Original Article

Journal of Cardiovascular Medicine and Surgery
Volume 6 Number 1, January to March 2020
DOI: http://dx.doi.org/10.21088/jcms.2454.7123.6120.12

Clinical Profile of Patients with Prosthetic Heart Valves at a Tertiary Care Hospital

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Abstract

Introduction: Doppler echocardiography was first used for evaluation of prosthetic valve function in 1983 and is a well-established more sensitive noninvasive tool for assessment of prosthetic valve function.[6] Even experienced cardiac Sonographers are often uncomfortable with the assessment of artificial heart valves, as the skills acquired for the assessment of native valves do not easily applicable to artificial valves. *Methodology:* All patients underwent either aortic or Mitral valve replacement or both (DVR) with or without TV repair/TV Annuloplasty through conventional midline sternotomy, during total normothermic cardiopulmonary bypass. Myocardial protection was achieved by intermittent anterograde cold blood cardioplegia. Prosthesis size was selected according to the size of the aortic annulus, & Mitral annulus which was incisures using specific manufacturer's sizers. *Results:* Among 114 MVR patients, 38% ATS AP mechanical valve were implanted (n = 44) 18.4% were St. Jude mechanical valve (n = 21) and 17.55% were TTK Chitra disc mechanical valve. Other MVR patient (n = 29) were implanted different types of Tissues valves. (25.4%) Among 44 ATSAP MVR patients, 52% were female (n = 23). Mean age was 37 ± 8.6 years. *Conclusion:* Mean BSA was 1,59 ± 0.18 m^2. Mean EF was 53.5 ± 6.5%. Mean post ATSAP MVR LA size was 3.9 ± 0.63 compare to pre MVR 4.7 ± 0.65.

Keywords: Prosthetic Heart Valves; MVR; Mechanical Valve.

How to cite this article:
Purushotham TS, Somashekhara G. Clinical Profile of Patients with Prosthetic Heart Valves at a Tertiary Care Hospital. J Cardiovasc Med Surg. 2020;6(1):69-73.

Introduction

Heart valve replacement is the second most common cardiothoracicsurgery after coronary artery bypass graft surgery.[1] All echo-cardiographer will come across patients with artificial valves in tertiary centres.[2]

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Received on 10.01.2020 **Accepted on** 12.02.2020

Prosthetic Valve replacement (Mechanical or Bio-prosthesis) is the only viable option for severe rheumatic and non-rheumatic native valvular heart disease with a lifelong commitment from both the patient and the cardiologist. Without regular follow-up including long-term prosthetic hemodynamic assessment, catastrophic complications can occur.[3]

The early Postoperative echocardiogram assess the stability of the valve, the presence and extent of valvular or paravalvular regurgitation, and the transvalvular pressure gradients.[4] Noninvasive methods such as fluoroscopy, M-mode and two-dimension alecho cardiography have been used for evaluation but these methods have significant limitations.[5] Cardiac catheterization has been

reliable for definite identification of prosthetic valve malfunction, but this procedure also has associated risks. Doppler echocardiography was first used for evaluation of prosthetic valve function in 1983 and is a well-established more sensitive noninvasive tool for assessment of prosthetic valve function.[6] Even experienced cardiac Sonographers are often uncomfortable with the assessment of artificial heart valves, as the skills acquired for the assessment of native valves do not easily applicable to artificial valves. Mean gradient is most important marker for assessment of prosthetic valve function and early postoperative baseline mean gradient can be used in future detection of prosthesis malfunction.[7]

Materials and Methods

It was a prospective observational study. One hundred Ninety nine (199) consecutive patients affected by Mitral stenosis (MS)/Mitral insufficiency (MR), aortic stenosis (AS) and/or aortic insufficiency (AI), who had had either St. Jude mechanical, ATS AP mechanical TTK disc valve, St. Jude Bicor Valve, St. Jude Trifeta, Medronic Hencock Ultra Porcine Valve, Edwards Life Science Perimounts, Bio-prosthetic Carpentier-Edwards Perimount standard (CEPS) Mitral & Aortic Valves or both aortic & mitral valve implanted were included for this study.

