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DOUBLE VALVE REPLACEMENT IN RHEUMATIC VALVE DISEASE

Cardiology

KEYWORDS: Valve, Rheumatic, DVR, Echocardiography

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ABSTRACT

Aim and objective: To analyze the functional and hemodynamic outcomes Double Valve Replacement with mechanical valve prosthesis for rheumatic valve disease. **Materials and method**: 30 consecutive patients of Double Valve Replacement for rheumatic valve disease are selected **Result:** There are 17 male and 13 female patients of mean age 35.1± 11 years. Mitral stenosis (56.6%) and aortic regurgitation (53.3%) are most common isolated pathology. Left ventricular End systolic volume, Left ventricular End Diastolic volume, Ejection Fraction,, Left Ventricular mass, transvalvular gradient and functional status(NYHA) are compared pre and post operatively and statistically analyzed. Overall survival rate at the end 3 year is 76.6%. **Conclusion**: Outcome of DVR is the most significantly relate to the status of myocardial function at the time of surgery. Thus, the surgical therapy in such patients should be undertaken earlier, in an attempt to preserve myocardial function.

INTRODUCTION

Rheumatic heart disease (RHD) is the most common causes of multiple valve disease in India. Most commonly involved valve in RHD is aortic and mitral valve and the incidence is around 34% [2]. In 47% cases RHD, more than one valve is diagnosed to be involved at the same time. [1].The repair of grossly deformed valve with calcification in rheumatic pathology is always a challenge for cardiac surgeons. Therefore, double valve replacement (DVR) with mechanical valves still plays an important role in rheumatic valve disease.

AIM AND OBJECTIVE:

The aim of this study is to analyze the functional and hemodynamic outcomes of DVR with mitral and aortic mechanical valve prosthesis for rheumatic valve disease.

MATERIALS & METHODS

We have selected thirty consecutive DVR patients with bileaflet mechanical valve prosthesis during the period of January 2013 to December 2014 in the department of cardiothoracic surgery, Gauhati Medical College, Assam,. There are 17 male and 13 female of mean age 35.1± 11 years. Patients with concomitant intervention due to coronary artery disease or tricuspid disease are excluded from study. The diagnosis rheumatic etiology was based on any of patient's clinical history, echocardiographic criteria, intra operative examination of valve pathology and post operative histo-pathological examination of valve tissue. All the patients were taken up for elective surgery All the surgeries were performed under standard cardiopulmonary bypass, moderate hemodilution and moderate hypothermia (32-28 degree Celsius) by using with cold blood cardioplegia. Mitral valve implantation is done by interrupted pledgeted suture in annular position**. Aortic valve** implantation was done in either annular or supra annular position. Pledgeted suture with supra annular position of aortic valves are mostly preferred with gross calcification of aortic valve annulus. All valve used were bileaflet mechanical prosthesis. The number and size of prosthesis used in this study are noted in the Table 1 below.

Table 1: Size and types of prosthetic valve used in the study

Type and size of prosthesis	No of patient	%
Aortic position		
St. Jude Medical mechanical valve	Total= 21	70
19	4	13.3
21	12	40
23	5	16
ATS mechanical valve	Total =9	30
18	2	6.6
20	4	13.3
22	3	10
Mitral position		
St. Jude Medical mechanical valve	Total=23	76.7
25	6	20
27	12	40
29	5	16
ATS mechanical valve	Total=7	23.3
25	3	10
27	2	6.6
29	2	6.6

Post operative anticoagulation was started within 12 hrs of surgery with subcutaneous injection of Low molecular weight heparin (40 IU). Oral accetacumoral was started within 24 hrs after operation. Heparin was continued till INR was 2.5 to 3.4. All patients were discharged with oral anticoagulation warfarin/acitrom. Post operative INR and consultation was advised as per AHA protocol. **Rheumatic prophylaxis:** All patients are subjected to pre and post operative rheumatic prophylaxis as per guidelines of AHA 2014.**Follow-up**: Patients were followed up 1, 6 and 12 months and then at one year interval by OPD visits or telephonic interview with patient / relatives / local physician.. All traced patients were evaluated with NYHA functional class and echocardiographic assessment. Valve Anti-coagulation related complications are noted.

RESULTS:

Clinical Presentation: All the patients were symptomatic at presentation. Most common symptom was Dyspnoea in the regurgitation group and chest pain in stenosis group. Different presenting features tabulated and charted below in Table. 2.

