RESEARCH PAPER

Early and Mid-term Results of Aortic Valve Replacement 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, Sri Jayadeva Institute of Cardiovascular Science and Research, Kalaburagi. (email not provided)**

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ABSTRACT

In this retrospective study, we assessed the operative mortality and mid-term clinical results of 120 patients who received aortic valve replacement (AVR) at our center from January 2017 through December 2025. The primary objective was to evaluate the rates of early and late morbidity and mortality among this group. Our findings indicated a hospital mortality rate of 3.3%, representing 4 patients. During the follow-up phase, the most significant complications recorded were prosthetic valve endocarditis (6.2%), hemorrhage (6.2%), cerebrovascular accident (3.1%), and the need for reoperation (0.83%). It is important to note that no instances of structural valve failure or valvular thrombosis were observed. Our analysis led us to conclude that performing AVR with mechanical prostheses is a reliable procedure associated with minimal mortality and morbidity.

Keywords: Aortic valve replacement, mechanical heart valve.

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INTRODUCTION

For the majority of patients with symptomatic aortic valve disease, aortic valve replacement (AVR) continues to be the primary standard of care. The projected mortality risk over five years for untreated severe aortic valve disease is estimated to be between 50% and 80%. Patients experience significant advantages from surgical treatment, as it considerably enhances survival rates and allows for more effective control of cardiovascular symptoms.

Aortic valve replacement (AVR) has become the definitive surgical treatment for patients suffering from symptomatic aortic valve disease[1]. In cases of severe disease where surgery is not performed, the projected five-year mortality rate is high, ranging between 50% and 80%[2]. However, clinical data indicates that surgical intervention significantly boosts survival rates and enhances the management of cardiovascular symptoms[3,4].

In Western countries, degenerative conditions are the primary cause of aortic valve issues among the elderly; however, in our specific geographical area, rheumatic heart disease continues to be a prevalent factor in the development of aortic valvular pathology.

Our results showed hospital mortality was 3.3% (4 patients). Complications recorded during the follow up study include: bleeding(6.2%), stroke (1.66%), and reoperation (1.66%). No structural valvular dysfunction and no valvular thromboses were reported, and we concluded that aortic valve replacement with mechanical valve may be performed with low morbidity and mortality.

Mechanical prostheses are world wide used for AVR. However AVR with mechanical prosthesis carries the potential risk of thromboembolism and the need for life long anticoagulation with the risk of hemorrhage.

The aim of this retrospective study is to analyze the in-hospital mortality and mid-term results of AVR (isolated or concomitant with other surgical procedures).

MATERIALS & METHODS:

A retrospective assessment was conducted using surgical register book, outpatient documentation, and clinical files for every patient who received an aortic valve replacement between January 2017 and December 2025, including both those who underwent isolated AVR and those receiving concomitant procedures.We considered baseline characteristics including age, gender, cardiac symptoms, New York Heart Association functional class, congestive heart failure, atrial fibrillation, diabetes, renal failure, chronic obstructive pulmonary disease, cerebrovascular accidents, previous cardiac surgery, coexistent coronary artery disease, mitral valve disease, endocarditis, and left ventricular ejection fraction (Table 1).

Intraoperative variables included are cardiopulmonary bypass time, aortic cross-clamp time, size and brand of the implanted prosthesis, associated surgical procedures, and surgical priority (Table 2). Surgical priority was classified as urgent if the procedure took place within seven days of the diagnosis and the patient required continuous hospitalization until the time of surgery. Operative mortality was categorized as any death taking place within 30 days following cardiac surgery, or any fatality occurring before the patient was discharged from the hospital, irrespective of the underlying cause.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. Late mortality was defined as mortality after 30 days of cardiac surgery and hospital discharge. The valve related complications were defined according to the recently suggested guidelines for reporting mortality and morbidity after cardiac valve interventions, as hemorrhage, thromboembolism, prosthetic valve endocarditis, device thrombosis, structural valve deterioration and non-structural dysfunction including paravalvular leak 7. Both the causes of mortality and various operative complications were documented and subjected to analysis.

