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Original Research Article

IGNORING TRICUSPID REGURGITATION DURING MITRAL VALVE SURGERY: A RISKY BET? A COMPARATIVE STUDY OF MITRAL VALVE REPLACEMENT WITH OR WITHOUT TRICUSPID REPAIR

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Abstract

Background: Tricuspid regurgitation is common in mitral valve surgery and may persist or worsen if left unaddressed, leading to right-sided heart failure. While tricuspid repair improves right ventricular function and survival, its necessity remains debatable because of procedural risks and the potential for spontaneous regression. This study aimed to evaluate the outcomes of patients who underwent MVR with and without concomitant tricuspid repair. **Materials and Methods:** This retrospective observational study included 54 patients who underwent mitral valve replacement at a tertiary care state apex hospital in Tamil Nadu, India, between January 2023 and December 2023. Patients were divided into two groups: (A) those undergoing isolated mitral valve replacement and (B) those undergoing MVR with tricuspid ring annuloplasty. The decision to repair TR was made intraoperatively based on surgeon preference and clinical findings, including right atrial size, pulmonary hypertension indicators, and saline regurgitation test results. **Result:** Both groups had a similar hospital stay, ICU stay, surgery duration, age, gender distribution, and baseline TR severity, with no significant differences. Mortality (p=0.85) and postoperative arrhythmia (p=0.92) did not differ significantly. However, patients who underwent tricuspid repair had lower rates of residual TR at discharge (p=0.02), less TR progression at 6 months (p=0.04), and reduced right ventricular dysfunction (p=0.03) and pulmonary hypertension (p=0.04) at 1-year follow-up. These findings highlight the long-term benefits of addressing TR during MVR surgery. **Conclusion:** Ignoring mild-to-moderate TR during MVR can lead to worsening TR, right ventricular dysfunction, and pulmonary hypertension. Concomitant tricuspid repair improved long-term outcomes without significantly affecting surgical duration, ICU stay, or early mortality.

INTRODUCTION

Tricuspid regurgitation (TR) is frequently encountered in patients undergoing mitral valve surgery, often as a secondary condition associated with left-sided valvular disease. Historically, TR was considered a benign and self-limiting condition that might resolve following correction of the mitral valve pathology.[1] However, emerging evidence suggests that untreated TR can persist or even progress postoperatively, leading to significant morbidity and mortality. The decision to repair or leave TR unaddressed during mitral valve replacement (MVR) remains a topic of ongoing debate.[2]

Functional TR, the most common form, is typically associated with annular dilation and right ventricular remodelling due to chronic volume overload from mitral valve disease. While mild TR may improve after mitral valve surgery due to decreased pulmonary pressures, moderate or severe TR often persists, contributing to right heart failure, reduced exercise tolerance, and poorer long-term outcomes.[3] Therefore, identifying patients who would benefit from concomitant tricuspid valve repair during mitral valve surgery is critical.[4]

Several studies have explored the impact of tricuspid repair during MVR, demonstrating potential advantages such as improved right ventricular function, reduced risk of late right heart failure, and

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better overall survival.[5] Techniques such as tricuspid annuloplasty have shown efficacy in stabilizing the tricuspid valve and preventing progressive regurgitation.[6] However, some clinicians argue against routine tricuspid intervention due to the potential for increased operative time, procedural risks, and the possibility that TR may regress spontaneously post-MVR.[7]

The primary objective of our study was to compare and evaluate the effect of combined concomitant tricuspid ring annuloplasty in patients undergoing mitral valve replacement for either mitral stenosis or regurgitation, with the patients also having a simultaneous mild to moderate or moderate tricuspid regurgitation versus those patients who underwent mitral valve replacement alone, without addressing the functional TR, on in-hospital outcomes. The secondary objective was to evaluate immediate surgical success, immediate postoperative outcomes, short-term effects, and one-year follow-up effects in both groups. Understanding the long-term implications of untreated TR will aid in optimising surgical decision-making and improving patient prognosis.

