RESEARCH PAPER

Early and Mid-Term Results of Mitral Valve Replacement for Rheumatic Mitral Valve Disease in a Tier-2 Indian City

Vedanth Gopalan[1], *Harshagopal Deshpande[2], Kailash Bagale[3]

[1]Associate Professor, Department of Cardiothoracic Surgery, Sri Jayadeva Institute of Cardiovascular Science and Research, Kalaburagi

[2]Assistant Professor, Sri Jayadeva Institute of Cardiovascular Science and Research, Kalaburagi

[3]Associate Professor, Department of Cardiothoracic Surgery, Sri Jayadeva Institute of Cardiovascular Science and Research, Kalaburagi

Corresponding Author: Dr Harshagopal Deshpande

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ABSTRACT

Background: Rheumatic heart disease is very much endemic in India. Mitral valve is the most commonly affected valve in rheumatic heart disease. Mitral valve replacement with mechanical valve is the commonest surgical procedure performed in rheumatic heart disease (RHD). However, there are no studies reporting the early and mid-term outcomes of mitral valve replacement in rheumatic heart disease from tier 2 cities of India.

Objective: The primary objective was to assess the early and mid-term clinical results of mitral valve replacements. To achieve this, mortality was established as the primary endpoint, while secondary outcomes included the complications after the surgery such as postoperative stroke, major bleeding events, acute kidney injury.

Materials and Methods: This retrospective clinical investigation was conducted at the Department of Cardiothoracic Surgery, Sri Jayadeva Institute of Cardiovascular Science and Research, Kalaburagi, a tertiary cardiac centre situated in a Tier-2 Indian city. The study population comprised 300 patients, ranging in age from 18 to 78 years, all of whom underwent mitral valve replacement (MVR) for rheumatic mitral valve disease between January 2017 and December 2025.

Results: The mean age of the study population was 43.3 ± 11.28 years (range: 18–78 years). Out of 300 patients operated, 241 patients (80.3%) were alive and 49 patients (16.33%) were dead, and 10 patients (3.33%) were lost to follow-up. The operative mortality was 21 (7%) and the follow-up mortality was 28 (9.33%). The reasons for follow-up mortality were cardiac complications in 8 (28.57%) patients, valve-related complications in 10 (35.7%) patients, sudden unexplained death in 8 (28.57%) patients, and non-valve/ non-cardiac death in 2 patients (7.14%). The one-year survival was 93.0%, five-year survival was 80.3%.During follow-up, valve-related events occurred in 155(51.6%) patients.

Conclusions: Surgical MVR in patients is safe and can be performed with good early and mid-term outcomes, irrespective of the patient cohort's age and surgical risk profile. The life expectancy of patients following surgical MV replacement is slightly lower compared to the same-age general population. But long term outcomes are still awaited.

Keywords: Rheumatic valve disease, Mitral valve replacement, Mechanical valve

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INTRODUCTION

Globally, in 2019, there were 40.5 million cases of rheumatic heart disease (RHD). The incidence of RHD varied between 3.4 cases per 100,000 populations in non-endemic countries and 444 cases per 100,000 populations in endemic countries. India is ranked the highest among the countries with deaths due to RHD. A recent Indian Council of Medical Research (ICMR) study in 10 different, mostly urban, locations of the country found the prevalence of RHD ranged from 0.2 to 1.1/1000 persons . Mitral stenosis (MS) continues to be a major health issue worldwide, particularly in developing nations where the prevalence of rheumatic heart disease remains high[1,2].

Despite advances in cardiac surgery and perioperative care, the management of MS presents ongoing challenges for healthcare providers, especially in terms of optimizing patient outcomes in the early postoperative period.

The patients are usually young and belong to the low socio-economic group, and their diseased valves are generally unsuitable for repair.