Table 2: Distribution of presenting feature

Symptoms	Number of patients	%
Dyspnoea	27	90%
Chest pain	17	56.6%
palpitation	13	43.3%
Peripheral edema	10	33.3%
Syncope	5	16.4%
PND	5	16.4%
Haemoptysis	4	13.4%
CHF	1	3.335%

Valvular lesions: Valvular lesions presented to us during this study were divided in to three groups, aortic predominant, mitral predominant and isolated valve pathology. Different category of patients are tabulated and charted below in table 3

Table 3: Distribution of valvular lesion according to dominant pathology

MITRAL DOMINANT	NO OF PATIENTS = 19 [63.3%]	AORTIC DOMINANT	NO OF PATIENTS =11 [36,7%]	ISOLATED VALVE PATHOLOGY	No of patients
MS + AR	**7**	AS,AR + MS	**2**	MS	**17** (56.6%)
MS + AS	**6**	AS,AR +MR	**3**	MR	**8**(26.6%)
MS + AS,AR	**2**	AS + MR	**1**	MS,MR	**5**(16.6%)
MS,MR+AR	**4**	AR + MR	**4**	AS	**12**(40%)
		AR+MS,MR	**1**	AR	**16**(53.3%)
				AS,AR	**7**(23.3%)

All the patients were followed up with echocardiography at 1st, 6th, 12th months and then at 1 year interval. Regular measurements of Left ventricular End systolic volume,(LVESV,) Left ventricular End Diastolic volume,(LVEDV) Ejection Fraction, (EF%,), Left Ventricular (LV) mass and Trans valvular Mean Gradient, was done and compared with preoperative findings mentioned in the Table 4 below.

Table 4 Echocardiographic data, pre and post operative follow up

Echo data (Mean)	Pre-operative	Month 1	Month 6	Month 12	P value	SD, Preop & M12
LVEDV, MS predominant group	160.59	152.7	149.46	142.53	.0004	16.58 7.36
LVEDV, AS predominant group	177.67	172	165	153.80	.0117	15.46 11.84
LVEDV, AR predominant group	231.1	220	202.8	183.6	0.0171	31.89 49.65
LVESV, MS predominant group	68.8	63.2	56.4	49.4	.0001	5.91 5.08
LVESV, AS predominant group	68.33	64	51.4	48.6	.0001	4.2 3.7
LVESV, AR predominant group	106.4	99.6	89	86.8	.0020	10.10 2.77
EF % MS predominant group	55.18	58.33	58.6	60.17	.0002	3.23 2.75
EF % AS predominant group	50.33	52.8	54.6	58.60	.0063	2.07 2.75
EF % AR predominant group	51.14	55.4	57.8	60.20	.0004	2.04 1.48
LV Mass MS predominant group	170.59	149.13	136.53	117.07	.0001	11.02 12.04
LV Mass AS predominant group	255	210	184	167.6	0.0002	20.46 17.57
LV Mass AR predominant group	282	189	168	152	0.0001	20.93 4.90
Transmitral mean gradient in MS predominant group	17.75			3.35	0.0001	2.08 20.46
Trans aortic Mean gradient AS Predominant group	94.5			17.8	0.0001	4.20 2.23
Trans aortic Mean gradient AR Predominant group	8.42			16.7	0.0001	1.27 1.47

LV- left ventricle ESV-End systolic volume EDV- End diastolic volume EF- ejection fraction, SD standard Deviation

The total bypass time was ranged from 2.27 hours to 4.32 hours with a mean of 3.13 hours. **The aortic cross clamp time** was ranged from 2.16 hours to 4.15 hours with a mean of 2.88 hours. The mean duration of **post operative elective ventilation** was 7.72 with a range of 8 to 14 hrs**. Post operative ICU stay** was 4-8 days (mean 5.9 days) and **hospital stay** was 7-14 days (mean 8.7 days).

Most commonly encountered immediate **Post-operative Complications are** Prolonged hyperbilirubinemia (10%), superficial Wound infection (10%), Low cardiac output (6.6%) sepsis (6.2%) and acute renal failure (6.6%) during hospital stay. Two had undergone re exploration for post operative bleeding within 24 hrs of surgery,

Hospital mortality encountered in three patients (10%) during the ICU stay within 8 days of post operative period due to Low output syndrome and Acute renal failure.

