Original Research Article

Ten-year outcomes of surgical treatment of ischemic mitral regurgitation-a retrospective study

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Received: 22 October 2023
Accepted: 07 November 2023

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ABSTRACT

Background: Mitral regurgitation (MR) is a prevalent form of valvular heart disease, affecting millions of people worldwide. Primary MR occurs due to mitral valve dysfunction, while secondary MR is caused by left ventricle remodelling. The study aimed to investigate the long-term outcomes of patients with IMR after undergoing coronary surgeries, including coronary artery bypass graft (CABG) with or without mitral valve repair or replacement.

Methods: Retrospective, observational study design was planned. Pre-operative and postoperative data were collected from 68 patients with ischemic MR who underwent coronary artery bypass surgery, with or without Mitral valve replacement or mitral valve repair. (That is CABG only/CABG+MVR/CABG+MVr) in the year between 2001 and 2010. Patients followed up at 3 months, 1 year, and 10 years after the procedure.

Results: Significant improvements in New York heart association (NYHA) functional class and MR status were observed for all three surgical groups, namely, a) CABG surgery, b) coronary artery bypass graft surgery with mitral valve replacement (CABG+MVR), and c) coronary artery bypass graft surgery with mitral valve repair (CABG+MVr). After 10 years, redo surgery rates were minimal for CABG only and CABG+MVR groups of patients, while CABG+MVr required 20% redo surgery. Postoperative complications, such as left ventricle failure, were seen in the immediate postoperative period, leading to the death of those patients 3 months following the surgery. After 3 months, complications decreased over time for all groups.

Conclusions: Surgical interventions effectively improved functional outcomes and reduced MR severity in patients with ischemic MR. Redo surgery rates were low for most patients, indicating the success of the initial procedures.

Keywords: IMR, Coronary surgery, CABG, Mitral valve repair, Mitral valve replacement, Long-term outcomes

INTRODUCTION

Mitral regurgitation (MR) is characterized by the retrograde passage of blood from the left ventricle to the left atrium due to improper coaptation of the mitral leaflets.[1] It is the third most prevalent form of valvular heart disease, affecting about 24.2 million individuals worldwide. Primary MR is caused by mitral valve dysfunction, while secondary MR is due to left ventricle remodelling.[2] Primary is a consequence of myxomatous degeneration and mitral valve prolapse, while secondary MR is a common and significant coronary artery disease

complication. Current guidelines prescribe valvular surgery along with CABG, CABG with mitral valve replacement (CABG+MVR) and CABG with mitral valve repair (CABG+MVr) for moderate to severe MR but do not specify which procedure constitutes the optimal surgical approach or under what conditions to prefer one over the other.[3] Novel randomized trials investigating IMR provide new information and corroborate some ideas previously suggested by a few retrospective cohort studies.[4] This study aims to evaluate the postoperative outcomes of three surgical interventions-CABG, CABG with mitral valve replacement (CABG + MVR), and CABG surgery with mitral valve repair (CABG + MVr) -

in the management of IMR, across varying postoperative follow-up periods (3 months, 1 year, and 10 years).

METHODS

A retrospective, observational study design uses secondary recorded data from the department of cardiovascular and thoracic surgery at SCTIMST, Trivandrum. Relevant permission was taken from the institute of ethical committee (IEC) with the outward no. SCT/IEC/2042/MAY/2023 of a medical college and hospital before the study conduction. We got a total 1428 number of patients with coronary artery disease and Ischemic mitral regurgitation, which underwent surgical management between the years 2001-2010.

Of those, 68 cases only participated in our study according to our eligibility criteria. Written informed or telephonic verbal consent was taken before the study setting. Confidentiality is maintained during study settings.

Inclusion criteria

Included patients with coronary artery disease having ischemic mitral regurgitation who underwent coronary artery bypass graft with or without mitral valve repair/replacement.

