Section: CTVS

Original Research Article

# LONG-TERM OUTCOMES AFTER BIOPROSTHETIC VS MECHANICAL AORTIC VALVES IN PATIENTS <65 YEARS: AN OBSERVATIONAL TEACHING HOSPITAL BASED STUDY

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## ABSTRACT

**Background:** For patients with valvular heart disorders, heart valve replacement is an essential intervention. Due to variations in durability, anticoagulation needs, and postoperative results, the decision between bioprosthetic and mechanical valves is still up for clinical interpretation. **Materials and Methods:** To compare the long-term clinical outcomes of patients who underwent heart valve replacement using either bioprosthetic or mechanical valves. The participants were 200 adult patients who had their mitral or aortic valves replaced. **Result:** The mechanical valve group had a slightly better overall survival rate (80.0%) than the bioprosthetic group (74.0%) during the 6-year follow-up period. However, just 5.0% of patients in Group-2 needed a second surgery, but the reoperation rate in Group-1 was much higher at 16.0%. Patients with mechanical valves had a higher incidence of thromboembolic problems (7.0%) compared to those with bioprosthetic valves (3.0%). On the other hand, 4.0% of Group-1 patients and 14.0% of Group-2 patients experienced significant bleeding events. Both groups had comparable rates of prosthetic valve endocarditis (2.0%). **Conclusion:** Because they require lifetime anticoagulation medication, mechanical valves have a higher risk of thromboembolic and bleeding problems despite their superior long-term durability and decreased need for reoperation. Although bioprosthetic valves are linked to less bleeding incidents, there is a greater chance that they will deteriorate structurally and necessitate additional surgery. To maximize clinical results, the type of valve should be chosen based on each patient's unique profile.

## INTRODUCTION

Patients with severe valvular illness can improve their prognosis with valve replacement.[1,2] In many cases, valve replacement surgery is required due to valvular heart disease, which continues to be a major cause of cardiovascular morbidity and mortality globally.[3] The two main categories of prosthetic heart valves are mechanical and bioprosthetic. Each variety has distinct qualities that affect long-term results, postoperative care, and therapeutic applicability.[4] Although mechanical valves are renowned for their endurance, a higher risk of thromboembolic events need lifetime anticoagulation medication.[5] On the other hand, bioprosthetic valves made from pig or cow tissues have lower thrombogenicity and frequently don't require long-term anticoagulation, which makes them appropriate for some patient groups, such the elderly or people who shouldn't take anticoagulants.[6] The choice between bioprosthetic and mechanical valves is still difficult, despite improvements in prosthetic valve design and surgical methods. Clinical choices are still influenced by the trade-off between valve longevity, reoperation risk, bleeding, and thromboembolic consequences.[7] The findings of recent long-term follow-up studies have been inconsistent, underscoring the need for more thorough information to inform the best valve choice, particularly for younger patients and those with comorbidities.[8] Over a 6-year follow-up period, this study attempts to compare the long-term clinical outcomes and complication rates related to mechanical and bioprosthetic heart valves. It is anticipated that the results will help physicians make evidence-based choices that are specific to each patient's profile.

## MATERIALS AND METHODS

This retrospective cohort study was conducted in the department of cardiovascular and thoracic surgery, Heritage IMS Varanasi to compare the long-term


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clinical outcomes of patients who underwent heart valve replacement using either bioprosthetic or mechanical valves. The institutional review board and institutional research committee gave its approval. The participants were 200 adult patients who had their mitral or aortic valves replaced. Patients were divided into two groups based on the type of prosthetic valve implanted:

Group-1: Prosthetic (n = 100) received bioprosthetic valves, and

Group-2: Mechanical (n = 100) received mechanical valves.

Patients who were at least 28 years old, had complete medical records, and had been followed up for at least five years met the inclusion criteria. Clinical information was gathered from hospital records, follow-up visit summaries, and echocardiographic reports for patients who had undergone prior valve surgery, had congenital cardiac defects, or had serious concomitant diseases. Age, sex, comorbidities, valve location, and type of implanted valve were among the baseline data. Overall survival, reoperation rates, thromboembolic events, significant bleeding episodes, and prosthetic valve endocarditis were the main outcomes evaluated. Any recorded ischemic stroke, transient ischemic attack, or systemic embolism was considered a thromboembolic event. The International Society on Thrombosis and Haemostasis (ISTH) criteria were used to categorize major bleeding. Clinical correspondence with local physicians, telephone interviews, and outpatient records were used to collect follow-up data. SPSS version 20.0 was used for statistical analysis. Categorical data were reported as frequencies and percentages, whilst continuous variables were expressed as mean ± standard deviation. The Kaplan-Meier method was used for survival analysis, and the log-rank test was used for intergroup comparisons. For categorical and continuous variables, respectively, chi-square and t-tests were used. Statistical significance was defined as a p-value of less than 0.05.

## RESULTS

The clinical study had 200 patients in total, 100 in each of the mechanical (Group-2) and bioprosthetic (Group-1) valve groups. Group 2's mean age was 48.4 ± 10.24 years, while Group 1's was 54.4 ± 12.34 years. The percentage of female patients was greater in Group-1 (59%) than in Group-2 (51.0%). [Table 1 &Figure 1] Summarizes baseline clinical and demographic features.

