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MANAGEMENT OF RHEUMATIC HEART DISEASE WITH VALVE REPLACEMENT AT TERTIARY CARE HOSPITAL, GUNTUR.

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ABSTRACT

Introduction: In India, rheumatic fever is endemic and remains one of the major causes of cardiovascular disease, accounting for nearly 25-45% of the acquired heart disease. In National Health Policy 2017, India aims to reduce premature deaths from CVDs, to 25% by 2025.The annual incidence of rheumatic fever is 100-200 times greater than that observed in developed countries and fluctuates between 100-200 per 1,00,000 children of school age (from 5 years to 17 or 18 years depending on the study).Rheumatic heart disease (RHD) is still prevalent in the Third World countries**.**

Material & Methods: The present hospital based observational study was conducted in the Department of Cardiovascular and Thoracic Surgery, Government General Hospital, Guntur Medical College, Guntur. Study period was from August 2017 to June 2022, a prospective study conducted on consecutive Patients who underwent valve replacement

Results: A total of 91 cases were included in the final analysis. Out of which 25 were Double valve replacement cases , 22 were Aortic valve replacement cases and 44 were Mitral valve replacement cases

OPERATIVE PROCEDURE:

1. Cardiopulmonary bypass was established using a membrane oxygenator, moderate systemic hypothermia .
2. Aortic and bicaval cannulation for double valve replacement(DVR)&Mitral valve replacement(MVR).
3. Aortic and single venous two stage cannulation for Aortic valve replacement(AVR). Myocardial preservation was done with blood cardioplegia repeated every 20-25 minutes.
4. Deairing done with Pulmonary artery or LA venting .
5. Antegrade intermittent blood cardioplegia is done for Mitral valve replacement.
6. Alternate antegrade and retrograde intermittent blood cardioplegia for double valve replacement(DVR).
7. Selective coronary cardioplegia for AVR and DVR.

TYPE OF PROSTHESIS - Mechanical bileaflet valves:

SURGICAL APPROACH:

1. Standard left atrial exposure for Isolated mitral valve replacement (MVR) .
2. Right atrial with Transseptal approach was used where ever tricuspid valve repair required..

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3. In patients with aortic valve disease undergoing aortic valve replacement (AVR) an oblique aortotomy was used to expose the aortic valve.
4. AVR was done with interrupted, pledgetted 2-0 braided polyester sutures).
5. In double valve replacement DVR (AVR+MVR) after excising the aortic valve the mitral valve was excised.
6. After completing the operation and de-airing the heart cross clamp was released and patients were weaned from CPB.
7. All patients were shifted to cardiac surgical intensive care.
8. After removal of chest drains on first postoperative day, Anticoagulation Acitrom .
9. Patients were maintained on an INR ranging between 2.5-3.5.
10. All patients were assessed by 2D and colour Doppler echocardiography (Toshiba 6000 Power Vision) preoperatively and postoperatively in ICU and prior to discharge.
11. The primary endpoint was mortality (early and late).
12. Early mortality was death within 30 days postoperatively or during the same hospital admission. The secondary endpoints were early and late complication

Conclusions: In patients of rheumatic heart disease having combined Mitral and Aortic valve disease DVR should be performed whenever indicated as it has similar in hospital mortality and better late survival as compared to isolated aortic or mitral valve replacement
[5,6]

Keywords: rheumatic heart disease,mitral valve,aortic valve,double valve,valve repair,valve replacement

INTRODUCTION

Valvular heart diseases are either congenital or acquired in origin. The mitral stenosis (MS), mitral regurgitation (MR), and aortic regurgitation(AR) of both congenital and acquired etiology are discussed if they are isolated or the major lesion. The cause of mitral valve prolapse (MVP) is not entirely clear, Isolated congenital pulmonary regurgitation (PR), tricuspid regurgitation, and tricuspid stenosis of significance are exceedingly rare

Most acquired valvular heart diseases are of rheumatic etiology and are rare in the industrialized countries, although they still occur frequently in less developed countries. Among rheumatic heart disease, mitral valve involvement occurs in about three fourths and aortic valve involvement in about one fourth of the cases. Stenosis and regurgitation of the same valve usually occur together. Isolated aortic stenosis (AS) of rheumatic origin without mitral valve involvement is extremely rare. Rheumatic involvement of the tricuspid and pulmonary valves almost never occurs.

.[1,7] Rheumatic fever is an acute, often recurrent, inflammatory disease that generally follows a pharyngeal infection with group A beta-hemolytic streptococci, principally in children. In the past several decades, rheumatic fever and rheumatic heart disease have declined markedly but not disappeared in developing countries. Evidence strongly suggests that rheumatic fever is the result of an immune response to streptococcal antigens, inciting either a cross-reaction to tissue antigens, or a streptococcal-induced autoimmune reaction to normal tissue antigens.

The cardiac surgical implications of rheumatic fever primarily relate to chronic rheumatic heart disease, characterized by chronic, progressive, deforming valvular disease (particularly mitral stenosis) that produces permanent dysfunction and severe, sometimes fatal, cardiac failure decades later.

Chronic rheumatic heart disease most frequently affects the mitral and to a lesser extent the aortic and/or the tricuspid valves. Chronic rheumatic valve disease is characterized by fibrous or

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fibrocalcific distortion of leaflets or cusps, valve commissures, and chordae tendineae, with or without annular or papillary muscle deformities.

Stenosis results from leaflet and chordal fibrous thickening and from commissural and chordal fusion,with or without secondary calcification. Regurgitation usually results from scarring-induced retraction of chordae and leaflets, and less commonly, fusion of a commissure in an opened position. Combinations of lesions may yield valves that are both stenotic and regurgitant.

The pathognomonic inflammatory myocardial lesions in acute rheumatic fever, Aschoff nodules are found infrequently in myocardium sampled at autopsy or at valve replacement surgery, most likely reflecting the extended interval from acute disease to critical functional impairment.

Surgery for combined mitral and aortic valve disease was introduced for the first time in the early 1960s and because of a high operative mortality some reluctance remained over the preceding decade to refer a patient for double valve surgery.

Hospital mortality rate of combined aortic and mitral valve operation ranges from 5-15% with a 10-year survival rate of 50-70%. Ten-year survival after aortic valve replacement (AVR) was better at 72.1% than after double valve replacement (DVR 62.3%) or mitral valve replacement (MVR 54.4%) alone.DVR has been advocated as a standard surgical option in patients requiring surgery for mitral and aortic valve disease. Aortic valve replacement with mitral valve repair has been advocated by contemporary series. Patients having rheumatic mitral valve disease are predisposed to late mitral valve failure.

Young age, rheumatic mitral stenosis and regurgitation, leaflet calcification or severe subvalvular disease are identified as factors leading to late MV failure. Hence, replacement instead of repair is recommended. Due to younger age and severe disease at the time of presentation, it is preferred to conduct double valve replacement instead of aortic valve replacement and mitral valve repair

METHODOLOGY: The present hospital based observational study was conducted in the Department of Cardiovascular and Thoracic Surgery, Government General Hospital, Guntur Medical College, Guntur. Study period was from August 2017 to June 2022, a prospective study conducted on consecutive Patients who underwent double and single valve replacement

- Study groups: (Total no.: n = 91)
  - Group A : MVR (Mitral valve replacement) (n=44)
  - Group B : AVR (Aortic valve replacement) (n=22)
  - Group C : DVR (Double valve replacement) (n=25)

Inclusion criteria

1.Rheumatic heart disease forDouble valve replacement
2.Isolated Aortic valve replacement
3.Isolated mitral valve replacement
4.Mitral valve replacement with tricuspid valve annuloplasty
5.Double valve replacement with tricuspid valve annuloplasty

Exclusion criteria

1.Double valve replacement with .Concomitant CABG
2.patients taken up for emergency Mitral valve replacement
3.patients undergoing valve replacement for non-rheumatic/congenital etiology
    a.congenital bicuspid aortic valve
    b.congenital mitral valve
4.Redosurgery

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Aims:

i. Primary Objective**:**To compare the follow-up results of double valve replacement (DVR) i.e. mitral valve replacement (MVR) and aortic valve replacement (AVR) vs. isolated MVR or AVR for rheumatic heart disease
ii. Secondary objective
iii. Selection of Prosthetic Valves
    a. Echo cardiographic findings
    b. Clinical end points
    c. Clinical findings.
    d. Electrocardiographic findings
    e. Chest radiograph
    f. .Echocardiogram
    g. Angiogram

The following data will be collected prospectively on the proforma

i. Preoperative details
    1. Baseline patient characteristics
    2. Diagnostic workup
ii. Peroperative details
    1. Anaesthesia
    2. Operative and CPB management
iii. Postoperative details
    1. Immediate postop recovery
    2. Follow-up

STASTICAL ANALYSIS:

- The data was analyzed using Statistical Package for Social Sciences version 14.0.
- Categorical variables were expressed as percentages,
- Continuous variables were given as mean ± standard deviation.
- Actuarial survival was analyzed by the Kaplan-Meier method.
- Events were defined as death and valve-related complications.
- These events were compared between the three groups by applying chi-square test and p-values were calculated.
- A p-value of less than 0.05 was taken as significant. Continuous variables like age, weight, body surface area, aortic cross clamp and cardiopulmonary bypass time were compared using ANOVA test.

Linearized event rates were calculated by dividing the total number of events by the patient-years of follow-up.

Statistical methods:

Study groups was considered as primary Explanatory variable. valvular lesions, cardiac structural and functional parameters like LVESD,LVEDD, LAD, EF, PAH etc., considered as primary outcome variables. Socio demographic parameters like Age, Gender, weight etc., considered as other outcome variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram.

The association between categorical explanatory variables and quantitative outcome was assessed by comparing the mean values. The mean differences along with their 95% CI were presented. ANOVA/Paired t- test was used to assess statistical significance.