Indications for valve replacements were: severe AS, severe AI or moderate AS associated with coronary artery disease requiring surgical revascularization. Severe MS not suitable for valvotomy or severe MR

Inclusion criteria

- Patients undergoing an isolated AVR or those requiring AVR associated with aorta-coronary bypass grafting (CABG) were included in the study.
- Patients with concomitant mitral valve replacement were included in this study.
- Patients undergoing MVR with or without Tricuspid valve repair for Severe MS or severe MR were also included in this study

Exclusion criteria

- Those patient who died before our echo evaluation
- Supra aortic valvular or infra valvular repair surgery patients

Valve design and surgical procedure

All patients underwent either aortic or Mitral valve replacement or both (DVR) with or without TV repair/TV Annuloplasty through conventional midline sternotomy, during total normothermic cardiopulmonary bypass. Myocardial protection was achieved by intermittent anterograde cold blood cardioplegia. Prosthesis size was selected according to the size of the aortic annulus,& Mitral annulus which was incisures using specific manufacturer's sizers.

Statistical analysis

The continuous variables were expressed as mean values ± standard deviations (SD) and compared using a t-test. Categorical variables are presented as frequencies and percentages and Statistical significance was defined as p-value < 0.05. Med-calc software version 13.0.20 was used to perform the statistical analysis

Results

One hundred Nanty nine patients with MS and /or MR or AS and/or AI who under-went either MVR or AVR or DVR were studied. Out of these patients 57.5% were men (n = 114). Out of these 199 patients 57.2% were MVR patients (n = 114) 31.6% were AVR patients (n = 63) and 11% were DVR (n = 22). Mean age was 43.8 ± 14.3 years. Mean BSA was 1.49 ± 0.15 m^2. Mean EF was 54.5 ± 4.5% in whole study population (Tables 1,2 and Figs. 1,2).

Table 1: showning different types of valve surgery and base line characteristic MVR patient

Total No. patients (n = 199)	MVR	AVR	DVR	p-value
No of patients	114 (57.2%)	63 (31.8%)	22 (11%)	
Mean age	39.42 ± 11.9	48.3 ± 14	42.9 ± 9.5	$p > 0.14$
Female	58	20	6	
Male	56	43	15	
Mean BSA	1.49 ± 0.12	1,54 ± 0.15	1.51 ± 0.15	$p > 0.14$
Mean EF	54.2 ± 5.2	54.8 ± 5.1	55.1 ± 4.1	$p > 0.14$
Mean LVIDD (Post)	4.5 ± 1.3	4.3 ± 0.6	4.6 ± 0.6	$p > 0.14$
Mean LVID	3.41 ± 0.6	3.25 ± 0.6	2.91 ± 0.6	$p > 0.14$

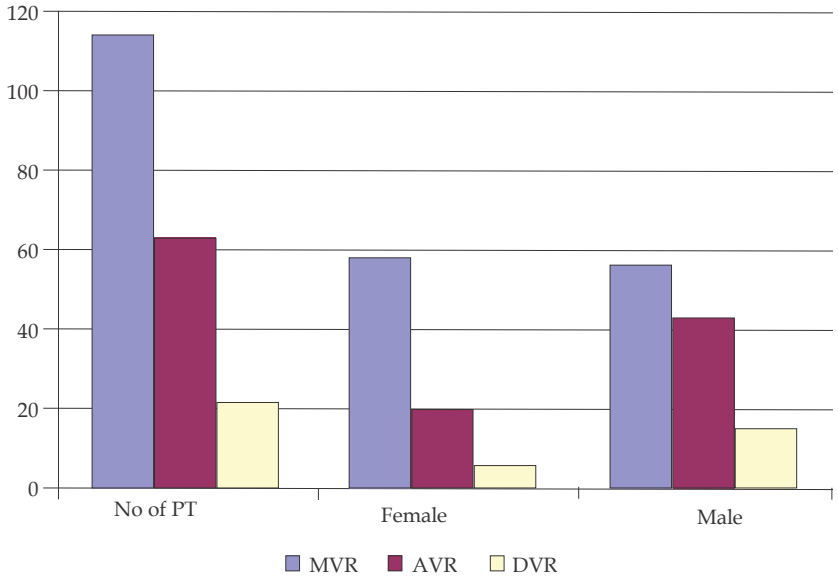

Fig. 1: comparing different type MVR valves in different age/sex groups.