Over the course of a patient's remaining life, mechanical heart valve replacement is associated with numerous potential complications. Common complications include thromboembolism, bleeding, reoperation, and a decrease in the quality of life[3]. These factors are compounded by the low socioeconomic status, poor compliance with anticoagulation, and late referral for surgery. The patients usually present with congestive heart failure, pulmonary hypertension, atrial fibrillation, stroke, or endocarditis[4]. Such variables may impact the results of mechanical valve replacement, leading to decreased survival rates in contrast to those documented in Western cohorts.

However, there are no data or studies reporting early to midterm outcomes of mitral valve replacement from tier 2 cities in India. Since there is a paucity of data, this study was undertaken to study and report the early and mid-term outcomes of mitral valve replacement.

MATERIALS AND METHODS

Study design:

From 1st January 2017 to 31st December 2025, 326 patients underwent mitral valve replacement (MVR). Concomitant procedures like aortic valve replacement and CABG were excluded from the study. 300 patients who underwent MVR for RHD were included for analysis, and reported for this study. Briefly, the medical records of all study patients were reviewed to gather pre-operative and peri-operative data such as demographic information, medical history, co-existing medical conditions, previous cardiovascular surgeries, New York Heart Association (NYHA) functional class, blood investigation details, and date of surgery, concomitant surgeries and early postoperative complications. During follow up, patients were physically examined by one of the clinical investigators to assess the NYHA functional class. All the events that occurred in patients post valve implantation were recorded. Patients who were reluctant to attend the follow-up clinic were contacted over the phone and their clinical information was collected using a questionnaire. In case of death, all possible information available was collected from hospital records or close relatives. Lost follow-up patients' data from the hospital records were gathered up to their last follow-up and were included in the study. Follow up data were collected prospectively from October 2025 to 31 January 2026. 31st January 2026 was the closing date of the study. Out of 241 confirmed alive patients, 228 (94.6%) were reviewed at our hospital with routine blood investigations, echocardiography, electrocardiogram, and chest X-ray and 13 (5.3%) patients' data were obtained through telephonic contact.

Table 1: Demographic

Variables	**Alive**	**Dead**
	***n* = 279 *n*(%)**	***n* = 21 *n*(%)**
Age		
≤ 40 years	135(48.3)	7(33.33)
> 40 years	144(51.6)	14(66.66)
Gender		
Male	94(33.36)	6(28.57)
Female	185(66.3)	15(71.42)

Table 2: Pre op NYHA

I	0	0	< 0.001*
II	187(67.0)	9(42.87))	
III	87(31.1)	8(38.09)	
IV	5(1.7)	4(19.04)	

Table 3: Comorbidites

Table 4: Pulmonary arterial hypertension

Severe	81(27)	8(38.09)	0.966
Moderate	69(24.7)	6(28.57)	
Mild	58(20.7)	4(19.04)	
Nil	71(25.4)	3(14.28)	

Table 5: Tricuspid regurgitation

Diabetes mellitus	20(7.16)	0(0)	1.000
Hypertension	25(8.9)	5(1.79)	0.344
Endocarditis	4(1.43)	0(0)	1.000
Renal disease	8(2.8)	0(0)	1.000
Liver disease	2(0.7)	0(0)	1.000
COPD	18(6.4)	0(0)	1.000
PVD	2(0.7)	0(0)	1.000
Atrial fibrillation	93(33.3)	9(42.8)	0.195
Congestive heart failure	8(2.8)	0(0)	1.000
Left atrial thrombus	30(10.75)	0(0)	1.000
Previous PTMC	49(17.56)	0(0)	1.000
History of CMV	6(2.1)	0(0)	1.000

Severe	46(16.48)	7(33.3)	0.049*
Moderate	66(23.65)	3(14.28)	
Mild	106(37.99)	3(14.28)	
Nil	61(21.8)	8(38.09)	

Table 6: Mitral stenosis

Severe	214(76.7)	14(66.6)	0.644
Moderate	33(11.82)	7(33.3)	
Mild	10(3.5)	0(0)	
Nil	8(2.8)	0(0)	