**Table 1: Shows the initial clinical and demographic features of patients.**

| Variables | Group-1(n = 100) | Group-2(n = 100) |
|---|---|---|
| Age in years | 54.4 ± 12.34 | 48.4 ± 10.24 |
| Male/Female | 39 / 61 | 51/ 49 |
| Hypertension (%) | 58.0% | 53.0% |
| Diabetes Mellitus (%) | 34.0% | 28.0% |
| Aortic Valve Replacement (%) | 55.0% | 49.0% |
| Mitral Valve Replacement (%) | 44.0% | 51.0% |

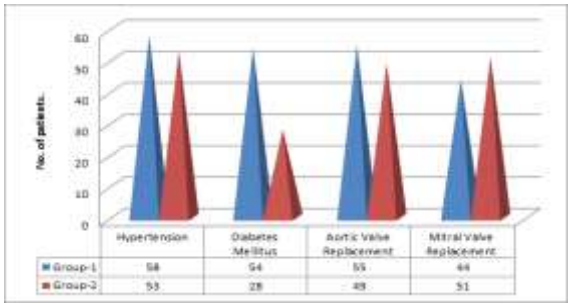


**Figure 1: Shows the clinical and demographic features of patients.**

The mechanical valve group had a slightly better overall survival rate (80.0%) than the bioprosthetic group (74.0%) during the 6-year follow-up period. However, just 5.0% of patients in Group-2 needed a second surgery, but the reoperation rate in Group-1 was much higher at 16.0%. Patients with mechanical valves had a higher incidence of thromboembolic problems (7.0%) compared to those with bioprosthetic valves (3.0%). On the other hand, 4.0% of Group-1 patients and 14.0% of Group-2 patients experienced significant bleeding events. Both groups had comparable rates of prosthetic valve endocarditis (2.0%). [Table 2] provides specifics on these outcome metrics.

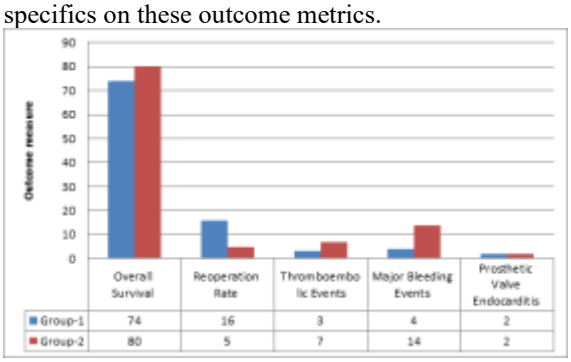


**Figure 2: Shows the Complication Rates and Clinical Results during a 6-Year Follow-Up.**

These results show that although mechanical valves have a greater incidence of thromboembolic and bleeding problems, they are linked to better durability and reduced reoperation rates (Table 2). Bioprosthetic valves, on the other hand, exhibited greater rates of structural valve degeneration requiring reintervention but provided superior bleeding safety.


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## DISCUSSION

The current study did not find a significant difference using inverse probability-weighted in overall survival rates and stroke rates between mechanical valves and bioprosthetic valves among patients in both mitral valve replacement and aortic valve replacement cohorts, based on a large series of isolated cohorts. With an emphasis on survival, reoperation, thromboembolic risk, bleeding problems, and prosthetic valve endocarditis, this study offers a thorough comparison between bioprosthetic and mechanical heart valves over a 6-year follow-up period. The results support previous research and shed light on the advantages and disadvantages of various valve types in various patient populations. In according to research indicating better long-term durability, especially in younger patients, mechanical valves showed a greater survival rate.[9] One of the main reasons for this benefit is that structural valve degradation, a typical issue with bioprosthetic valves, is less common.[10] However, a substantially greater probability of major bleeding events is associated with the requirement for lifetime anticoagulation in mechanical valve patients, a pattern that is consistent with our findings and other reports.[11] Patients who had bioprosthetic valves, on the other hand, had less bleeding incidents, which is consistent with research supporting its usage in older patients or those who cannot take anticoagulant medication.[12] However, a number of long-term observational studies have documented the higher reoperation rate in this group as a result of structural valve degeneration, which continues to be a therapeutic problem.[13] The mechanical valve group had a significantly greater incidence of thromboembolic events, underscoring the need to strike a careful balance between the risk of hemorrhagic complications and appropriate anticoagulation.[14] In order to reduce these hazards, prior studies have also stressed the significance of rigorous INR monitoring in patients with mechanical valves.[15] In keeping with meta-analyses that indicated no discernible difference in infection susceptibility depending on valve type, our study similarly observed comparable incidence of prosthetic valve endocarditis between the two groups.[16] For all valve replacement patients, early identification and proper antimicrobial prophylaxis are still crucial.[17] These results support existing recommendations, which state that bioprosthetic valves are favored in older persons and those where anticoagulation poses a considerable risk, whereas mechanical valves are recommended for younger patients and those with longer life expectancies.[18] In the end, the choice should be customized, considering the patient's age, comorbidities, lifestyle, and preferences. We could not completely rule out the possibility that patients who were lost during the long-term follow-up had subsequent occurrences that were not recorded in our trial, even though the primary outcomes were collected by telephone contact or a query on the resident death registration system.

## CONCLUSION

In conclusion, our study is limited by its retrospective design and dependence on medical records, which may induce bias, even though it provides insightful information. Results may also be impacted by modifications to anticoagulation techniques and advances in valve technology during the course of the trial. More conclusive results may be obtained from future prospective multicenter trials that include newer valve models and have larger sample sizes.

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