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The association between explanatory variables and categorical outcomes was assessed by cross tabulation and comparison of percentages. Chi square test was used to test statistical significance.
P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.(1)

1. Machines IB. IBM SPSS Statistics for Windows, Version 22.0. IBM Corp Armonk, NY; 2013.

RESULTS: A total of 91 cases were included in the final analysis. Out of which 25 were Double valve replacement cases , 22 were Aortic valve replacement cases and 44 were Mitral valve replacement cases. (table1)

Table1: Descriptive analysis of Group in study group (N=91)

Characteristic	***Number***
Total no. of patients	*36*
Sex distribution	
Male	*20*
Female	*16*
***Mean age** (years)*	*11.6±11.08*
cough	*2-12 weeks*
fever	*2weeks*
breathlessness	*2-12weeks*
pneumonia	*18*

Group	***Frequency***	***Percentages***
DVR	25	27.47%
AVR	22	24.18%
MVR	44	48.35%
Total	91	100.00%

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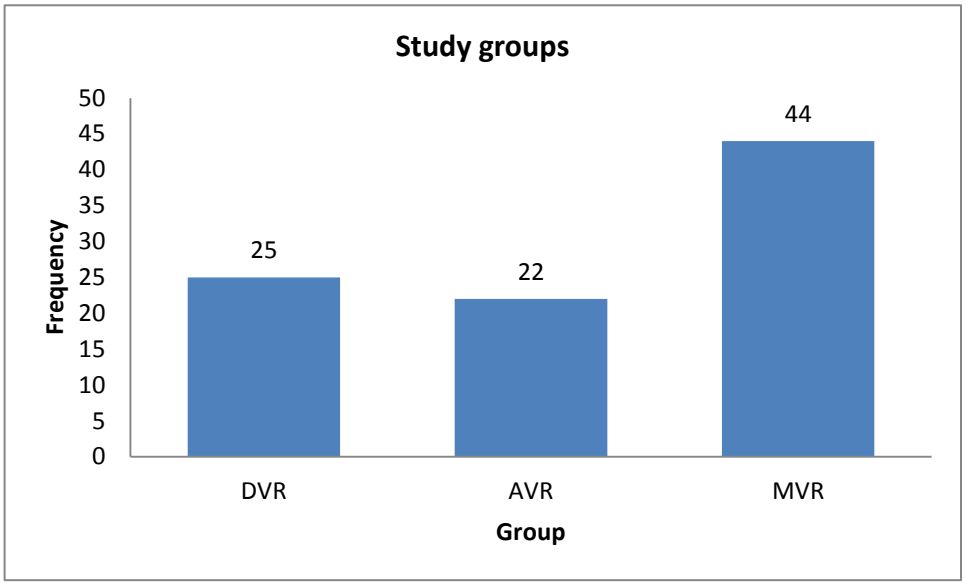

Table 2: Comparison of baseline parameters across the study group

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I. Age (mean ± SD)	44.04±13.81	52.96 ±11.28	46.09 ±11.87	0.04
II. Gender (N(%))				
Male	18 (72%)	17 (77.3%)	18 (40.9%)	0.005
Female	7 (28%)	5 (22.7%)	26 (59.1%)	
III. Weight (mean ± SD)	61.96 ±5.33	62.63 ±4.49	58.66 ±6.52	0.01
IV. Height (mean ± SD)	159.16±3.56	158.63 ±3.76	157.29 ±3.91	0.12

The mean age in study groups DVR, AVR and MVR was 44.04, 52.96 and 46.09 respectively. The proportion of males was (72%, 77.3% and 40.9%) and females was (28%, 22.7% and 59.1%) in study groups DVR, AVR and MVR respectively. The mean weight in study groups DVR, AVR and MVR was 61.96 ,62.63 and 58.66 respectively . The mean height in study groups DVR, AVR and MVR was159.16, 158.63 and 157.29 respectively. (Table2)

Table 3: Distribution of valvular lesions across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***
MS	19	0	33
MR	14	0	22

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AS	20	20	0
AR	22	11	0

There were 19 cases and 33 cases with mitral stenosis in DVR and MVR groups respectively . There were 14 cases and 22 cases with mitral regurgitation in DVR and MVR groups respectively . There were 20 cases and 20 cases with Aortic stenosis in DVR and AVR groups respectively . There were 22cases and 11 cases with Aortic regurgitation in DVR and AVR groups respectively .(table3)

Table 4: Comparison of baseline cardiac structural and functional parameters across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.LVESD	51.56 ± 0.960	51.72 ± 0.827	51.86 ± 1.025	0.45
II.LVEDD	31.88 ± 0.971	32.13 ± 0.940	32.27 ± 0.949	0.26
III.LAD	38.76 ± 4.728	38.45 ± 9.950	38.70 ± 3.707	0.98
IV. EF	57.08 ± 4.386	59.95 ± 4.735	57.15 ± 3.563	0.02
V. PAF				
Yes	23 (92%)	19 (86.4%)	42 (95.5%)	0.42
No	2 (8%)	3 (13.6%)	2 (4.5%)	
VI.NSR/AF				
NSR	16 (64%)	22 (100%)	15 (34.1%)	0.00
AF	9 (36%)	0 (0%)	29 (65.9%)	
VII.NYHA				
3	25 (100%)	22 (100%)	44 (100%)	Cannot be computed

The mean LVESD was 51.56 , 51.72 and 51.86 in DVR, AVR, MVR groups respectively. The mean LVEDD was31.88, 32.13 and 32.27 in DVR, AVR, MVR groups respectively. The mean LAD was 38.76, 38.45 and 38.70 in DVR, AVR, MVR groups respectively. The mean EF was 57.08, 59.95 and 57.15 in DVR, AVR, MVR groups respectively. (table4)

Table 5: Comparison of cardiac structural and functional parameters at discharge across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.LVESD	50.64 ±1.8	51±0.0	50.79±1.36	0.65

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II.LVEDD	30.92±0.40	31.0±0.0	31.82±1.08	<0.01
III.LAD	36.32±3.82	33.32±6.65	36.32±3.72	0.03
IV. EF	58.72±3.65	60.36±3.11	58.64±2.73	0.08
V. PAF				
Yes	0(0%)	0(0%)	0(0%)	Cannot be computed
No	25 (100%)	22 (100%)	44 (100%)	
VI.NSR/AF				
NSR	25 (100%)	22 (100%)	44 (100%)	Cannot be computed
AF	0(0%)	0(0%)	0(0%)	
VII.NYHA				
2	25 (100%)	22 (100%)	44 (100%)	Cannot be computed

Table 6: Comparison of cardiac structural and functional parameters at 3 months

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.LVESD	45.96 ±1.93	46.23±1.99	44.86±1.86	0.01
II.LVEDD	27.36±1.71	28.91±2.64	26.89±2.55	0.006
III.LAD	34.44±4.0	33.32±6.65	33.46±2.64	0.59
IV. EF	60.92±2.81	61.77±1.54	61.23±2.58	0.49
V.NSR/AF (CT)				
NSR	22 (88%)	22 (100%)	36 (81.8%)	0.10
AF	3 (12%)	0 (0%)	8 (18.2%)	
VI.NYHA				
1	25 (100%)	22 (100%)	44 (100%)	Cannot be computed

Table 7: Comparison of cardiac structural and functional parameters at 6 months

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.LVESD	43.36±2.23	44.09±1.48	41.91±2.87	0.002
II.LVEDD	24.36±1.55	26.18±3.22	24.43±2.19	0.01
III.LAD	32.2±4.09	30.5±5.79	30.64±2.81	0.24

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IV. EF	62.56±2.2	64.46±0.51	63.05±2.22	0.004
V.NSR/AF (CT)				
NSR	23 (92%)	22 (100%)	38 (86.4%)	0.18
AF	2 (8%)	0 (0%)	6 (13.6%)	
VI.NYHA				
1	25 (100%)	22 (100%)	44 (100%)	Cannot be computed

Table8 : Comparison of baseline parameters across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.MVG systolic	26.68±3.53	NA	27.05 ±3.56	0.68
II.MVG diastolic	15.48±1.08	NA	15.61 ±1.06	0.62
III.AGR systolic	40.88±13.13	41.77±13.78	NA	0.82
IV. AGR diastolic	20.40±9.82	21.05 ±10.30	NA	0.83

Table 9: Comparison of other parameters across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.MV size	25.08±0.40	NA	25.18±0.58	0.44
II. AV size	16.0±0.0	18.32±1.29	NA	<0.01
III. xclamp	55.48±2.68	108.05±2.21	56.36±2.30	<0.01
IV. PD	72.64±5.22	143.91±2.09	74.43±4.42	<0.01

Table10 : Comparison of Postoperative parameters across the study groups

Parameter	***DVR (N=25)***	***AVR (N=22)***	***MVR (N=44)***	***P value***
I.MVG systolic	12.88±2.74	NA	12.84 ±2.93	0.96
II.MVG diastolic	7.76±1.48	NA	7.75±1.60	0.98
III.AGR systolic	21.16±9.08	21.73 ±9.56	NA	0.84
IV. AGR diastolic	10.68±6.47	11.14±6.77	NA	0.81

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Table11 : Comparison of Postoperative at 3months parameters across the study groups

Parameter	*DVR (N=25)*	*AVR (N=22)*	*MVR (N=44)*	*P value*
I.MVG systolic	6.52±2.35	NA	6.39±2.65	0.84
II.MVG diastolic	4.52±1.50	NA	4.82± 1.44	0.42
III.AGR systolic	10.08±4.04	10.36±4.24	NA	0.82
IV. AGR diastolic	5.32±3.25	5.55±3.40	NA	0.82

Table12 : Comparison of Postoperative at 6 months parameters across the study groups