Table 1:

Characteristic	Value
Age (years) (mean ±SD)	49.4±16.9
Female sex, n (%)	36 (30%)
Male sex, n (%)	84 (70%)
NYHA class I-II, n (%)	30 (25%)
NYHA class III-IV, n (%)	90 (75%)
Chest pain, n (%)	84 (70%)
Dyspnea, n (%)	108 (90%)
Syncope, n (%)	12 (10%)
Palpitation, n (%)	36 (30%)
CAD, n (%)	12 (10%)
CHF, n (%)	2 (1.67%)
COPD, n (%)	12 (10%)
EF%	58±10
EF < 40%, n (%)	12 (10%)
DM, n (%)	24 (20%)
HTN, n (%)	66 (55%)
CVA, n (%)	2 (1.67%)
Endocarditis, n (%)	3 (2.5%)
Echo: AS, n (%)	72 (60%)
Echo: AI, n (%)	24 (20%)
Echo: AS + AI, n (%)	24 (20%)

NYHA: New York Heart Association, CHF: congestive heart failure, HTN: hypertension, COPD: chronic obstructive pulmonary disease, AF: atrial fibrillation, CAD: coronary artery disease, DM: diabetes mellitus, EF: ejection fraction, CVA: cerebrovascular accident, AS: aortic stenosis, AI: aortic incompetence

Table 2:

Variable	n (%) or Mean ± SD
Surgical Procedure	
AVR	67 (55.8%)
AVR + CABG	18 (15%)
AVR + MVR	30 (25%)
AVR + Aneurysm repair	5 (4.1%)
Surgical Priority	
Elective	118 (98.33%)
Urgent	2 (1.66%)
Type of Aortic Valve	
TTK Chitra	6 (5%)
St. Jude	66 (55%)
Perimount Magna	5(4.16%)
Meril	43(35.83%)
Size of Valve	
19 mm	8 (6.6%)
21 mm	68(56.6%)
23 mm	32 (26.6%)
25 mm	12 (10%)
Operative Times (min)	
CPB time	109 ± 35
Cross clamp time	80 ± 28

AVR: aortic valve Replacement, CABG: coronary artery bypass grafting, MVR: mitral valve replacement,

RESULTS

120 patients underwent AVR (isolated or concomitant with other surgical procedures) at our institution between January 2017 and December 2025. The mean age was 49.2±16 (69 men, 36women). 18 patients (15%) underwent concomitant AVR and CABG, and 30 patients (25%) underwent double valvular procedures. All except 16 (25%) patients were in NYHA class III or IV.Most common presenting symptoms were dyspnea on exertion or at rest in 108 patients (95%), chest pain in 45 (70%). Assessment of left ventricular (LV) function showed that 12 (10%) of our patients had poor function, defined as an ejection fraction of less than 40%. Mean ejection fraction was 56.8 ±12.7%. The baseline of the study patients and operative data are shown in (Tables 1 and 2) respectively.

Aortic stenosis was the predominant valvular lesion in 72 patients (60%), followed by combined aortic stenosis and insufficiency in 24 patients (20%), and aortic insufficiency in 24 patients
(20%). Rheumatic valvular disease was found to be the most common etiology of valvular lesion in 72 patients (60%), followed by degenerative in 42 (35%)

Table 3: Causes of the Aortic Valve Disease

Histopathology	N (%)
Rheumatic	72 (60%)
Degenerative	42 (35%)
Aneurysm ascending aorta	4(3.3%)
Endocarditis	2 (1.6%)

Operative mortality was 3.3% (4 patients). 4 patients developed paravalver leak and then developed LV dysfunction, lung infection and death. 2 patients died because of non cardiac causes;developed sepsis died from sepsis secondary to lung infection two weeks after aortic valve replacement with concomitant MVR. Late death occurred in 4 cases. The cardiac causes of late death were congestive failure and arrhythmias in a patient with pancreatic cancer two years after aortic valve replacement, 2 died because of Urosepis.1 died of stroke.

Early postoperative complications are listed in (Table 4). The most common postoperative complication was atrial arrhythmia, which affected 20% of the patients.

Table 4: Morbidities

Morbidity	N (%)
Stroke	2 (1.66%)
Atrial arrhythmia	20 (16.6%)
Re-exploration for bleeding	2 (1.66%)
Prosthetic valve endocarditis	2 (1.66%)
Major bleeding event	3(2.5%)
Reoperation	1 (0.83%)

In our study two patients (1.66%) developed stroke immediately post surgery, 2 patients developed bleeding (1.6%). There was one report of major hemorrhage accident (cerebral hemorrhage necessitating craniotomy) in a context of an INR greater than 5. The remaining 3 patients had a minor bleeding 2 nasal and 1 urinary tract bleeding. 2 patients developed prosthetic valve endocarditis (1.66%). All had double valve replacement
with bileaflet mechanical prostheses. Both died prior to scheduled reoperation because of congestive heart failure. One patient required reoperation for the implanted valves secondary to ST T changes. No structural valvular dysfunction was reported and no valvular thromboses were noted.