Exclusion criteria

Patients were excluded from those who previously underwent a procedure such as carotid endarterectomy, redo operations, valve replacement and repair in conjunction with a coronary artery bypass graft, or who had another congenital heart condition.

Pre-operative, immediate postoperative and late postoperative data were collected through electronic medical records (EMR). The principal investigator and co-investigators performed the retrospective data analysis and the clinical examination of post-operative follow-up.

Statistical analysis

The compilation of data was done systematically. Using a Microsoft excel worksheet (Microsoft, USA, version 8.1), a master table was made. Accordingly, the data was subdivided, distributed, and presented in individual tables and graphs. Statistical analysis was done using international business machines, statistical package for social science (Statistics for Windows, version 25.0, Armonk, NY: IBM Corp.). Statistical tests were compared by applying statistical tests to find the statistical significance of the results.

RESULTS

The patients' mean age was 56.87±9.344 years, with a range of 43-89 years old at the time of surgery, 5-30 days

of hospital stay after the surgery was observed, and the mean value is 8±6 days. 36.8% (n=5) of patients had the co-morbidity of Dyslipidemia. 33.8% (n=23) had co-morbidity of dyslipidemia associated with hypertension and diabetes (Table 1).

Table 1: Distribution of patients by sex and co-morbidity on pre-operative observations.

Parameters	N	Percentage (%)
Gender		
Male	60	88.24
Female	9	11.76
Co-morbidity		
Normal	1	1.5
Only hypertension	9	13.2
Dyslipidemia	25	36.8
Hypertension + diabetes	9	13.2
Hypertension + diabetes + peripheral artery disease	1	1.5
Hypertension + diabetes + dyslipidemia	23	33.8

Among all 68, 10 patients died immediately after surgery. Hence, data from 58 surviving patients were available on the third month and 1-year postoperative follow-up. By the end of our study, postoperative follow-up on 10 years, 57 patients were analyzed because one patient died after 5 years (Table 2). The survival rate was observed and presented by using Kaplan-Meier estimates. Survived patients after coronary artery bypass surgery only, and coronary artery bypass surgery with mitral valve repair resulted in all the patients becoming asymptomatic on the follow-up examination after the surgery (Figure 1). Similarly, all survived patients who underwent coronary artery bypass surgery with mitral valve replacement became asymptomatic till 3 months following the surgery. Later, a single patient developed symptoms on postoperative examination follow-up of 1 year, which was resolved 10 years after the follow-up examination was observed.

Patients who underwent coronary artery bypass graft with mitral valve repair surgery needed to redo surgery less frequently later. For the remaining group, none of the patients underwent redo surgery. Left ventricle failure (LVF) was the most frequent post-operative complication that appeared immediately after the surgery shown in Table 2. All those patients died due to the complications of the LVF.

By the endpoint of the 10-year follow-up, surgical impact on MR status signifies that improvement of MR status to normal level from the baseline level among patients who underwent coronary artery bypass surgery, coronary artery bypass surgery with the mitral valve repair, coronary artery bypass surgery with the mitral valve replacement.

All the 96.7 percentages (n=30) of patients who underwent coronary artery bypass surgery only had improved functional class I status after ten years of post-operative follow-up. The 81.1 percentages (n=9) of patients who underwent coronary artery bypass surgery with mitral valve replacement had improved functional class I status after ten years of post-operative follow-up. In comparison, the 5.6 percentages (n=14) of patients who underwent coronary artery bypass surgery with mitral valve repair had improved functional class I status after ten years of the post-operative follow-up (Table 3 and 4).

Table 2: Distribution of patients by death, symptoms, redo surgery and co-morbidity on pre-operative follow-up immediately after surgery, 3 months, 1 year and 10 years.