Table 2: Base line charecterstic MVR patients

	ATSAP MVR (*ww* = 44)	**Stud mach (*n* = 21)**	**TTK Chitra (*n* = 20)**	**Bio-prosthetic MVR (*n* = 29)**	***p*-value**
Mean age (years)	37 ± 8.6	35 ± 10	42 ± 11	42 ± 18	$p > 0.13$
Female	52% (*n* = 23)	48% (*n* = 10)	55%(*n* = 11).	20% (*n* = 8)	$p > 0.2$
Male	48% (*n* = 21)	52% (*n* = 11).	45% (*n* = 9)	80% (*n* = 21)	$p > 0.2$
Mean BSA	1.59 ± 0.18	1.49 ± 0.18	1.47 ± 0.19	1.46 ± 0.28	$p > 0.4$
Mean EF		53.5 ± 6.5%	54 ± 4.5%	56 ± 5.3%	52 ± 0.3%

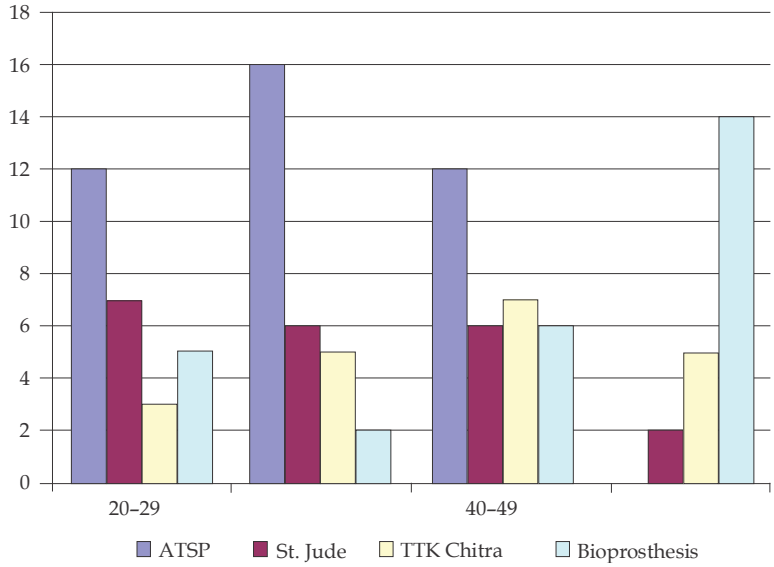

Fig. 2: Age wise distribution of different types of prosthesis.

Discussion

Among 114 MVR patients, 38% ATS AP mechanical valve were implanted (*n* = 44) 18.4% were St. Jude mechanical valve (*n* = 21) and 17.55% were TTK Chitra disc mechanical valve. Other MVR patient (*n* = 29) were implanted different types of Tissues valves. (25.4%) Among 44 ATSAP MVR patients, 52% were female (*n* = 23). Mean age was 37 ± 8.6 years. Mean BSA was 1,59 ± 0.18 m^2. Mean EF was

53.5 ± 6.5%. Mean post ATSAP MVR LA size was 3.9 ± 0.63 compare to pre MVR 4.7 ± 0.65.

More commonly used valve sizes were 27 (n = 25), 29 (n = 16) & 25 (n = 3). The mean mitral valve gradient (MVG) was 5.5 ± 0.77 mm Hg. According to valve sizes of for 29 mm sized valve, 27 mm sized valve, 25 mm valve and 23 mm sized valve mean Mitral valve gradient were 5.5 ± 0.77 mm Hg, 5 ± 0.1 mm Hg, 7.04 ± 6.44 mm Hg and 5.0 ± 0.1 mm Hg respectively. without statistical significance difference (p = 1.0).

Among 21 St. Jude mechanical MVR patients, 52% were male (n = 11). Mean age was 35 ± 10 years. Mean BSA was 1.49 ± 0.18 m^2. Mean EF was 54 ± 4.5%. Mean post St. Jude mechanical MVR LA size was 4.05 ± 0.9 compare to pre MVR 5.12 ± 0.8. More commonly used valve sizes were 27 (n = 11), 29 (n = 7) & 20. Mean mitral valve gradient (MVG) was 5.0 ± 0.1 mm Hg. According to valve sizes of 29 mm, 27 mm, 20 mm and 25 mm sized St. Jude mechanical valve, Mean mitral valve gradient (MVG) were 5.0 ± 0.77 mm Hg, 5 ± 0.01 mm Hg, 5.5 ± 0.01,mm Hg and 5.0 ± 0.01 mm Hg respectively without statistical significance difference (p = 1.0) except between 27 mm and 23 mm there was high gradient in 23 mm sized valve may be due less no of cases. As valve size decreases mean MVG increases.