Parameter	*DVR (N=25)*	*AVR (N=22)*	*MVR (N=44)*	*P value*
I.MVG systolic	3.16±1.18	NA	3.05 ±1.26	0.72
II.MVG diastolic	1.84±0.99	NA	1.93 ± 0.99	0.71
III.AGR systolic	5.84±2.21	5.55 ±2.19	NA	0.65
IV. AGR diastolic	2.80±1.41	2.91 ±1.47	NA	0.08
I. change of LAD postop from baseline	2.44±1.98	5.14±4.35	2.39±5.79	0.64
II. change of LAD postop at 3months from baseline	4.32±3.48	5.14±4.34	5.25±3.16	0.56

INTRAGROUP COMPARISONS:
GROUP 1: DVR

Table13: Comparison of Baseline LVESD with postoperative LVESD

LVESD	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	51.56 ± 0.96				
Post op	50.64 ± 1.8	0.92	0.30	1.54	0.005
At 3 months	45.49 ± 1.92	5.6	4.84	6.35	<0.01
At 6 months	43.36 ± 2.23	8.2	7.22	9.18	<0.01

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The mean LVESD Baseline , post operative, post operative at 3months and post operative at 6months was 51.56,50.64,45.49 and 43.36 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

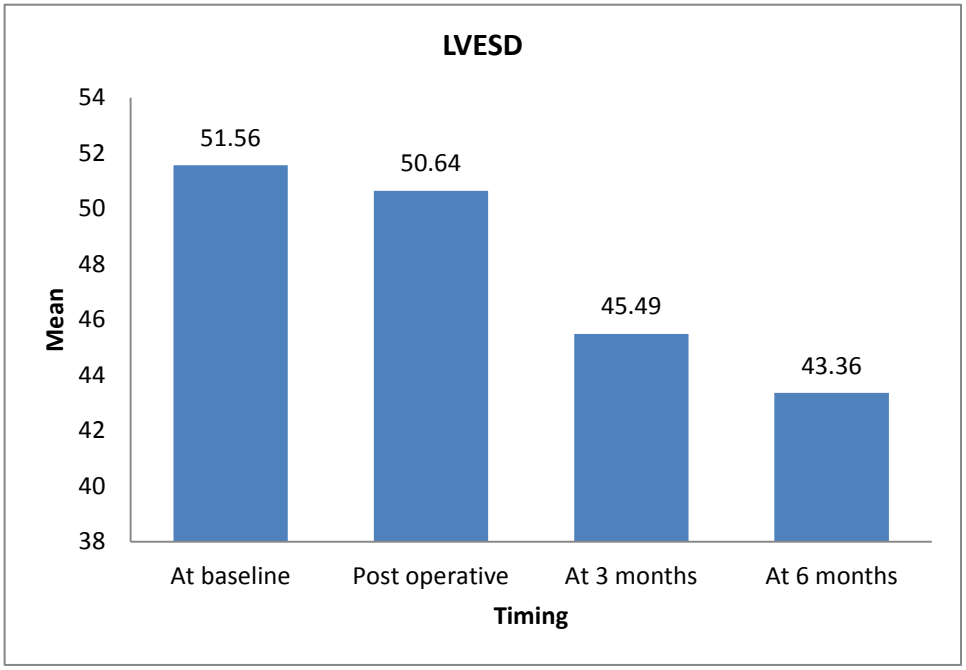

Table14: Comparison of Baseline LVEDD with postoperative LVEDD

LVEDD	***Mean ± SD***	***Mean Difference***	***95% CI***		***P value***
			Lower	***Upper***	
At baseline	31.88±0.97				
Post op	30.92±0.40	0.96	0.59	1.33	<0.01
At 3 months	27.36±1.70	4.52	3.66	5.38	<0.01
At 6 months	24.36±1.55	7.52	6.74	8.31	<0.01

The mean LVEDD Baseline , post operative, post operative at 3months and post operative at 6months was 31.88, 30.92, 27.36 and 24.36 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

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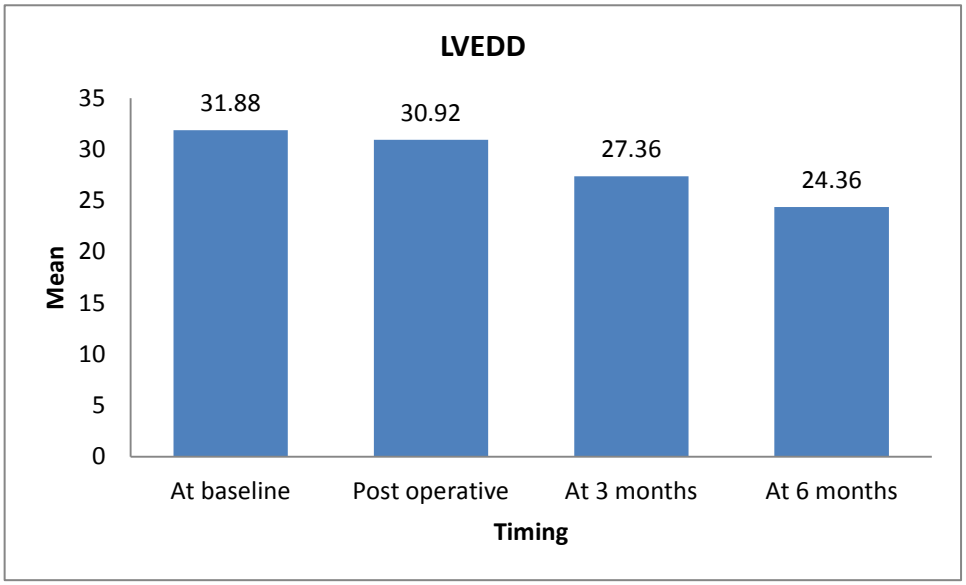

Table15: Comparison of Baseline LAD with postoperative LAD

LAD	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	38.76±4.73				
Post op	36.32±3.82	2.44	1.62	3.26	<0.01
At 3 months	34.44±4.00	4.32	2.88	5.76	<0.01
At 6 months	32.20±4.09	6.56	5.15	7.97	<0.01

The mean LAD Baseline , post operative, post operative at 3months and post operative at 6months was 38.76,36.32,34.44 and 32.2 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

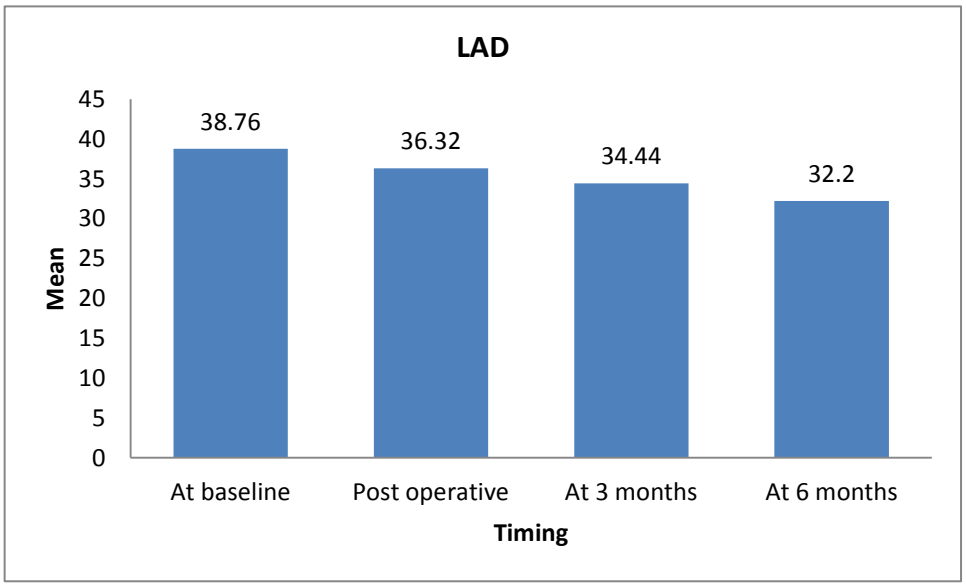

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Table16: Comparison of Baseline EF with postoperative EF

EF	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	57.08±4.39				
Post op	58.72±3.65	-1.64	-2.93	-0.36	0.01
At 3 months	60.92±2.81	-3.84	-5.57	-2.11	<0.01
At 6 months	62.56±2.20	-5.48	-7.21	-3.75	<0.01

The mean EF Baseline , post operative, post operative at 3months and post operative at 6months was 57.08,58.72,60.92 and 62.56 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant(p<0.01).

