ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 05 | May - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

DOUBLE VALVE REPLACEMENT WITH TRICUSPID VALVE REPAIR: SINGLE CENTRE EXPERIENCE

Cardiovascular

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ABSTRACT

Background: Surgical treatment of valvular heart diseases comprises a major number of cardiac operations. Triple valve surgery poses challenge for surgeons because of long bypass time and myocardial preservation and also for patients in the form of prosthetic valve related morbidities such as anticoagulation related bleeding, endocarditis and thromboembolism. **Objectives:** This study was aimed to evaluate the early and mid-term outcomes of Double valve replacement with tricuspid valve repair. **Methods:** A retrospective observational study of a total of 74 patients operated between January 2013 to December 2019 was undertaken at our institute. All patients were operated via standard median sternotomy. Aortic and mitral valve were replaced and the tricuspid valve was repaired. In the postoperative period, warfarin was given as anticoagulation of choice. **Results:** Of 74 patients, there were 41 males and 33 females. All patients had mitral and aortic valve replaced. Sixty two (62) patients received tricuspid ring annuloplasty and 12 had repairs (8 De Vega's and 4 Felt annuloplasty). Overall survival after triple valve surgery noted at one year was 92.2 %, at five years was 83.4% and eight years was 66.7% **Conclusion:** Results with triple valve surgery are encouraging with acceptable survival. Patients have Post op morbidity in form of valve thrombosis and anticoagulation associated bleedingS.

KEYWORDS

aortic, mitral, tricuspid valve, repair, replacement.

Introduction

Valvular heart disease comprises of a major portion of all the cardiac ailments. Treatment of damaged valves may involve medication alone, but often involves surgical valve repair or valve replacement. Several cardiac diseases such as rheumatic and degenerative valve disease, as well as endocarditis, may affect multiple valves and require double and triple valve surgery [1-6]. Despite the dramatic decline of acute rheumatic fever in developed countries, significant morbidity and mortality are still associated with rheumatic heart disease in developing nations. Surgical treatment of rheumatic valvular disease still constitutes a significant number of cardiac operations in developing countries. Triple valve surgery (TVS), despite many advances in techniques and equipments still remains challenging for surgeons because of long bypass time and issues of myocardial protection. Operative mortality after TVS is reported to be high and ranges between 20% and 25% [1–5]. In addition, TVS exposes the patients to added long-term prosthetic valve-related morbidities such as endocarditis, thromboembolism, anticoagulation-related haemorrhage, and paravalvular leak compared with single valve replacement [1, 2, 6]. Finally, TVS has been associated with decreased long-term survival, with reported survival at 5 and 10 years of 55% and 35% respectively [2, 4].

The current study describes the experience with patients who underwent triple valve surgery (TVS) at a single centre in an attempt to define early and late clinical outcomes.

Material and methods

Inclusion Criteria

From January 2013 to December 2019, 74 consecutive patients with multiple valve disease underwent TVS at Dr RML Hospital, New Delhi. Clinical, operative, and outcome variables were reviewed retrospectively.

Patient characteristics

A total of 74 patients underwent triple valve surgery at our centre. The mean age of the patients was 34.87 years with range from 14 to 71 years. Out of 74 patients, there were 41 males and 33 females. Majority of the patients who underwent the surgery, were in NYHA class III (64.8%) or NYHA IV (9.4%). The most common aortic valve and mitral valve disorder was rheumatic valve disease in 72 (97.2%), followed by endocarditis in 2 (2.7%) patients. Of all patients aortic stenosis was seen in 16 (21.6%) patients wile aortic regurgitation was seen in14 (18.9%) patients while 44 (59.4%) patients had mixed lesions. Mitral stenosis was found in 11 (14.8%) patients, mitral regurgitation in 6 (8.1%) patients and mixed lesions were present in 57 (77%) patients. In contrast, the most common tricuspid valve disease was functional regurgitation secondary to left heart disease, followed by organic tricuspid disease in 2 (2.7%) patients.

All the patients were operated electively and there were no emergency operations. All the patients were implanted with mechanical valve at aortic and mitral positions and the tricuspid valve was repaired. The patients with severe tricuspid valve regurgitation or with tricuspid valve index more than 2.1 were considered eligible for tricuspid repair. The most common aortic valve size implanted was 19 in 34 (45.9%) patients while the most common mitral valve prosthesis was 29 in 22 (29.7%) patients. At tricuspid valve 62 rings were implanted and 12 suture repairs were done (8 De Vegas, 4 Felt annuloplasty).

Table 1: clinical profile of patients

NYHA I	2 (2.7%)
NYHA II	14 (18.9%)
NYHA III	48 (64.8%)
NYHA IV	7 (9.4%)
CHF	31 (41.8%)
DIABETES	25 (33.7%)
HYPERTENSION	22 (29.7%)
LVEF(mean)	45%
ATRIAL FIBRILLATION	24 (32.4%)

Surgical technique
All the patients were operated through midline sternotomy. Standard aorto bicaval cannulation technique was used. Standard antegrade Del Nido cardioplegia along with topical hypothermia was used in all patients for myocardial protection. Average CPB time was 118 minutes while the average ACC time was 74 minutes. Intraoperative transesophageal echocardiography was performed in all patients to assess the extent and mechanism of valve disease and the quality of the replacement or repair postoperatively. Mitral valve was approached through LA incision and the aortic valve was replaced through hockey shaped anterior aortotomy incision. Mechanical valves were seated with pladgetted ethibond sutures. All the mitral and aortic valves were replaced. At tricuspid position, ring annuloplasty was done in 62 patients. In 12 patients suture annuloplasty was done. Out of 12, modified De Vegas was done in eight patients and felt annuloplasty was done in four patients. Post-surgery patients were weaned off CPB with ionotropic support and pacing wires, if needed and shifted to ICU with drains and pacing wires in situ.