Surgery	MR status	Period postoperative follow-up, n (%)			
		Immediate	3 months	1 year	10 years
CABG only	Death	2 (5.9)	0 (0)	0 (0)	1 (3.3)
	Symptoms	9 (26.5)	0 (0)	0 (0)	0 (0)
	Complications	2[a] (5.9)	0 (0)	0 (0)	1[c] (3.33)
	Redo surgery	0	0 (0)	0 (0)	0 (0)
CABG+MVR	Death	5 (31.3)	0 (0)	0 (0)	0 (0)
	Symptoms	15 (93.8)	0 (0)	1 (9.1)	0 (0)
	Complications	5[a] (31.3)	0 (0)	0 (0)	0 (0)
	Redo surgery	0	0 (0)	0 (0)	0 (0)
CABG+MVR	Death	3 (18.7)	0 (0)	0 (0)	0 (0)
	Symptoms	0 (0)	0 (0)	0 (0)	0 (0)
	Complications	3[a] (18.7)	1[b] (6.6)	0 (0)	0 (0)
	Redo surgery	1[R] (6.66)	0 (0)	0 (0)	2[R] (13.33)

Table 3: Comparative distribution of study patients according to their MR status in pre-operative examination and postoperative follow-up of 3 months, 1 year and 10 years.

Surgery	MR status	Pre-op, n (%)	3 months, n (%)	1 year, n (%)	10 years, n (%)
CABG only	Class 1	1 (2.9)	26 (81.3)	29 (90.6)	30 (96.7)
	Class 2	27 (79.4)	6 (18.8)	3 (8.8)	1 (3.3)
	Class 3	5 (14.7)	0 (0)	0 (0)	0 (0)
	Class 4	1 (2.9)	0 (0)	0 (0)	0 (0)
CABG+MVR	Class 1	0 (0)	3 (8.8)	7 (63.6)	9 (81.1)
	Class 2	2 (12.5)	8 (23.5)	4 (36.4)	2 (18.2)
	Class 3	14 (62.5)	0 (0)	0 (0)	0 (0)
	Class 4	4 (25)	0 (0)	0 (0)	0 (0)
CABG+MVr	Class 1	0 (0)	11 (73.3)	14 (93.3)	14 (93.3)
	Class 2	1 (5.6)	4 (26.7)	1 (6.7)	1 (6.7)
	Class 3	15 (83.5)	0 (0)	0 (0)	0 (0)
	Class 4	1 (11.1)	0 (0)	0 (0)	0 (0)

Table 4: Comparative distribution of study patients according to their NYHA functional class in pre-operative examination and postoperative follow-up of 3 months, 1 year and 10 years.

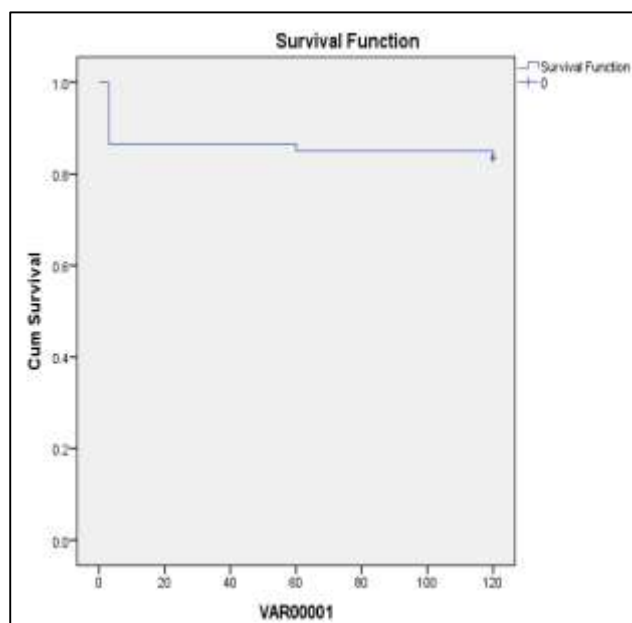| Surgery	MR status	Pre-op, n (%)	3 months, n (%)	1 year, n (%)	10 years, n (%)
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	Class 2	2 (12.5)	8 (23.5)	4 (36.4)	2 (18.2)
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CABG+MVr	Class 1	0 (0)	11 (73.3)	14 (93.3)	14 (93.3)
	Class 2	1 (5.6)	4 (26.7)	1 (6.7)	1 (6.7)
	Class 3	15 (83.5)	0 (0)	0 (0)	0 (0)
	Class 4	1 (11.1)	0 (0)	0 (0)	0 (0)

Figure 1: Distribution of study participants according to their mortality.