Table 7: Mitral regurgitation

Severe	70(25.08)	8(38.09)	0.470
Moderate	96(34.4)	4(19.04)	
Mild	80(28.6)	1(4.76)	
Nil	33(11.8)	8(38.09)	

Table 8: Hospital stay

≤ 10 days	214(76.7)	15(71.42)	0.177
> 10 days	65(23.29)	6(28.57)	

Significant p value ≤ 0.05

n number of patients, *NYHA* New York heart association, *COPD* Chronic obstructive pulmonary disease, *PVD* Peripheral vascular disease, *PTMC* Percutaneous transvenous mitral commissurotomy, *CMV* closed mitral valvotomy

RESULTS

A total of 300 patients underwent mitral valve replacement between January 2017 and December 2025. Mitral stenosis was the predominant pathology, accounting for 228 (76.0%) patients, while 72 (24.0%) patients had mitral regurgitation. Mechanical prostheses were implanted in 298 (99.3%) patients and bio prosthetic valves in 2 (0.7%) patients.

The study identified a strong female predominance in the cohort (200 females to 100 males, a 2:1 ratio).

The mean age of the cohort was notably young at 43.3 years (spanning 18 to 78 years), a finding that strongly aligns with the typical presentation of rheumatic heart disease

Clinical diagnoses were classified as isolated Mitral Stenosis (42%), combined Mitral Stenosis and Regurgitation (34), and

isolated mitral regurgitation (24%). Patients presenting with pure regurgitation were significantly younger, averaging 38.0 years. The analysis of surgical procedures revealed that isolated Mitral Valve Replacement (MVR) was the most prevalent intervention (70.7%), followed by MVR performed in conjunction with Tricuspid Valve (TV) Repair or Plasty (15.7%).

The addition of TV Repair or Plasty was found to notably prolong operative times, with Cardiopulmonary Bypass (CPB) duration increasing from 105.2 to 137.2 minutes and Cross Clamp (XC) time extending from 80.4 to 112.9 minutes.

Evaluation of pre-operative to post-operative cardiac rhythms showed that 28.8% of patients presenting with pre-operative Atrial Fibrillation (AF) successfully transitioned to Sinus Rhythm (SR) following surgery.

A moderate-to-strong positive correlation (r = 0.52) was observed between CPB duration and post-operative blood loss, indicating that extended bypass times are linked to increased bleeding volumes.

The majority of the deaths were due to low cardiac output leading to sepsis. Operative mortality was observed in 21 (7.0%) patients. Cardiogenic shock occurred in 20 (6.6 %) patients. Re exploration for bleeding was done in 9 patients (3%). Postoperative complications included stroke in 3 (1.0%), acute kidney injury in 39 (13.0%), dialysis-requiring acute kidney injury in 4 (1.3%), surgical site infection in 24 (8%), surgical site infection requiring debridement and re-suturing in 4 (1.3%), and postoperative pneumonia requiring ventilator support in 8 (2.7%) patients.

Table 9:

Variable	Value
Mitral stenosis	228 (76.0%)
Mitral regurgitation	72 (24.0%)

Table 10:

Mechanical valve	298 (99.3%)
Bioprosthetic valve	2 (0.7%)

Table 11: Early Outcomes Summary

Outcome Category	Incidence n (%)
Mortality	21 (7.0%)
Stroke	3 (1.0%)
AKI	39 (13.0%)
Dialysis	4 (1.3%)
SSI	24 (8%)
Debridement/Re-suturing	4 (1.3%)
Pneumonia requiring ventilator support	8 (2.7%)

DISCUSSION

The northern part of Karnataka is a still underdeveloped region and people living in this region are socioeconomically backward and hence do not get access to medical facilities easily. 76% of patients had predominantly mitral stenosis. As the majority of our patients are from low socioeconomic backgrounds, they cannot afford bio prosthetic valves, which are costlier than mechanical valves. Only 2 female patients were offered bio prosthetic valve as they wanted to get pregnant and the adverse effects of anticoagulants to the developing fetus were explained to them. 99.3% received mechanical prostheses. We noticed a mortality rate of 7% .The stroke rate was only 1%. AKI 13%, SSI 8% Patients living in this region are malnourished. Hence they required prolonged ICU stay. This study reports the early and mid term (1-5 years) outcome of MVR with mechanical valve replacement in RHD in a relatively young population. The salient features of this study include comparable early and mid-term survival and event-free survival in these cohorts of patients.