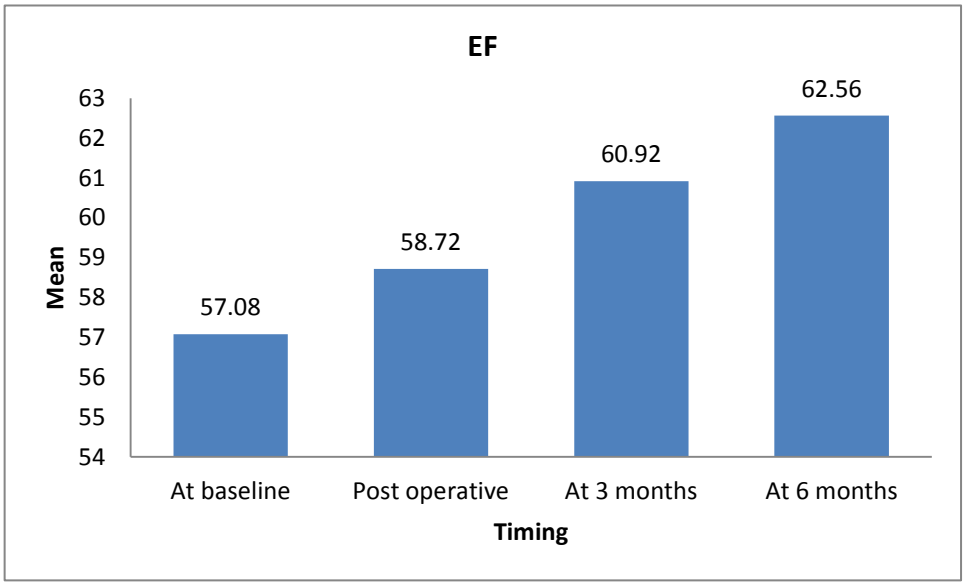

Table17: Comparison of Baseline MVG with postoperative MVG

MV.G systolic	*Mean ± SD*	*Mean Difference*	**95% CI**		**P value**
			Lower	*Upper*	
At baseline	26.68± 3.53				
Post op	12.88±2.74	13.8	12.97	14.63	<0.01
At 3 months	6.52±2.35	20.16	19.04	21.28	<0.01
At 6 months	3.16±1.18	23.52	22.23	24.81	<0.01

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The mean MVG systolic Baseline , post operative, post operative at 3months and post operative at 6months was 26.68,12.88,6.52 and 3.16 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

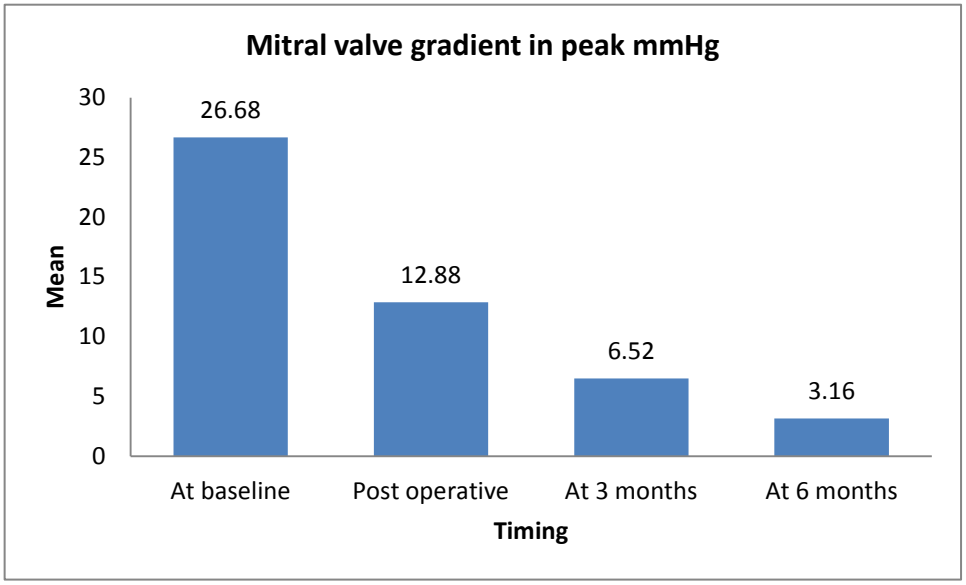

Table: Comparison of Baseline MVG with postoperative MVG

MVmean gradient in mm Hg	***Mean ± SD***	***Mean Difference***	***95% CI***		***P value***
			Lower	***Upper***	
At baseline	15.48±1.08				
Post op	7.76±1.48	7.72	7.25	8.19	<0.01
At 3 months	4.52±1.50	10.96	10.34	11.58	<0.01
At 6 months	1.84±0.99	13.64	13.13	14.16	<0.01

The mean MVG , Baseline , post operative, post operative at 3months and post operative at 6months was 15.48,7.76,4.52 and 1.84 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

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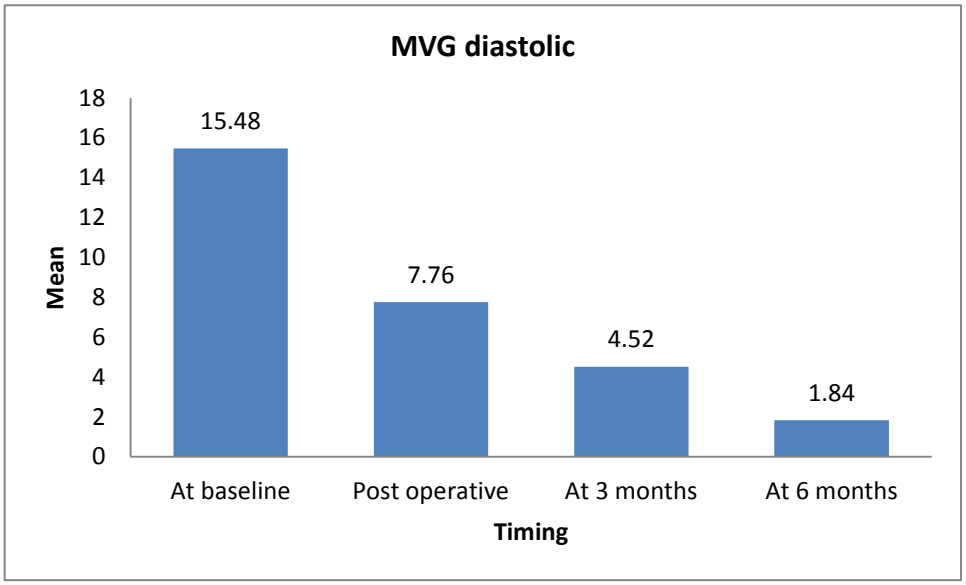

Table18: Comparison of Baseline AGR with postoperative AGR

AG.peak mm Hg	***Mean ± SD***	***Mean Difference***	***95% CI***		***P value***
			Lower	***Upper***	
At baseline	40.88±13.13				
Post op	21.16±9.08	19.72	17.07	22.37	<0.01
At 3 months	10.08±4.04	30.80	26.81	34.79	<0.01
At 6 months	5.84±2.21	35.04	30.14	39.95	<0.01

The mean Aortic valve peak gradient- Baseline , post operative, post operative at 3months and post operative at 6months was 40.88,21.16,10.08 and 5.84 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

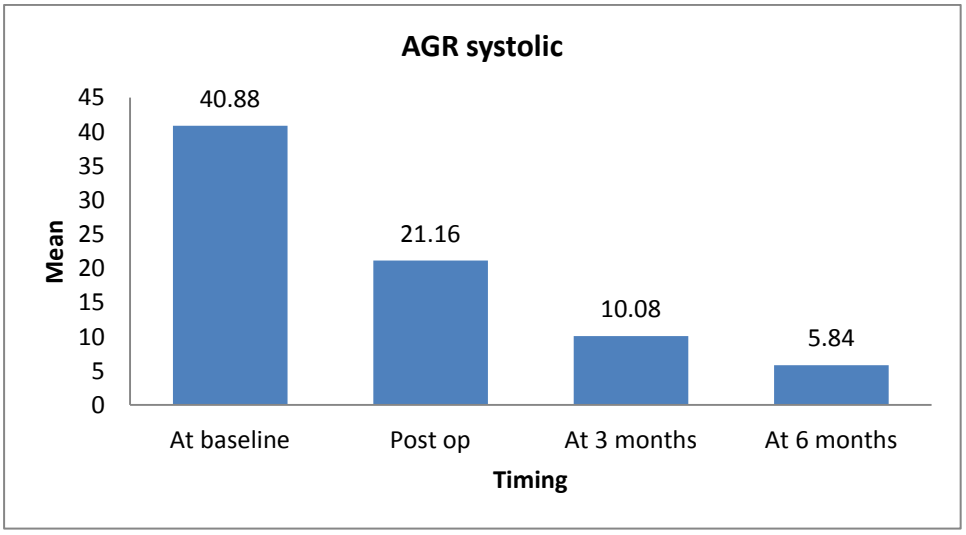

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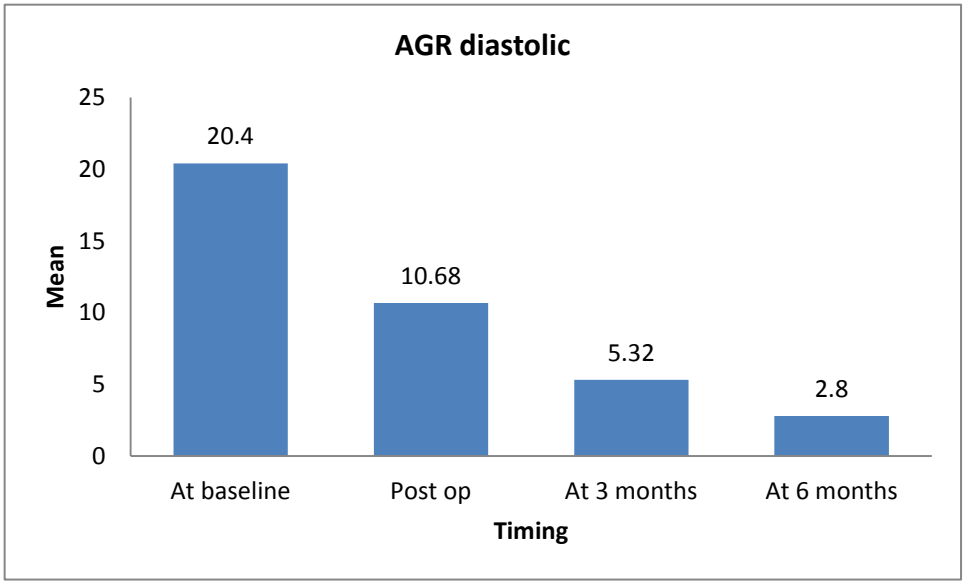
Table19: Comparison of Baseline AGR with postoperative AGR

AG.R diastolic	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	20.40±9.82				
Post op	10.68±6.47	9.72	8.11	11.33	<0.01
At 3 months	5.32±3.25	15.08	12.25	17.91	<0.01
At 6 months	2.80±1.41	17.60	14.07	21.13	<0.01

The mean AGR diastolic Baseline , post operative, post operative at 3months and post operative at 6months was 20.40,10.68,5.32 and 2.80 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).