Follow up: Mean follow up period was 2.8 years (range 12 months to 3 year.) one patient died in the 10th wk of post operatively with congestive cardiac failure. Overall survival rate at the end of 1 year is 86.6%. **Hemorrhagic Events** was noted in three patients. Two of them were presented with intramuscular hematoma. One had episode of CVA with intracranial bleed, who died on 16th week of follow up. **Thromboembolic events encountered in one** patient at 26th wk post operative period and diagnosed to have prosthetic valve thrombosis on autopsy; death of one patient due to unknown cause was reported after 32 months of surgery Over all post operative 3 year survival rate is 76.6%. The survival is shown in the figure below.

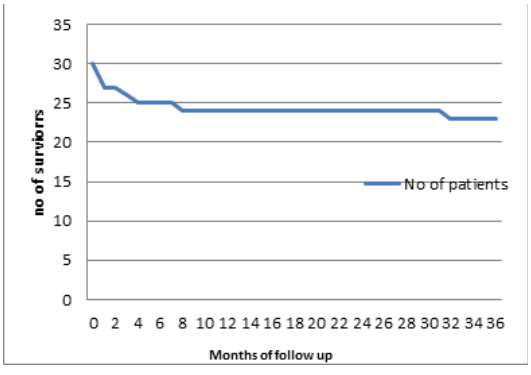

Fig: Survival chart of 30 post operative DVR patients in 3 year follow up period.

NYHA functional class of the patients were assessed at regular intervals on follow up and charted below in Table5

Table 5 NYHA grading pre and post operative follow up

Functional class	Preoperative	1st month	6rd month	12th month
NYHA I	3	15	13	20
NYHA II	21	12	12	4
NYHA III	6	0	0	0
NYHA IV	0	0	0	0

DISCUSSION

The peak age group in our study was 41-50 years which is comparable to other studies worldwide. [3, 5] Dyspnea is the most common symptom as in our study in 27 cases (90%) like other studies [6, 8, and 9] RHD is found to be one of the common causes in combined mitral

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and aortic replacement. The Armenti et al [3] noted 100% association of RHD with DVR. Whereas David at al [12] reported of 85% patients of DVR was to be associated with RHD in his study. Most common isolated valve lesion is recorded here are mitral stenosis and aortic regurgitation like other part of the word [6, 7]. 90% patients were presented to us with NYHA Class III and IV similar to 83% in Mueller et al and [4] 96% in Gray et al [3]. There is significant improvement in functional class at the end of 6 months of post operative period. Out of 24 survivors, at the end of one year, 20 patients were in NYHA class I and 4 patients were enjoying health with NYHA Class II at the end of 1 year. Most common difficulty encountered during surgery was grossly deformed valve, with clumped and fused chordae. Gross calcification noted extending up to annulus and grossly calcium laden leaflet in both aortic and mitral valve. This gross deformity prevents any attempt for valve repair for these rheumatic valves.

In our study preoperative left ventricular EF% and left ventricular end-diastolic volume (LVEDV)were noted to have immediate and long-term effect on survival. Four patients of early post operative death were noted to have EF% < 45 % and left ventricular end-diastolic volume index was larger than 165 cc/m2before surgery Richard J. Gray [3] observed that end-diastolic left ventricular volume index is larger than 150 cc/m2 , and EF <35% before surgery is associated poor post operative outcome in his study. There is significant LV mass regression seen in post operative period, even in comparatively small size valve in our study. It can be explained due to aesthetically small built population of north eastern part of India with mean BSA of 1.1 in our study.

CONCLUSION:

In a country like India, with high prevalence of rheumatic fever, we encounter a large number of rheumatic valve patients. The late presentation of patients with grossly deformed valve is still a big challenge for us to adopt comparatively conservative modalities of surgery. In our study we have noted that better result can be achieved by taking up for surgery preferably early period, with mild to moderate symptoms without waiting for further deterioration of Left ventricular function.

Conflict of interest: Authors declare that they have no conflict interest.

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Compliance with ethical standard: all procedures performed in this study involving human participants were in accordance with ethical standards of institutional research committee and with the 1964 Helsinki declarations and its later amendments.

Consent: Informational consents were obtained from all individual participants included in the study. This article does not contain any study with animals performed by any of the authors.

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