Anticoagulation
In the postoperative period, anticoagulation with warfarin was initiated for all patients if there was no evidence of active bleeding. Target international normalized ratio (INR) was 2.5-3.0 in all patients.

Follow up
All patients were followed up from OPD visits and direct telephonic interviews. The average follow up period was 57.44 months +/- 20.62 months and ranged from 24 to 107 months. Data was collected from the hospital records and the cardiologists' records. Of total 74 patients, 20 patients were lost to follow up and 54 patients were followed till the completion of study.

Statistical analysis
Data collection and record keeping was done using Microsoft Excel 2010 and statistical analysis was done using IBM SPSS version 21.0.Results

Operative Mortality and Morbidity **(n=74)**
There were a total of 3 (4.1%) in hospital deaths. Two patients died because of failure to wean from CPB and continuous low cardiac output state. One patient died in hospital because of septicaemia and multiorgan failure.

There were 4 reexplorations, because of persistent drainage. One of them had a surgical site bleeding.

Three patients (4.1%), had AKI leading to haemodialysis before the discharge from the hospital and added to the patients' morbidity.

Two patients had stroke in the early post-operative period. One of them succumbed to death due to septicaemia and multi-organ failure, while the second one had a prolonged hospital stay.

A total of 23 (31.1%) patients needed temporary epicardial pacing in operating room to wean off from CPB, but at discharge only one (1.3%) patient had to be discharged with permanent pacemaker.

Late Mortality and Morbidity **(n=54)**
A total 8 cardiac disease associated death were noted in late follow up. Three patients died because of congestive heart failure with normally retained prosthetic valves, 3 died of valve thrombosis, 1 died because of myocardial infarction and 1 died of anticoagulation related bleeding.

Overall survival after triple valve surgery noted at one year was 92.2 %, at five years was 83.4% and eight years was 66.7%.

A total of six patients had valve related thrombosis in the follow up. Of six patients 3 died due valve thrombosis associated complications. Freedom from valve thrombosis at one years was 94.1% and at 5 years was 83.4%.

A total of 4 patients had major cerebrovascular accident (CVA) in the follow up. Freedom from major CVA at 1 year was 94.8% and at five years was 95.5%.

Anticoagulation related major bleeding was noted in 10 patients in follow up. Out of ten patients one patient died due bleeding associated coagulopathy. Freedom from anticoagulation related bleeding at one year was 96.3% and five years was 93.7%.

Late functional class
On latest follow up 43 patients were alive. Of them 48% were in NYHA I, 18% in NYHA II, 23% in NYHA III and 9% were in NYHA IV. All the patients had normally functioning valves.

Discussion
Triple valve surgery is not a frequently performed operation. TVS is a challenging surgery because of prolonged bypass time and placement of multiple valves in close approximation. Patients have decreased myocardial functions and are exposed to long cardiolplegia time.

Early mortality rate has been progressively reduced passing from 20 to 25% in the 90s [1, 2] to 10–12% in recent years [7, 8-10]. Suri et al [10] reported the 18-year unadjusted mortality trend for TVS from The Society of Thoracic Surgeons Database. The hospital mortality of 4.1% in this study compares favourably with that in other studies, which indicated that operative mortality ranged from 13% to 31% (2, 6, 11).

There are reports describing short and long-term survival for surgery [3, 11-12]. In our study we found survival at one year was 92.2 %, at five years was 83.4% and eight years was 66.7%. Alsoufi and colleagues (11) presented that the actuarial survival rates were 75% and 61% at 5 & 10 yr. after TVS. Galloway and colleagues [3] showed that patients undergoing TVS had a 5-yr actuarial survival of 62%. Yilmaz and colleagues [12] reported that the actuarial survival rates were 85%, 72%, and 48% at 5, 10, and 15 years after TVS.

Thromboembolism and bleeding complications are the major problems due to anticoagulation [12-14]. Alsoufi and colleagues [11] reported a probability of freedom from thromboembolism of 88% at 10 years and from anticoagulation-related haemorrhage of 83% at 10 years in our study freedom from anticoagulation related bleeding at one year was 96.3% and five years was 93.7%. Current international normalized ratio target levels of 2.5 to 3.5 are advocated after mitral valve replacement using a mechanical prosthesis, similarly we recommend international normalized ratio target levels of 2.5 to 3.0 after multiple valve replacement.

Major cerebral complications occurred in 2 patients in peri-operative period and in 4 patients during the follow-up. The quality of anticoagulation treatment is the most important factor influencing postoperative thromboembolic events [15].

All three valves viz mitral, aortic and tricuspid are in close proximity to each other and share the fibroskeleton of the heart. After placement of two valves and a ring we observed that 23 (31.1%) patients needed temporary epicardial pacing in OT to wean off from cardiopulmonary bypass. But in post-operative period only one patient needed permanent pacemaker suggesting that despite being in close proximity cardiac rate and rhythm disorder are not affected significantly in TVS.

Conclusion
The results of Triple valve surgery are encouraging even though it has a long mean cross clamp time and cardiopulmonary bypass time. The mortality and morbidity rates are acceptable. The complications associated are bleeding, thromboembolic events and CHF in late follow up. The TVS patients have to maintain better control of INR for proper functioning of all valves. Due to close proximity of the annulus of the three valves and the AV node, rate and rhythm disorders are common in immediate post-operative period.

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