Postoperative NYHA	Baseline NYHA	Total
	3	
2	25 (100.0%)	25 (100.0%)

***GROUP2:* AVR**

Table20: Comparison of Baseline LVESD with postoperative LVESD

LVESD	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	51.73±0.83				

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Post op	51.00±0.0	0.72	0.36	1.09	<0.01
At 3 months	46.23±1.99	5.50	4.52	6.47	<0.01
At 6 months	44.09±1.47	7.63	6.93	8.34	<0.01

The mean LVESD Baseline , post operative, post operative at 3months and post operative at 6months was 51.73,51,46.23 and 44.09 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant(p<0.01).

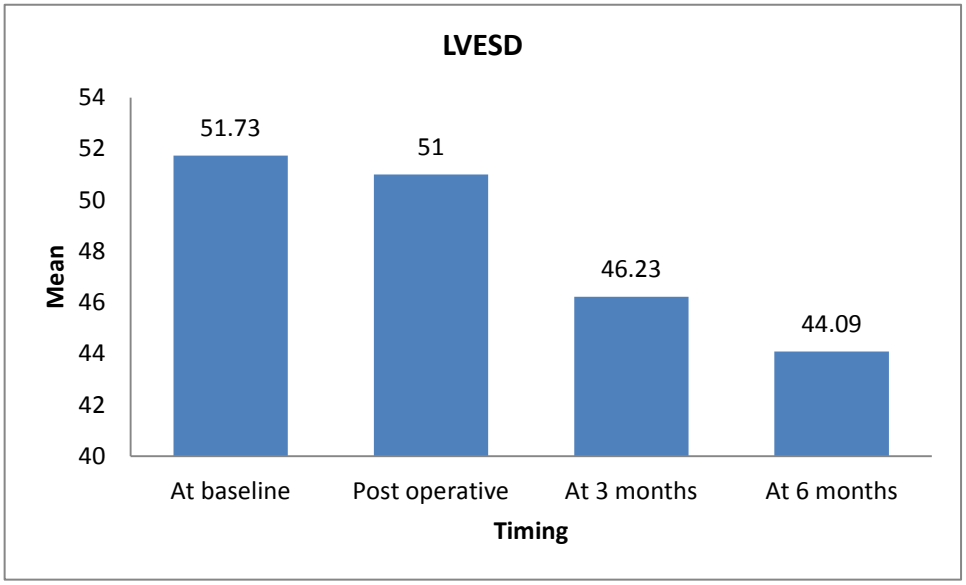

Table21: Comparison of Baseline LVEDD with postoperative LVEDD

LVEDD	***Mean ± SD***	***Mean Difference***	***95% CI***		***P value***
			Lower	***Upper***	
At baseline	32.13±0.94				
Post op	31.00±0.0	1.14	0.72	1.55	<0.01
At 3 months	28.91±2.63	3.22	2.03	4.42	<0.01
At 6 months	26.18±3.21	5.95	4.58	7.33	<0.01

The mean LVEDD Baseline , post operative, post operative at 3months and post operative at 6months was 32.13,31,28.91 and 26.18 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant(p<0.01).

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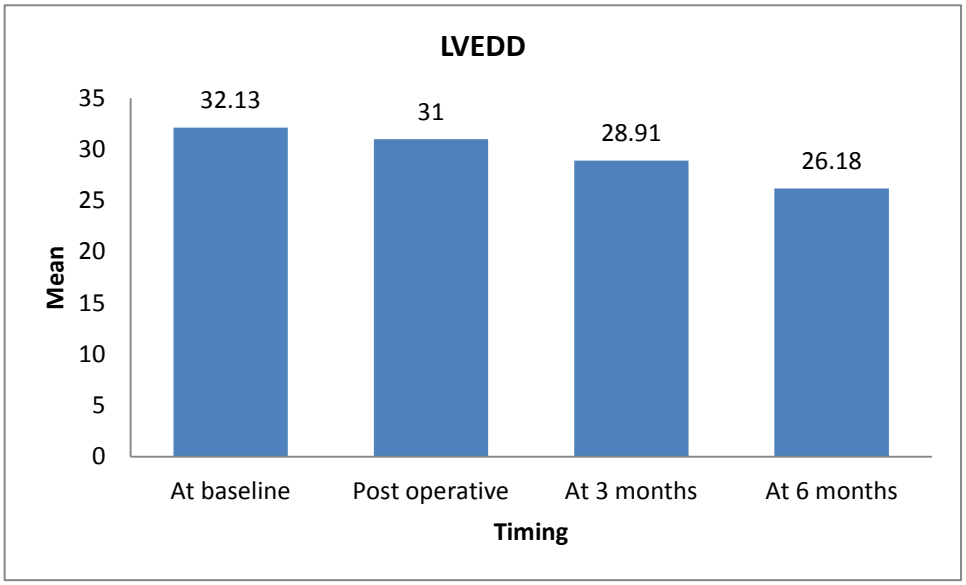

Table22: Comparison of Baseline LAD with postoperative LAD

LAD	***Mean ± SD***	***Mean Difference***	***95% CI***		***P value***
			Lower	***Upper***	
At baseline	38.46±9.95				
Post op	33.32±6.65	5.14	3.21	7.06	<0.01
At 3 months	33.32±6.65	5.14	3.21	7.06	<0.01
At 6 months	30.50±5.79	7.95	4.34	11.57	<0.01

The mean LAD Baseline , post operative, post operative at 3months and post operative at 6months was 38.46,33.32,33.32 and 30.50 respectively. The mean difference between base line and post operative at 3months, post operative at 6months was statistically significant($p<0.01$).

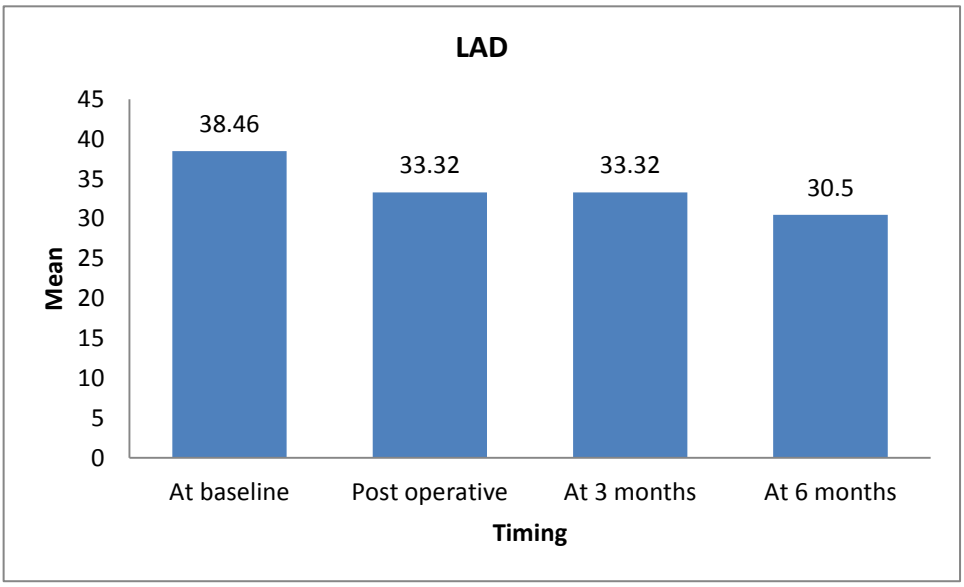

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Table23: Comparison of Baseline EF with postoperative EF

EF	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	59.96±4.74				
Post op	60.36±3.11	-0.41	-1.96	1.14	0.59
At 3 months	61.77±1.54	-1.82	-3.71	-0.08	0.06
At 6 months	64.46±0.51	-4.50	-6.54	-2.46	<0.01

The mean EF Baseline , post operative, post operative at 3months and post operative at 6months was 59.96,60.36,61.77 and 64.46 respectively. The mean difference between base line and Postoperative ,post operative at 3months was statistically not significant (P>0.05) but post operative at 6months was statistically significant(p<0.01).

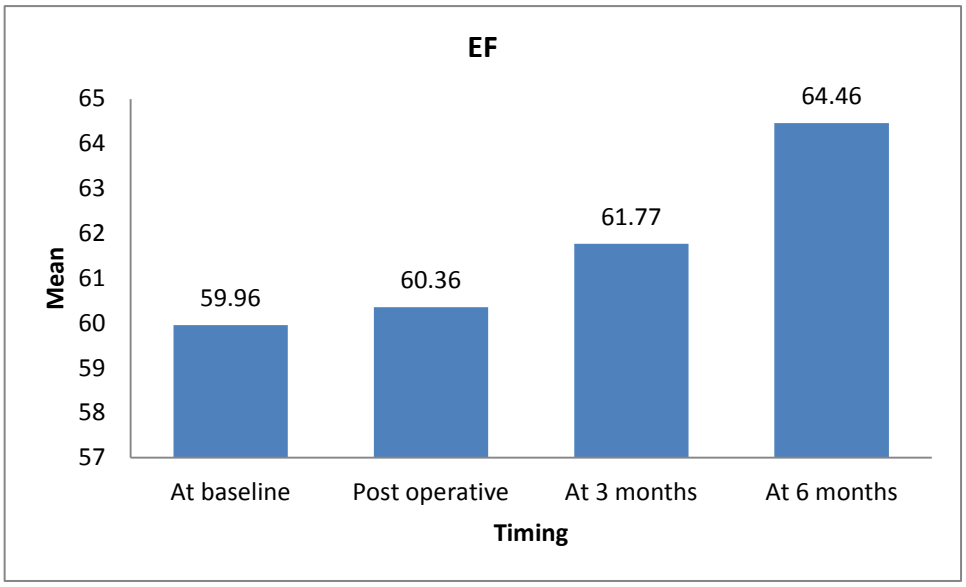

Table24: Comparison of Baseline AGR with postoperative AGR

AG.R systolic	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	41.77±13.78				
Post op	21.73±9.56	20.05	17.03	23.06	<0.01
At 3 months	10.36±4.24	31.41	26.89	35.93	<0.01
At 6 months	5.55±2.19	36.23	30.81	41.64	<0.01