DISCUSSION

In our study, the mean age of the studied patients is 56 years. This finding differed from the study findings of Smith et al and El Bardissi et al as the resulting mean age of their patients is 65 years old, approximately 10 years higher than ours.[5,6] This may be due to racial and genetic reasons. Approximately one week (8 days) hospital stay was observed among 79% (n=54) of the patients in our study, and similar days of hospital stay after the surgery were observed in the study of Wang et al.[7] There were 88.24% (n=60) males included in our study, which is higher in numbers than females.

Our results of higher male >> female agreed with the results of Kang et al in their results, males were 68% (n=39).[8] Avierinos et al reported that Women undergo mitral valve surgery less often than men, and those with severe regurgitation incur excess long-term mortality versus men.[9] Hence, the incidence of males is higher than females. The co-morbidity of hypertension associated with diabetes was observed among 19% (n=245) by Dziadzko et al.[10] This finding is nearly higher than our results, 13.2% (n=9) for diabetes and hypertension. The higher prevalence of co-morbidity in patients observed may be the concern of the Diagnostic and Interventional Cardiology statement. They stated that Diabetics whose blood sugar, blood pressure, blood fats (lipids), body mass index (BMI) and kidney function rate were within the therapeutic target range had a persistently high risk of hardening in left-sided valves.

The New York heart association functional class III was observed at the baseline among 44.4%. In the study of Chow et al., their results followed our findings that 44.1% had NYHA class III on the pre-operative examination among 68 patients.[11] No patient showed class III by the end of our study, and this status improved after the surgical intervention. Our results of improving MR status are aligned with the study findings of Smith et al and Kang et al analyzing trends in isolated CABG found positive outcomes in MVR patients.[5,8] This study suggests that CABG with or without mitral valve replacement or repair improves MR status in cardiovascular patients. These interventions address MR and produce long-term benefits. In long-term follow-up studies that examine various coronary artery bypass grafts, patients without mitral valve replacement or repair have a low re-operation rate. These results show that the initial procedures and surgical interventions helped the patients to improve their MR status.

Postoperative complications such as respiratory failure, cerebrovascular events, renal failure and arrhythmias are observed in 17.6%, 11.8%, 14.7% and 20.6% of the study patients. In the study of Koene et al postoperative complications of cerebrovascular events, renal failure and arrhythmias were observed among 28%, 25%, and 11% of the patients.[12] In the study of Chow et al 14.3% of patients had postoperative renal failure, and 1.83% of patients had postoperative respiratory failure observed.[11]

Limitations

As it is a rsetrospective study, there may be information bias. The sample size is relatively small, which may limit the generalizability of the findings. If the study is conducted in only one institute, the outcome rate will differ in different populations and races.

CONCLUSION

IMR is a common complication of cardiac surgery. In recent years, there has been a shift in the understanding and management of IMR. Surgical techniques have improved, and randomized clinical trials have provided stronger evidence for the benefits of mitral valve repair. The study found that the prevalence of IMR has decreased over time, with most patients presenting with mild or moderate MR. Patients with severe MR were rare. CABG alone is sufficient for patients with mild MR, but those with severe MR benefit from concomitant mitral valve repair. This can improve functional capacity, left ventricular remodeling, and MR severity. The study also found that mortality rates after cardiac surgery for IMR are low, and most patients achieve favorable outcomes without the need for additional surgical interventions. However, complications such as left ventricular failure can occur, and comprehensive care and follow-up are important.

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