics was smaller than 0.1, indicating a negligible imbalance between groups with and without mitral valve intervention (Supplemental Table 2). Nonparametric density estimates showed that the distribution of the propensity score in matched pairs was comparable. In the propensity score-matched analysis, there was no difference in the incidence of operative mortality (2.4% vs 1.2%; $P = .51$). Similarly, the incidence of STS major morbidity was similar between groups (23.7% vs 29.3%; $P = .16$), including the component complications (Table 4). The proportion of patients requiring reoperation or readmission after discharge was also similar between groups.

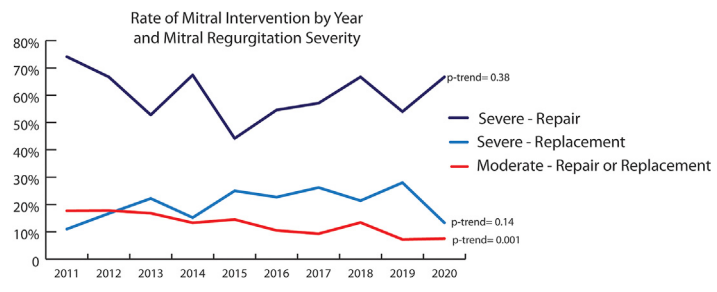

FIGURE 3 Proportion of patients undergoing mitral valve repair or replacement by mitral regurgitation severity over time.

COMMENT

This study presented a contemporary snapshot of management of IMR at the time of CABG in a statewide collaborative database from 33 centers from 2011 to 2020. During the time period of this study, management guidelines for IMR shifted. The role of mitral valve repair for moderate IMR at the time of CABG was deemphasized to COR IIb, LOE B (may be considered).[6] At the same time, guidelines were updated to favor chordal-sparing mitral valve replacement over downsized annuloplasty repair for severe IMR, with COR IIa, LOE B-R.[6,8] Concordant with current guidelines, the proportion of patients undergoing concomitant mitral valve surgery for moderate IMR at the time of CABG decreased over time. However, despite the guidelines, the proportion of patients undergoing mitral valve replacement for severe IMR did not change. In addition, in the propensity score-matched analysis, morbidity and operative mortality were similar among patients who underwent mitral valve intervention compared

with patients with equivalent preoperative mitral regurgitation.

Most patients with moderate IMR did not undergo mitral valve intervention at the time of CABG, and the proportion of patients with moderate IMR undergoing mitral valve repair has decreased over time. The CTSN Moderate Ischemic Mitral Regurgitation trial randomized patients with moderate IMR to CABG or CABG with mitral valve repair, with 2-year results demonstrating no improvement in survival, no difference in left ventricular end-systolic volume index, and higher early hazard of neurologic events in patients undergoing mitral valve repair.[8] Randomized studies before the CTSN trial had demonstrated a decrease in left ventricular end-diastolic dimension and left ventricular end-systolic volume index with mitral valve repair.[10-13] The differences in outcomes of these previous studies may be attributable to a higher proportion of viable myocardium and fewer previous myocardial infarctions in patients in the CTSN trial, in which case IMR may improve with revascularization alone without the need for mitral annuloplasty. Although myocardial viability data were not available for this study, the decrease in the proportion of patients undergoing mitral valve repair for moderate IMR over time suggests that surgeons are becoming more selective in determining which patients to repair and are following society guidelines.

Importantly, the proportion of patients undergoing mitral valve replacement for severe IMR did not change over the time period of this study despite updated guidelines from both the AATS and the ACC/AHA. Indeed, most patients with severe IMR received mitral valve repair rather than replacement. In addition, approximately 20% of patients with severe IMR did not receive mitral repair or replacement at the time of CABG. The CTSN Severe Ischemic Mitral Regurgitation randomized controlled trial demonstrated that mitral valve replacement for severe IMR resulted in a lower rate of recurrence of moderate or severe mitral regurgitation compared with mitral repair along with less heart failure and fewer cardiovascular readmissions; however, there was no difference in adverse events or survival at 2 years.[7] Subsequently, the Papillary Muscle Approximation randomized trial assigned 96 patients with severe IMR undergoing CABG to either undersized restrictive mitral annuloplasty or restrictive mitral annuloplasty with papillary muscle reapproximation and demonstrated a lower rate of recurrent moderate or severe mitral regurgitation at 2 years after mitral annuloplasty (13.2%) than had been identified in the CTSN trial.[14] The lower prevalence of recurrent moderate or severe mitral regurgitation was attributed to more aggressive annular size reduction and a higher rate of revascularization compared with the CTSN trial.[14] These findings contribute to ongoing debate about optimal management of severe IMR despite updates to AATS and AHA/ACC guidelines and may have contributed to the absence of change in replacement rates for severe IMR.

TABLE 3 Unadjusted Outcomes

Outcome	Moderate Mitral Regurgitation			Severe Mitral Regurgitation		
	CABG	CABG + MVR/r	*P* Value	CABG	CABG + MVR/r	*P* Value
Renal failure	41 (3.5)	11 (6.4)	.06	0 (0.0)	14 (4.5)	.08
Stroke	14 (1.2)	4 (2.3)	.27	1 (1.3)	9 (2.9)	.69
Prolonged ventilation	179 (15.1)	41 (23.8)	.004	14 (18.2)	77 (24.6)	.23
Deep sternal wound infection	7 (0.6)	0 (0.0)	.60	0 (0.0)	0 (0.0)	…
Reoperation	67 (5.7)	9 (5.2)	>.99	4 (5.2)	30 (9.6)	.26
STS major morbidity, %	29.1	19.9	.005	28.4	20.8	.17
Operative mortality, %	0.58	1.01	≥.99	2.2	2.6	.69

Values are reported as number (percentage). CABG, coronary artery bypass grafting; MVR/r, mitral valve repair or replacement; STS, The Society of Thoracic Surgeons.