MATERIALS AND METHODS

This retrospective observational study included 54 patients who underwent mitral valve replacement at the Department of Cardiovascular Surgery in a tertiary care state apex hospital in Tamil Nadu between January 2023 and December 2023.

Inclusion Criteria

Patients who underwent mitral valve replacement for stenotic, regurgitant, or combined mitral valve lesions were included.

Exclusion Criteria

Patients with coronary artery disease, myocardial ischaemia, prior median sternotomy, previous mitral valve repair, or requiring concomitant aortic valve surgery, isolated mitral valve disease, or severe tricuspid regurgitation requiring surgery were excluded.

Methods: The patients were divided into two groups: (A) patients with TR undergoing isolated mitral valve replacement and (B) patients with TR undergoing a combination of mitral valve replacement with tricuspid ring annuloplasty. The decision to address mild-to-moderate or moderate TR was made on-table, based on the preference of the operating surgeon, factoring in clinical findings such as the size of the right atrium, thrill over the right atrium, resistance to ventilation with a Bains circuit indicative of severe coexisting pulmonary hypertension, and saline regurgitation test to assess the coaptation of the tricuspid valve leaflets.

Data on renal, cardiac, respiratory, and liver function and rhythm disturbances were collected by retrospectively assessing the case record documentation and preoperative work-up and assessment records. The surgical procedure was performed, and the findings leading to either addressing the TR or not were recorded from the OR notes. Pre-and postoperative ECHOs at the time of discharge, the 1st follow-up at 15 days from discharge, at 6 months, and 1 year were collected from both hospital case records and patient follow-up books retrospectively, getting in touch with the patients.

Statistical analysis: Data were presented as mean, standard deviation, frequency, and percentage. Continuous variables were compared using the independent sample t-test. Categorical variables were compared using Pearson's chi-square test. Significance was defined as P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM SPSS version 21.0.

RESULTS

The mean total hospital stay was slightly longer in Group B (10.5±2.3 days) than in Group A (10.2±2.5 days), but the difference was not significant (p=0.58). The mean ICU stay was comparable between the groups, with Group A at 3.8±1.4 days and Group B at 3.7±1.2 days (p=0.71). The mean surgery duration was slightly longer in Group B (181.3±22.7 min) than in Group A (178.6±25.2 min), but the difference was not significant (p=0.63).

The mean age was similar between Groups A (43.5±7.8 years) and B (42.9±6.5 years), with a p-value of 0.68. The mean duration of postoperative inotropic support was nearly identical in both groups, with Group A at 12.6±5.2 h and Group B at 12.1±4.8 h (p=0.74) [Table 1].

Table 1: Comparison of perioperative parameters between the groups.

	Group A (n=33)	Group B (n=21)	P-value
Mean age (years)	43.5±7.8	42.9±6.5	0.68
Mean surgery duration (minutes)	178.6±25.2	181.3±22.7	0.63
Mean ICU stay (days)	3.8±1.4	3.7±1.2	0.71
Mean total hospital stay (days)	10.2±2.5	10.5±2.3	0.58
Mean postoperative inotropic support (hours)	12.6±5.2	12.1±4.8	0.74

Group A had 57.6% females, whereas Group B had 66.7% females (p = 0.42), showing no significant difference. Moderate TR was present in 69.7% of Group A and 66.7% of Group B (p = 0.79), indicating similar baseline TR severities. Mortality was 6.1% in Group A and 4.8% in Group B (p = 0.85), with no significant difference between the groups. Postoperative arrhythmia occurred in 24.2% of Group A and 23.8% of Group B (p = 0.92), showing comparable arrhythmic risk.