Among 20 TTK Chitra disc mechanical MVR patients, 55% were female (n = 11). Mean age was 42 ± 11 years. Mean BSA was 1.47 ± 0.19 m^2. Mean EF was 56 ± 5.3%. Mean post TTK Chitra disc mechanical MVR LA size was 3.96 ± 0.9 compare to pre MVR 5.18 ± 0.8. More commonly used valve sizes were 27 (n = 12), 29 (n = 2), 25 (n = 2) & 26 (n = 2). The Mean Mitral valve gradient (MVG) was 5.09 ± 0.3 mm Hg. According to valve sizes of 29 mm, 27 mm, 26 mm and 25 mm sized TTK Chitra disc mechanical valve Mean Mitral valve gradient (MVG) were 5.0 ± 0.77 mm Hg, 5 ± 0.01 mm Hg, 5.5 ± 0.8 mm Hg and 5.0 ± 0.2 mm Hg respectively without statistical significance difference (p = 1.0) except between 27 mm and 25 mm there was high gradient in 25mmsized valve may be due less no of cases.

Among 29 Bio-prosthetic MVR patients, 51% were male (n = 15). Mean age was 42 ± 18 years. Mean BSA was 1.46 ± 0.28 m^2. Mean EF was 52 ± 0.3%. Mean post Bio-prosthetic MVR LA size was 3.6 ± 0.36 compare to pre MVR 5.2 ± 0.6. More commonly used valve sizes were 27 (n = 8), 29 (n = 6) 25 (n = 10) & 30 (n = 2).

The Mean Aortic valve gradient (AVG) of ATSAP mach, St. Jude mechanical TTK Chitra disc and Bio-prosthetic aortic valves were 9 ± 0.07 mm Hg, 13.35 ± 4.14 mm Hg, 9.5 ± 0.5mm Hg, and 10.3 ± 0.5 mm Hg respectively. St. Jude mechanical valve has good hemodynamic profile but compare to ATSAP mach AV & TTK Chitra mach valves. The ATSAP mach AV valves have good hemodynamic profile them with statistical significant difference (p < 0.01). Comparing the St. Jude mach aortic valves with Bio-prosthetic aortic valves, Bio-prosthetic aortic valves have low aortic gradients & good hemodynamic profile with statistical significant difference (p < 0.01).

Among 10 St. Jude DVR patients. 70% were male (n = 7). Mean age was 40.1 ± 6.53 years. Mean BSA was 1.46 ± 0.18 m^2. Mean EF was 54.5 ± 4.5%. Mean post LA size was 3.0 ± 0 compare to pre DVR 4.55 ± 0.6. More commonly used valve sizes were 27 (n = 6), 29(n = 1) & 25 (n = 3). The Mean Aortic valve gradient (AVG) was 11.7 ± 1.54 mm Hg & Mean mitral valve gradient (MVG) was 5.2 ± 0.6 mm Hg. Five Grade IV, Three Grade III AR were noted. Three Grade III MR & Two Grade II MR were noted.

Among 7 Bio-prosthetic DVR patients. 57% were male (n = 4). Mean age was 42.2 ± 19.9 years. Mean BSA was 1.58 ± 0.18 m^2. Mean EF was 50.5 ± 11.5%. Mean post Bio-prosthetic DVR LA size was 3.7 ± 0.6 compare to pre DVR 5.05 ± 0.6. More commonly used valve sizes were 27 (n = 3), 25 (n = 3) & 28 (n = 1). The Mean Aortic valve gradient (AVG) was 5.5 ± 0.7 mm Hg & Mean mitral valve gradient (MVG) was 5.57 ± 0.7 mm Hg.

Among 5 ATSAP DVR patients. 80% were male (n = 4). Mean age was 42.2 ± 19.9 years. Mean BSA was 1.53 ± 0.3 m^2. Mean EF was 50.5 ± 11.5%. Mean post Bio-prosthetic DVR LA size was 3.7 ± 0.2 compare to pre DVR 4.76 ± 0.6. More commonly used valve sizes were 27 (n = 2), 25 (n = 2) & 29 (n = 1). The Mean Aortic valve gradient (AVG) was 12.8 ± 4.7 mm Hg & Mean mitral valve gradient (MVG) was 8.0 ± 0.22 mm Hg which is comparable with other study.[8]

Four AS underwent CABG and aortic valve replacement, Four patients underwent CABG along with mitral valve replacement. There were no statistically significant differences in the preoperative clinical characteristics in different types of mitral and Aortic mechanical/Bio prosthetic valves as similar to other studies.[9,10] Redo AVR done in 3 cases and Redo MVR in one case. Two VSD surgical closure and Two ASD closure surgery done along with valve replacement.

Conclusion

Out of these 199 patients 57.2% were MVR patients (n = 114) 31.6% were AVR patients (n = 63) and 11% were DVR (n = 22). Mean age was 43.8 ± 14.3 years. Mean BSA was 1.49 ± 0.15 m^2. Mean EF was 54.5 ± 4.5% in whole study population.

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