Mitral valve repair is considered to be the gold standard for treatment of degenerative mitral valve disease as it achieves superior short and long-term outcomes compared to valve replacement[5]. Even though expert's consensus recommends mitral valve repair when feasible in RHD[2,6,7] long term durability is still a concern due to continued rheumatic activity in younger population[6,8] leading to continued fibrosis and distortion of the mitral valve apparatus and recurrence of disease and higher reoperation rates. Moreover, not all rheumatic valves are suitable for repair and reoperations increase the economic burden[9,10].

The majority of the valves get replaced and mechanical valves are usually used because of the lower cost of mechanical valves and younger age group of the patients. Moreover, biological prosthesis in these young patients is associated with higher rates of degeneration leading to higher reoperation rates, economic burden, and potential for higher short and long-term mortality[9,11].

The early outcome of MVR was good with very low mortality and univariate analysis showed advanced functional class and the presence of severe tricuspid valve regurgitation were associated with adverse outcomes similar to other reports[12]. PAH is a well-known entity in mitral valve disease, especially in mitral valve stenosis. PAH is a consequence of elevated left atrial pressure associated with changes in pulmonary vasculature with a concomitant increase in pulmonary vascular resistance and loss of vascular compliance[13,14]. Many studies report that PAH is associated with poorer outcomes in the immediate post-operative period[15-17]. In this study, 258 patients (86%) of patients had PAH at the time of surgery and 81 patients (27%) of patients had severe PAH. This finding was in similar to other studies which showed that PAH was an independent risk factor for long term mortality[18]. The reason could be that the majority of our patients had mitral stenosis and that these patients had presented to us for surgery much after irreversible changes had occurred in pulmonary circulation[19-21] This is attested by the fact that in the majority of our patients, PAH had subsided and 10 patients had persistent severe PAH at the time of follow-up

However, the early and midterm outcome of mechanical valve replacement was poor with only 80% survival at 5 years. Our results are similar to many other reports documenting the less than satisfactory outcome following mechanical valve replacement. Cardiac mortality and valve-related mortality accounted for the majority of deaths. The reasons are multifold-they include deterioration of left ventricular function over time leading to increased risk of cardiac death and the increased anticoagulation-related complications in mechanical mitral valve replacement. In our

study, 80% of the mortality occurred due to these reasons[21-25].

153 patients developed a significant event during follow up. 25 patients developed valve thrombosis and thrombolysis was performed in all patients with a moderate outcome as 9 patients died due to stroke following thrombolysis. Eleven patients developed major bleeding episodes (0.54%/py) and 28 patients (1.32% py) developed major thromboembolic events during follow-up and 16 patients died of these complications. The poor compliance with anticoagulation in these patients. This factor along with long-standing atrial fibrillation and lack of standardization in international normalized ratio (INR) testing and lack of dedicated INR clinics makes these patients more vulnerable to deleterious effects of anticoagulation.

Since mechanical valve replacement seems to be a suboptimal option for these patients, these outcomes may be improved by early referral for valve repairs with carefully monitored penicillin prophylaxis. Whether early referral for replacement will improve the outcome is a debatable point as mechanical valve replacement brings additional burden of lifelong anticoagulation and bleeding and thromboembolic complications[26].

CONCLUSIONS

Surgical MVR in patients is safe and can be performed with good early and mid-term outcomes, considering this patient cohort's age and surgical risk profile. The life expectancy of elderly patients following surgical MV replacement is slightly lower compared to the same-age general population. Hence, MV diseases with an indication for intervention should be treated independently of the patient's age.

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