The yearly volume of patients with moderate or severe IMR remained consistent during the study period. The COAPT trial demonstrated that patients with heart failure and secondary mitral regurgitation experience fewer heart failure hospitalizations and improved survival when treated with MitraClip (Abbott) in addition to guideline-directed medical therapy.[15] Since the publication of the COAPT trial, both the number and proportion of patients presenting with moderate or severe mitral regurgitation were consistent with previous years. As MitraClip utilization increases, these proportions may decrease.

This analysis highlights discordant uptake of guidelines as demonstrated by the guideline-concordant decrease in utilization of mitral valve repair for moderate IMR compared with the guideline-discordant stability of mitral valve replacement for severe IMR. The trends in mitral valve intervention in this study raise

TABLE 4 Outcomes for CABG With or Without Mitral Valve Intervention in Propensity Score–Matched Patients

Outcome	CABG	CABG + MVR/r	*P* Value
Renal failure	6 (2.41)	17 (6.8)	.01
Stroke	3 (1.2)	6 (2.4)	.51
Prolonged ventilation	46 (18.5)	58 (23.3)	.20
Deep sternal wound infection	2 (0.8)	0 (0)	.999
Reoperation	21 (8.4)	18 (7.2)	.74
STS major morbidity	59 (23.7)	73 (29.3)	.16
Mortality	6 (2.4)	3 (1.2)	.51

Values are reported as number (percentage). CABG, coronary artery bypass grafting; MVR/r, mitral valve repair or replacement; STS, The Society of Thoracic Surgeons.

important questions related to implementation and deimplementation of guidelines-based care in cardiac surgery and demonstrate that publication of new guidelines may not be enough to change clinical practice. The STS has participated in the Choosing Wisely campaign to promote evidence-based care and appropriate medical decision-making.[16] For example, within cardiac surgery, widespread adoption of internal mammary artery bypass grafting has been slow despite well-demonstrated advantages in long-term patency rates.[17] Barriers to implementation of new practice patterns have been recognized in surgery and include surgeon perception of negative outcomes, perceptions related to generalizability of trial findings, poor communication of new/emerging evidence, and concerns related to reimbursement or changes in compensation for procedures that require additional complexity and time.[18,19] Additional efforts to analyze both implementation and deimplementation of treatments in cardiac surgery are needed.

LIMITATIONS. This study was limited by its retrospective and observational nature. Given the retrospective nature, there is selection bias due to lack of explanation of why surgeons performed mitral valve repair or replacement in some patients but not in others. In addition, the MSTCVS database provides limited information related to echocardiographic findings that may have influenced surgical decision-making. Analysis was also limited to perioperative morbidity and mortality rather than to intermediate or long-term outcomes. This study was not designed to promote one surgical option over another or to comment on the effects of individual surgeon experience or hospital mitral surgery volume on decision-making or outcomes related to IMR, and previous evaluations of mitral surgery volume have excluded IMR from analysis.[20,21] Finally, although there is the potential for miscoding or misclassification of data in registry-based analyses, the MSTCVS has consistently achieved high overall scores for data accuracy as part of routine audits (>98% data accuracy).[22,23]

CONCLUSION. In this statewide analysis of management of IMR at the time of CABG during 9 years, in accordance with guideline changes, fewer patients with moderate IMR underwent mitral repair. In addition, contrary to the study hypothesis, there was no change in the proportion of patients with severe IMR undergoing mitral valve replacement in the setting of CABG, contrary to randomized trial data and guideline updates. Importantly, mitral valve repair or replacement was not associated with higher morbidity or operative mortality, consistent with randomized trial data. Further investigation is needed to determine optimal strategies for dissemination and implementation and deimplementation of new evidence, techniques, and technology and understanding reasons that surgeons decide to pursue one approach over another.

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DISCLOSURES

The authors have no conflicts of interest to disclose.

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Southern Thoracic Surgical Association Seventieth Annual Meeting

The Seventieth Annual Meeting of the Southern Thoracic Surgical Association (STSA) will be held November 2-5, 2023, at the Loews Sapphire Falls Resort at Universal Orlando™ in Orlando, FL.

Those wishing to participate in the Scientific Program should submit an abstract by Monday, April 3, 2023, 11:59 PM, Eastern Time. Abstracts must be submitted electronically. Instructions for the abstract submission process will be posted on the STSA website at www.stsa.org as soon as they are available.

Residents submitting an abstract for presentation at the STSA Seventieth Annual Meeting may elect to participate in the STSA Hawley Seiler Residents Competition. Hawley Seiler Residents Award candidates must submit a manuscript to the STSA headquarters office no later than October 11, 2023. The Resident Award will be judged based on the quality of the candidate's abstract, presentation, and manuscript. Reference www.stsa.org/awards to learn more about STSA Annual Meeting scientific paper awards.

Contact STSA Headquarters with questions at stsa@stsa.org or (312) 202-5892.