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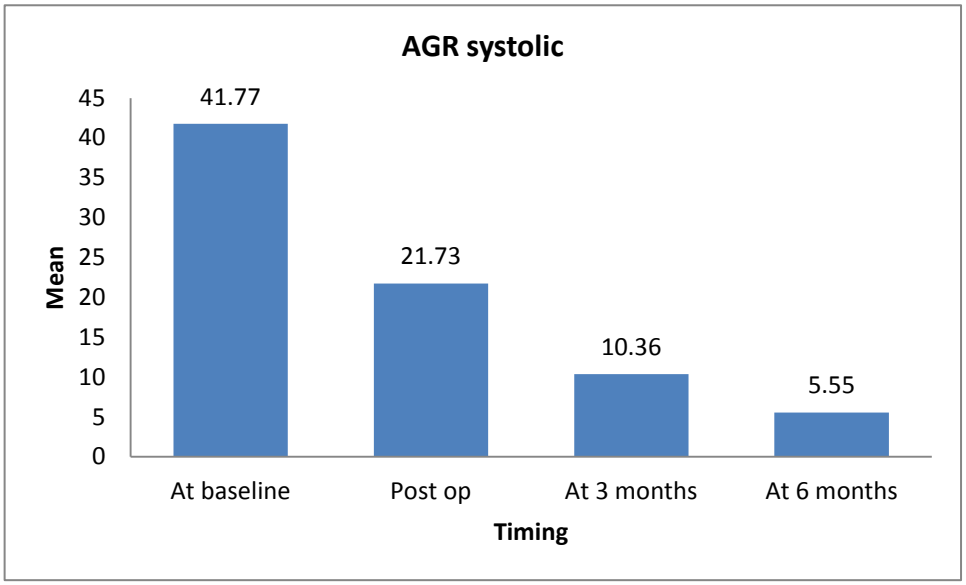
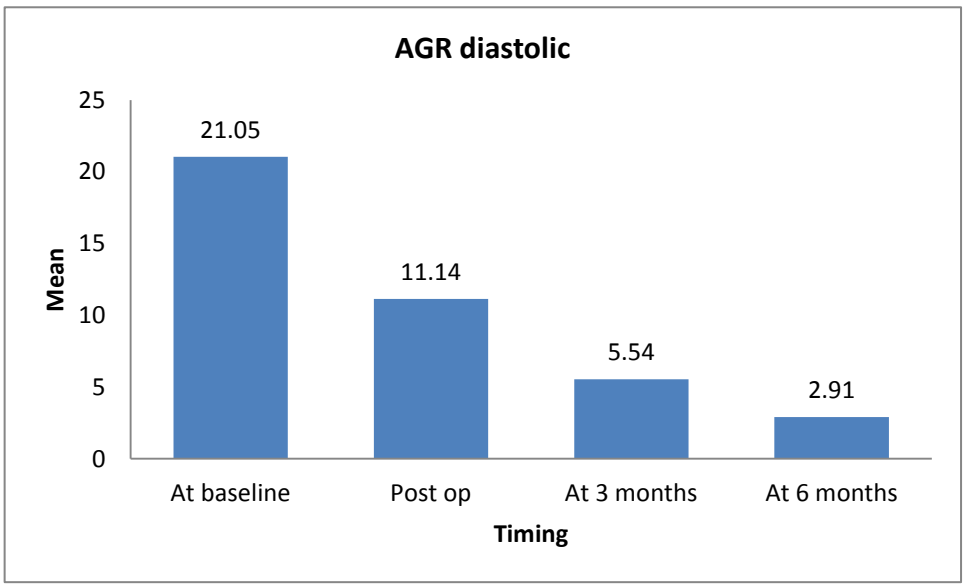


Table25: Comparison of Baseline AGR with postoperative AGR

AG.R diastolic	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	21.05±10.30				
Post op	11.14±6.77	9.91	8.09	11.73	<0.01
At 3 months	5.54±3.40	15.50	12.31	18.69	<0.01
At 6 months	2.91±1.48	18.14	14.16	22.12	<0.01



GROUP3: MVR

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Table26: Comparison of Baseline LVESD with postoperative LVESD

LVESD	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	51.86±1.03				
Post op	50.79±1.36	1.07	0.67	1.46	<0.01
At 3 months	44.86±1.86	7.00	6.37	7.63	<0.01
At 6 months	41.91±2.87	9.95	9.11	10.79	<0.01

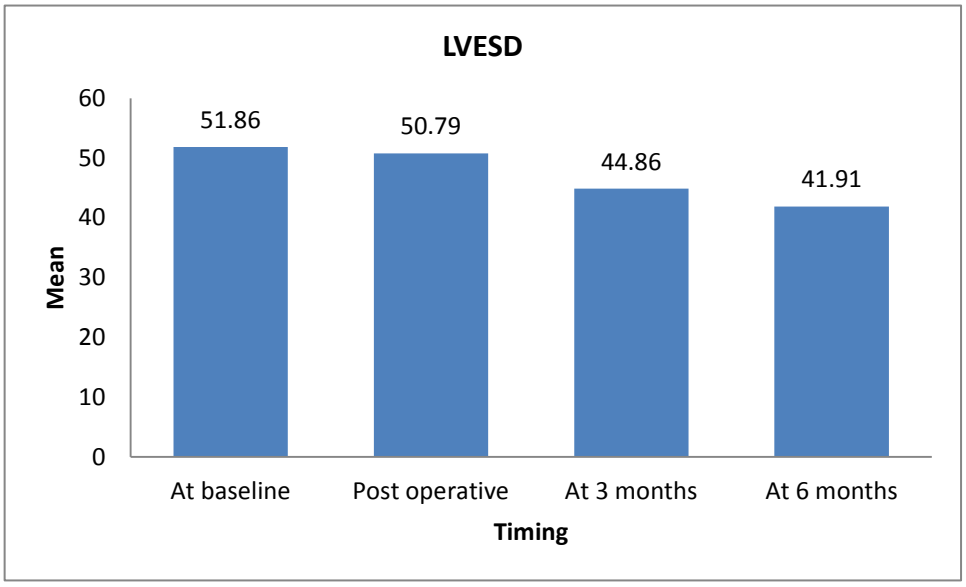

Table27: Comparison of Baseline LVEDD with postoperative LVEDD

LVEDD	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	32.27±0.95				
Post op	31.82±1.08	0.45	0.11	0.80	0.01
At 3 months	26.89±2.54	5.39	4.53	6.25	<0.01
At 6 months	24.43±2.19	7.84	7.13	8.56	<0.01

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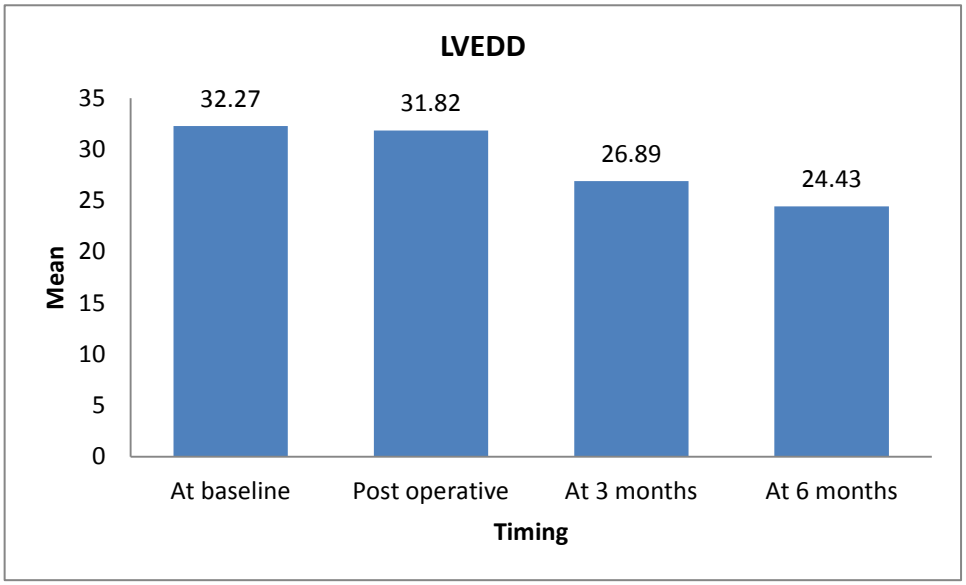

Table28: Comparison of Baseline LAD with postoperative LAD

LAD	***Mean ± SD***	***Mean Difference***	***95% CI***		**P value**
			Lower	***Upper***	
At baseline	38.71±3.71				
Post op	36.32±3.71	2.39	0.63	4.15	0.009
At 3 months	33.46±2.64	5.25	4.29	6.21	<0.01
At 6 months	30.64±2.82	8.07	7.08	9.06	<0.01