DISCUSSION

The natural prognosis of severe aortic disease is ominous: 90% of patients with angina and syncope died within 3 years of the onset of symptoms and if heart failure was present death occurred within 2 years[5].In industrialized nations, aortic stenosis represents the most prevalent form of valvular heart disease, responsible for nearly two-thirds of associated fatalities recorded from 1999 to 2020[6].

The majority of our patients were less than 65 years of age and the cause of valvular disease was rheumatic in most. Hence the choice remains a mechanical device. Conventional practice suggests that revascularization should be performed at the time of aortic valve replacement if major coronary artery stenosis is present regardless of the presence or absence of angina[7]. Reports[8] indicate that myocardial revascularization does not increase the operative mortality of valve replacement, and the functional result may be improved by relieving the symptoms of angina and providing improved myocardial protection. Aortic valve replacement has been shown to be associated with postoperative cerebrovascular accidents in approximately 10% of cases in several studies[9,10]. Which may be related to embolic events[11,12].This most devastating morbidity has a significant impact on survival and quality of life[13], we have routinely employed the technique of inserting a gauze into the left ventricle during excision of the native aortic valve with the aim of capturing embolic debris. In our study 2 patients (1.66%) developed stroke immediately post surgery. The low occurrence of thromboembolic episodes in our patient population with the use of the mechanical valve prosthesis is noteworthy, the low incidence of thromboembolic events is presumably related to factors such as inherent difference in coagulable states[14], and competence of the individuals managing the patient's anticoagulation. Also risk factors for thromboembolism are reduced in younger patients.

The need for lifelong oral anticoagulation therapy in patients with mechanical prosthetic valves is well-recognized. In patients not receiving long-term anticoagulation therapy, the average rate of major thromboembolism is estimated to be 4 to 8 per 100 patient-years[15]. This risk is reduced to 2.2 per 100 patient-years with anti platelet therapy, and further reduced to 1 per 100 patient-years with oral anticoagulation (warfarin). Thus, the utilization of postoperative warfarin therapy reduces the incidence of major embolism by approximately 75% and has become the standard of care for all patients with mechanical prostheses[15].

The American College of Cardiology/American Heart Association and the American College of Chest Physicians recommended, in their most recent guidelines, that contemporary mechanical valves in the aortic position be anticoagulated with a target INR of 2.0 to 3.0.

The American College of Cardiology/American Heart Association, in their most recent guidelines, recommended that the addition of aspirin (80 to 100 mg/day) to warfarin be strongly considered for all patients with mechanical valves[16]. Concerning the localization of bleeding; the most common sites of minor bleeding are the nose and mouth, accounting for over one-third of episodes and the gastrointestinal tract is the most frequent source of major bleeding[17]. In our study, three minor bleeds (75%) occurred in the ENT-tracts and one major bleeds were intracerebral hemorrhage.We adhered to a low-intensity anti coagulation regimen in which a target international normalized ratio (INR) in isolated aortic valve replacement AVR 2 to2.5, in Double valve 2.5 to 3.0.

Despite advancements in prophylaxis, diagnostic techniques, and therapeutic interventions, prosthetic valve endocarditis continues to pose a significant challenge following heart valve surgery. The traditional approach to the management of this condition has been early surgery. Superior results have been shown with surgical treatment compared with antibiotics alone. However, while early surgery is indicated in patients with hemodynamic compromise, there is evidence that in selected cases treatment with antibiotics alone provides equivalent results[18].

Prosthesis-patient mismatch (PPM) occurs most frequently in individuals receiving an aortic valve replacement (AVR) to treat severe calcified aortic valve stenosis, which is a condition typically associated with the aging process.

Nearly thirty years after the pioneering study by Rahimtoola[19] the effects of PPM are still controversial. Several researchers have argued that elevated transvalvular gradients following aortic valve replacement potentially obstruct the reduction of left ventricular mass. In a report by Mariano Vicchio and colleagues[20], it was noted that while moderate or severe patient-prosthesis mismatch occurred in a significant number of individuals who received small-sized bileaflet aortic valve prostheses, this condition did not adversely affect their long-term clinical outcomes. Furthermore, the study found that such mismatches had no impact on the regression of left ventricular mass or the patients' overall quality of life.

There were 4 cases of paravalvular leak in the present review. We believe that interrupted horizontal mattress sutures with Teflon pledgets are a sine qua non in its prevention.

The New York Heart Association functional status of surviving patients significantly improved when compared with the New York Heart Association status before surgery. Whereas 75% of patients were in New York Heart Association class III or IV preoperatively, 81.2% achieved class I or II postoperatively.

The main limitation of the present study resides in its retrospective design.

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