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More patients in Group A (45.4%) had residual TR than in Group B (19%) (p = 0.02), indicating better TR control with repair. Worsening TR at the 6-month follow-up was observed in 36.3% of Group A versus 14.3% of Group B (p = 0.04), favouring tricuspid repair. Right ventricular dysfunction at 1-year follow-up was more common in Group A (33.3%) than in Group B (9.5%) (p = 0.03), suggesting a protective effect of repair. At the 1-year follow-up, pulmonary hypertension was present in 42.4% of Group A and 23.8% of Group B (p = 0.04) [Table 2].

Table 2: Comparison of postoperative outcomes between groups

	Group A (n=33)	Group B (n=21)	P-value
Gender distribution	Female: 19 (57.6%)	Female: 14 (66.7%)	0.42
	Male: 14 (42.4%)	Male: 7 (33.3%)	
Preoperative TR severity	Mild: 10 (30.3%)	Mild: 7 (33.3%)	0.79
	Moderate: 23 (69.7%)	Moderate: 14 (66.7%)	
Immediate postoperative mortality	2 (6.1%)	1 (4.8%)	0.85
Postoperative arrhythmia	8 (24.2%)	5 (23.8%)	0.92
Residual TR at discharge	15 (45.4%)	4 (19%)	0.02
Worsening TR at 6-month follow-up	12 (36.3%)	3 (14.3%)	0.04
Right ventricular dysfunction at 1-year follow-up	11 (33.3%)	2 (9.5%)	0.03
Pulmonary hypertension at 1-year follow-up	14 (42.4%)	5 (23.8%)	0.04

DISCUSSION

The average duration of surgery, average ICU stay, total hospital stay, and inotrope requirement in the immediate postoperative period were nearly the same for both groups. Common complications encountered were postoperative haemorrhage, electrolyte imbalance, and arrhythmias, especially atrial fibrillation (AF), which was more common in those with preoperative AF; the incidence was similar in both groups, without any change due to the surgical procedure. All-cause mortality was the same in both groups, as was the number of postoperative deaths due to the effect of surgery.

The course of the initial postoperative period in-hospital was very similar in both groups, as was the immediate follow-up period post-discharge to 1st review at 15 days. This similarity between the groups was reflected even in the initial two ECHOs compared – the ECHO assessment at the time of discharge and that at 1st review 15 days post-discharge. This indicated that the type of surgery – addressing the mitral valve disease alone versus concomitantly addressing the TR – did not have a significant short-term difference in the course and outcome of the patients, with recovery, complications, and early mortality being comparable and the same in the two groups.

The difference arose in the longer follow-up periods. It was noted that the persistence and new occurrence of severe TR progressing from preoperative or immediate postoperative mild TR was higher in group A, where only mitral valve replacement was performed. The occurrence and worsening of TR were more common in group A than in group B, where TRA was performed in the same sitting. The persistence of right ventricular dysfunction and pulmonary hypertension was also more common in group A than in group B, although the occurrence due to dysfunction caused by surgical stress was the same initially in both groups.

Limitations: This retrospective, single-centre study has limited generalisability and potential selection bias due to its restricted demographic. Variability in the surgical approaches among multiple surgeons may have influenced the outcomes. The one-year follow-up restricted the long-term assessment of TR progression and right ventricular function, and the absence of long-term echocardiographic evaluation limited the conclusions on tricuspid repair durability. Future multicentre studies with longer follow-up periods are needed to establish stronger guidelines.

CONCLUSION

Our study demonstrates that ignoring mild-to-moderate or moderate TR during mitral valve replacement may lead to worsening TR, right ventricular dysfunction, and pulmonary hypertension. Patients who underwent concomitant tricuspid ring annuloplasty had lower rates of residual TR at discharge, worsening TR at 6 months, right ventricular dysfunction, and pulmonary hypertension at 1-year follow-up than those who underwent MVR alone. Tricuspid repair did not significantly increase surgical duration, ICU stay, or early mortality. While current practices regarding functional TR remain surgeon-dependent, these findings support the proactive management of TR at the time of mitral valve surgery to prevent long-term complications. Larger multicentre studies with extended follow-up are warranted to further establish guidelines for optimal TR management.

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