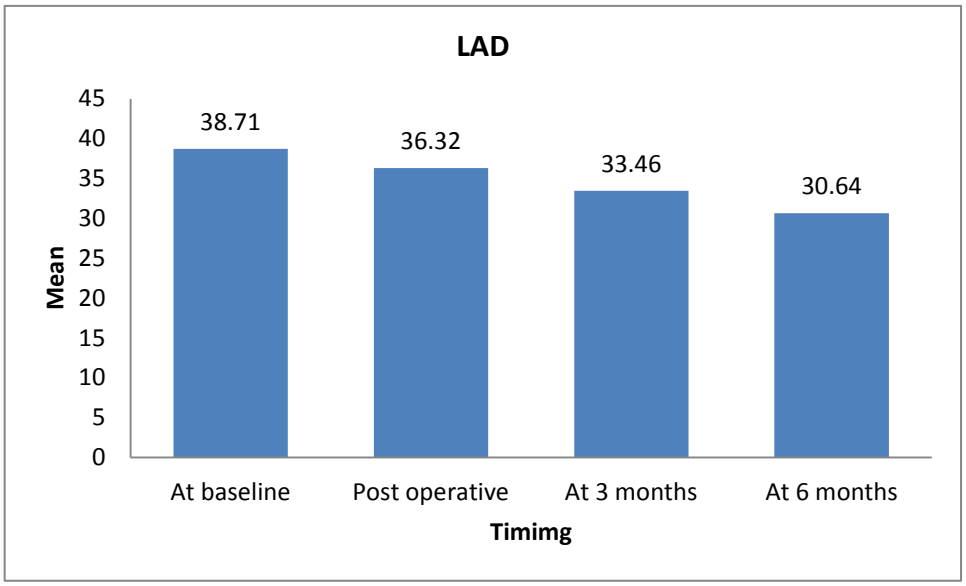

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Table29: Comparison of Baseline EF with postoperative EF

EF	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	57.16±3.56				
Post op	58.63±2.73	-1.47	-2.32	-0.64	0.001
At 3 months	61.23±2.58	-4.07	-4.98	-3.16	<0.01
At 6 months	63.05±2.22	-5.89	-6.79	-4.98	<0.01

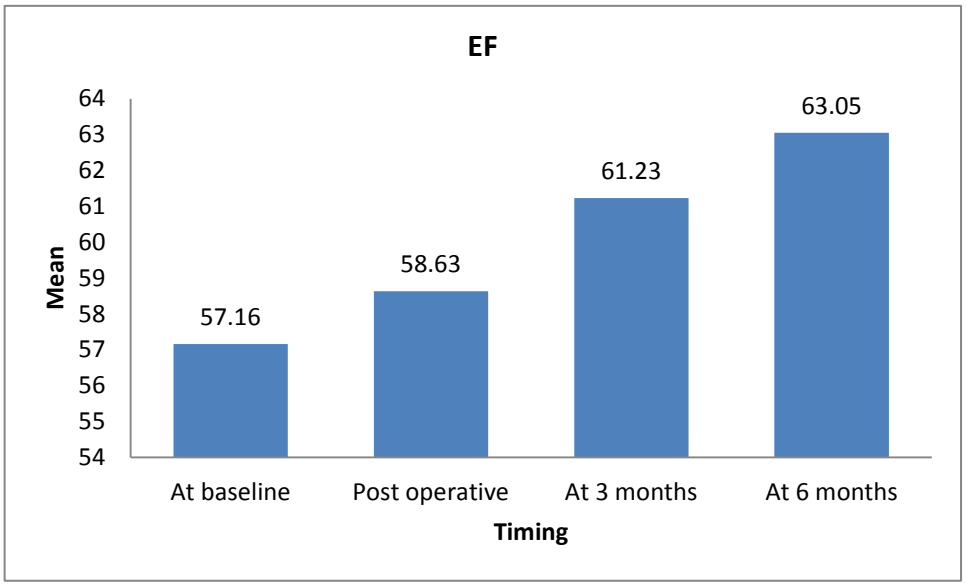

Table30: Comparison of Baseline MVG with postoperative MVG

MV.G systolic	*Mean ± SD*	*Mean Difference*	*95% CI*		*P value*
			Lower	*Upper*	
At baseline	27.05±3.56				
Post op	12.84±2.93	14.20	13.47	14.94	<0.01
At 3 months	6.39±2.65	20.66	19.78	21.54	<0.01
At 6 months	3.05±1.26	24.00	23.04	24.96	<0.01

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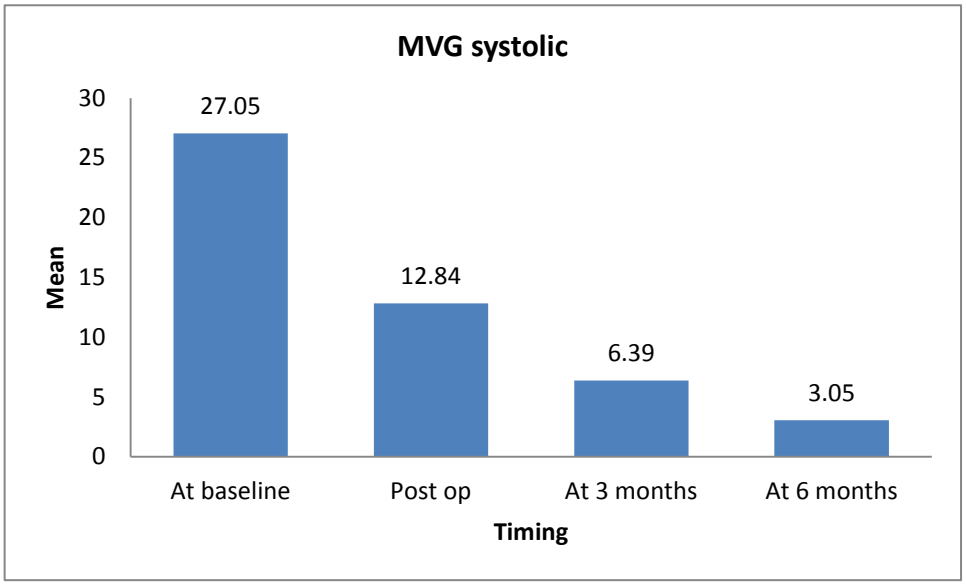

Table31: Comparison of Baseline MVG with postoperative MVG

MV.G diastolic	***Mean ± SD***	***Mean Difference***	***95% CI***		**P value**
			Lower	***Upper***	
At baseline	15.61±1.06				
Post op	7.75±1.60	7.86	7.51	8.22	<0.01
At 3 months	4.82±1.44	10.79	10.37	11.22	<0.01
At 6 months	1.93±0.99	13.68	13.29	14.07	<0.01

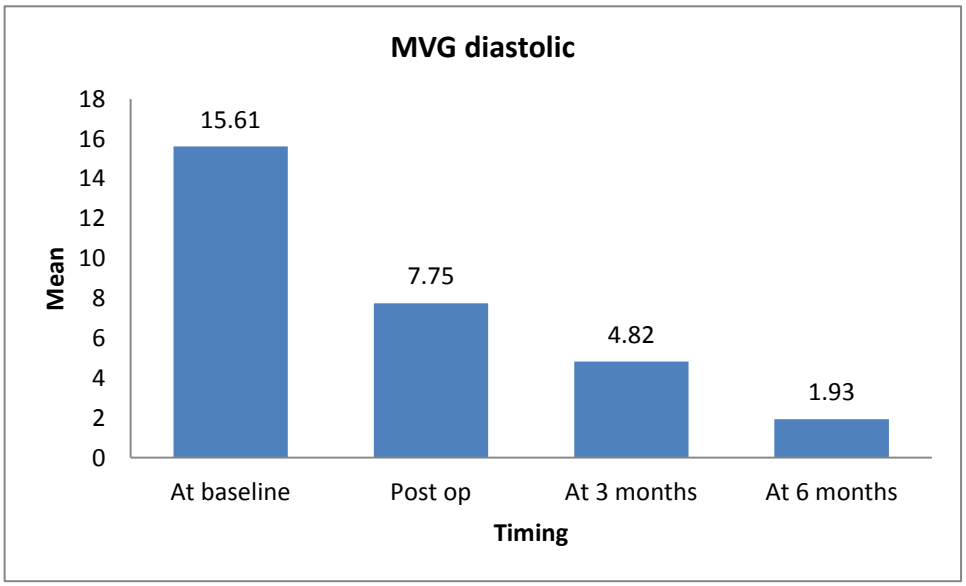

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Table32 : Valve lesions in the three groups.

Groups	***Valve Lesion***	***Numbers***
Group A (MVR) n=45	MS	27
	MR	17
	Mixed MV	1
Group B (AVR) n=23	AS	9
	AR	13
	Mixed AV	1
Group C (DVR) n=25	MS+AS	5
	MS+AR	6
Groups	***Valve Lesion***	***Numbers***
Group C (DVR)n=25	MR+AS	1
	MR+AR	9
	MS+Mixed AV	2
	AS+Mixed MV	1
	AR+Mixed MV	1

MS=Mitral Stenosis; MR=Mitral Regurgitation; Mixed MV=Mixed mitral valve disease; AS=Aortic Stenosis; AR=Aortic regurgitation; Mixed AV=Mixed aortic valve disease

	Group A (MVR) n=45	***Group B (AVR) n=23***	***Group C (DVR) n=25***	***p-value***
Pre-operative variables				
Age mean years	30.2±11.6	30.3±13.7	29.3±10.3	< 0.086
Gender Male Female	21 24	20 3	20 5	< 0.0001
AF	29	0	13	
NYHA class II III IV	9 36	9 14	5 20	< 0.001
Weight mean kgs.	53.3±13.3	55.5±12.1	56.3±14.1	< 0.055
BSA	1.5±0.2	1.55±0.17	1.54±0.2	< 0.509

P-value unreliable; AF :trial fibrillation
AVR : Aortic valve Replacement BSA : Body surface area;
DVR : Double valve replacement
MVR : Mitral Valve Replacement NYHA : New York Heart Association.

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OPERATIVE VARIABLES

Variables	***Group A MVR***	***Group B AVR***	***Group C DVR***	***p Value***
AXC time mean mins	40.4±12.9	67.9±25.3	92.4±21.8	< 0.001
CPB time mean mins	62.1±19.7	97.7±35.8	120.7±28.3	< 0.001
Valve implanted Bileaflet	44 Mitral	22 Aortic	50 25 each Mitral and Aortic Medtronic	

P-value unreliable; AXC : Aortic cross clamp; AVR : Aortic valve Replacement

CPB : Cardiopulmonary bypass DVR : Double valvereplacement
MVR : Mitral Valve Replacement

Outcome:

Amongst total of 91 patients :

- MVR (n=44) Group A
- AVR (n=22) Group B
- DVR (n=25) Group C

There were 100% follow- up in this study and no late deaths.
The early mortality was 5/91 (5.49%).
DVR 2/25 (8%)

- Case 1 : Low cardiac output : ventricular arrhythmia (predominant lesion was Aortic stenosis and gross LV hypertrophy.
- Case 2: Intractable ventricular tachycardia prior H/o of acute pulmonary oedema (on ventilator)

MVR 3/44 (6.8%)

- Case 1: Low cardiac output with MODS : 45 yrs F Chronic rheumatic heart disease with severe MS & MR, severe TR mild PR and severe PAH with prior history of congestive heart failure.
- Case 2: Low cardiac output with Acute renal failure. 40 years male with chronic rheumatic heart disease with severe calcific MS, moderate MR severe TR organic Tricuspid valve disease. Prior history of hospital admission for congestive heart failure.

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- Case 3: Acute Pulmonary oedema and acute renal shut down. 49 yrs female Chronic rheumatic heart disease with severe MS and severe PAH with Severe TR and borderline LV function.

Discussion:

Combined mitral and aortic valve disease occurs in 10% patients with rheumatic heart disease.[5] Double valve replacement has been reported to have reduced long-term survival.[14] DVR is a standard surgical option in patients requiring surgery for combined aortic and mitral valve disease.

- Although AVR and mitral valve repair (MVR) has been advocated in patients having rheumatic heart disease. Younger age, mixed mitral valve disease, leaflet calcification or severe subvalvular disease predispose to late mitral valve failure. In the present study even young patients were seen with severe diffuse calcified valves due to on going rheumatic fever.Therefore, at the time of presentation these valves are not suitable for MV repair thus relegating the option of MVR.The only option left is DVR.

- In the current study early mortality of 5/91 (5.49%) and no late mortality was observed. There were two deaths 2/25 (8%) Group C and three deaths 3/44 (6.8%) in Group A. Our results were comparable to previous studies.Remadi *et al*[1]*. in a study of 254 patients, consisting of* 79.5% RHD, reported an early mortality of 7.05%.The main cause of operative mortality was low cardiac output syndrome and intractable ventricular arrhythmia in the DVR procedure requiring a long operating time. The linearized rates of thromboembolic and hemorrhagic events were 1.07% and 0.9% per patient-year respectively.

- No Immediate or late complications were seen like thromboembolic phenomenon, anticoagulation related bleeding, infection, wound dehiscence, structure valve failure etc.In this series the Low cardiac in patients with regurgitant lesions with dilated poor left ventricles and borderline ejection fraction

- The CPB and AXC times were similar to Remadi *et al*

- John *et al. advocated mechanical prosthesis instead of* bioprosthesis keeping in view better performance in the long-term owing to superior durability.

- low-intensity anticoagulant regimen was followed to maintain the target prothrombin time at 1.5 times the control value.

- In the present study bileaflet mechanical valves have been used because of the superior performance and long term durability.

- These patients were kept on oral anticoagulation maintaining an INR of 2.5 – 3.5

- Bioprosthesis were not used in this series because of multi valvular involvement, advanced RHD, younger age of patients and increased cost of bioprosthesis and early degeneration.

- Studies comparing DVR vs. AVR and MVR have shown superiority of DVR over AVR and MVR and vice versa.

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- In all the groups majority of the patients were in NYHA III, after surgery they were in NYHA functional class I

- John S etal, Kaul et al, and Talwar et al all have shown in their study that following surgery 95.4% of the patients return to NYHA functional class I from NYHA III preoperatively

In the present study Significant reduction was seen in the left atrial dimensions (LAD), Left Ventricular end diastolic dimensions (LVEDD) and Left Ventricular end systolic dimensions (LVESD) with improvement in the LV ejection fraction which is similar to study by

- Kuwaki *et al. reported no survival advantage* of AVR and MVR over DVR with a survival rate at 12 years of 81.4% and 75.9% respectively.
- In young RHD patients, mechanical valve at aortic position will require life-long anticoagulation even if mitral valve repair is performed.
- Patients with DVR and AVR and MVR were on long-term anticoagulation leading to lack of difference between the two groups while comparing late cardiac survival in their study. Hamamoto *et al.* reported similar survival 15 years after surgery in DVR and AVR and MVR in RHD patients.
- Because of lower incidence of valve failure and similar rate of thromboembolic complications between DVR and AVR and MVR
- Hamamoto *et al.11 recommended that DVR with*mechanical valves should be the procedure of choice . Gillinov *et al. while comparing DVR with AVR and MVR*,reported hospital mortality rate of 5.4% for the latter and7% for DVR.
-
- Late survival was increased by mitral valve repair as compared to, if replacement was performed.
- mitral valve repair is more durable than bioprosthesis and mitral valve amenable to repairshould be repaired in a patient with rheumatic double valve disease This may be the case in the UnitedStates.
- But our patients presented late, by which stage they have a complex pathology along with calcification, which made repair impossible
-
- Talwar *et al. keeping in view better event free* survival have suggested AVR and MVR to be the procedure of choice in double valve surgery when- ever mitral valve repair is possible.
- In this study in-hospital mortality were similar in DVR patients as compared to isolated MVR and AVR.

Our population consisted of high risk rheumatic heart disease patients with severelycalcified valves not amenable to mitral valve repair

DVR is a complex operation associated with a higher operative mortality than isolated AVR or MVR.[3] In a recent report on the perioperative outcomes of heart valve surgery in 623.039 patients from the database of the Society of Thoracic Surgeons, DVR represented only 6.3% of all valve operations and was associated with an overall operative mortality of 10.7%, whereas the operative mortality was 4.9% for AVR and 6.3% for MVR.[3]Numerous patient variables affect operative mortality in DVR, but technical difficulties in replacing both valves also play an important role. There are no data on how often this technical error occurs, but experienced surgeons know that MVR with high-profile valves can be a problem, particularly in female patients with mitral stenosis and a small left ventricular cavity. In addition, bioprosthetic mitral valve stents have also been blamed for some cases of left ventricular wall rupture after MVR.[4]

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Implantation of a prosthetic valve in the mitral position deforms the intervalvular fibrous body and makes it rigid. In addition, all prosthetic mitral valves protrude to some degree into the LVOT. During DVR, the MVR is performed first, and visual inspection of the LVOT before implanting the aortic valve prosthesis invariably shows some degree of protrusion of the mitral valve prosthesis into the LVOT, particularly when the intervalvular fibrous body is short. The mitral valve prosthesis narrows the diameter of the LVOT and prevents the intervalvular fibrous body from moving away from the interventricular septum during systole. If the diameter of the aortic annulus and outflow tract is sized before and after implantation of the mitral valve prosthesis during DVR, there is often a reduction in aortic valve size selection, particularly in patients with rheumatic heart disease and a small ventricular cavity.

For these reasons, we have postulated that the anatomic abnormality caused by the presence of a prosthetic mitral valve adversely affects the hemodynamic function of the aortic valve prosthesis in patients who have undergone DVR. To verify this hypothesis, the present study was conducted, whereby we compared the hemodynamics of the aortic valve prosthesis in patients who underwent DVR with those of patients who underwent isolated AVR with the same size and type of prosthetic valve. The results of this study failed to confirm our hypothesis, because the hemodynamics of the prosthetic aortic valves seem to be similar whether they are implanted in isolation or in combination with mitral valve prostheses.

Limitations

- This study lacks mitral valve repair group for comparison as our patients presented with advanced valvular disease which was not amenable to repair.
- Mitral valve repair was used initially but the procedure was abandoned due to high early mitral valve failure
- The second limitation is that it is a single-centre study with limited data to give recommendations regarding management of combined mitral and aortic valve disease
- Other reasons that could explain the outcomes of this comparative study are the limited sample size of patients who have undergone DVR, given the large number of confounding factors that affect blood flow across the LVOT in these patients. In addition, the pathology and the valve lesion were not matched, and most patients who underwent DVR had rheumatic heart valve disease. Finally, the timing of echocardiographic evaluation of the prosthetic aortic valves may play a role on the outcomes. In ideal circumstances, such a study should be conducted after patients have completely recovered from surgery, and the valve hemodynamics should be assessed at rest and during maximum exercise.
-
- The presence of mitral valve prosthesis in patients who have undergone DVR has no effect on the early hemodynamic features of the prosthetic aortic valve, as assessed by echocardiography early after surgery.
- The mortality rate is within the parameters found in the literature, identifying recognized factors which neutralization by changes in surgical indication and medical management may enable risk reduction
- Among the rheumatic population, double valve replacement offers excellent symptomatic improvement and favorable late survival. Hemodynamic superiority and thromboresistance are the normal selection criteria for these prostheses, although the surgeon's experience, and the ease of insertion, availability and cost of the valve also play important roles. A strict adherence to optimal anticoagulation levels optimizes protection against thromboembolism

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and anticoagulation-related hemorrhage, and helps to provide the patient with a good quality life.

CONCLUSION

- In patients of rheumatic heart disease having combined Mitral and Aortic valve disease DVR should be performed whenever indicated as it has similar in hospital mortality and better late survival as compared to isolated aortic or mitral valve replacement
- Early after surgery, the hemodynamic performance of aortic valve prostheses was not affected by the presence of mitral valve prostheses in patients who underwent combined aortic and mitral valve replacement.

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