# ARE THERE PREDICTORS OF POST OPERATIVE OUTCOME IN PATIENTS UNDERGOING MITRAL VALVE REPLACEMENT FOR RHEUMATIC VALVULAR HEART DISEASE?

*WAQAS AHMED[1], YASSER JALIL KHAN[2], ALI YAWAR ALAM[3], NAVEED AKHTAR[4]*

ABSTRACT

**Background:** Rheumatic heart disease is the most common cause of valvular heart disease in developing countries. Frequently patients present quite late in their disease course. We sought to determine the predictors of post operative outcome in patients undergoing mitral valve replacement for rheumatic heart disease.

**Methods:** This retrospective study was conducted in Shifa International hospital, Islamabad from February 2003 to December 2006. 34 patients underwent mitral valve replacement due to rheumatic mitral valve disease. All patients had their demographic characteristics, operative details and comprehensive preoperative and post operative echocardiographic parameters recorded. Data was analyzed using SPSS V.13 statistical software.

**Results:** Mean age of the study population was 35.09±10.52 years with female predominance (n =23, 67.6 %). After a mean follow-up of 187.2±17.51 days, the ability of preoperative and postoperative clinical and echocardiographic data to predict outcome and the impact of valve replacement on survival was assessed retrospectively. 30 patients (88.2%) underwent mitral valve Replacement due to underlying isolated rheumatic mitral valve while 4 patients (11.8%) had both mitral and aortic valve replacement. 12 patients (35.3%) had tricuspid valve annuloplasty done during the same operation. There were no perioperative deaths. There were 2 (5.9%) deaths after a mean period of 162±12 days as a result of prosthetic valve thrombosis. Comparison of pre operative and post operative echocardiographic data revealed statistically significant reduction in pulmonary artery systolic pressure in 28 patients (p-value 0.001), reduction in left atrial size in 31 patients (p-value 0.001) and reduction in right ventricular dimensions in 25 patients (p-value 0.001). Actual probability of freedom from valve related death, including in-hospital mortality, at cumulative follow up duration of 25.76±17.62 months was 94.1% irrespective of preoperative echocardiograpgic parameters, mono or bivalvular replacement and post procedural congestive cardiac failure or thromboembolic events.

**Conclusion:** Despite the fact that most patients in this study presented in advanced stages of rheumatic heart disease, we could not identify any independent intraoperative or preoperative echocardiographic characteristics which would predict worse postoperative outcome. Valve replacement should be potentially offered to all patients presenting with severe rheumatic valvular disease irrespective of the stage of the disease.

**Key Words:** Mitral valve replacement, rheumatic valvular heart disease, Outcome predictors.

[1] *Consultant Cardiologist, Shifa International Hospital, Islamabad. Assistant Professor Cardiology, Shifa College of Medicine.*

[2] *Cardiology Trainee Shifa International Hospital, Islamabad*

[3] *Associate Professor Community Health Sciences, Shifa College of Medicine, Islamabad.*

[4] *Consultant Cardiologist, Shifa International Hospital, Islamabad. Associate Professor Cardiology, Shifa College of Medicine.*

***Address for correspondence:***
*Waqas Ahmed, MD*
*Consultant Cardiologist, Shifa International Hospital*
*H-8/4, Islamabad.*
*E-mail: pakdoc786@yahoo.com*

## INTRODUCTION

Rheumatic heart disease (RHD) continues to be a daunting challenge with significant morbidity and mortality in developing countries.[1] Despite the passage of decades, the prevalence of rheumatic fever and rheumatic heart disease remains at an alarming rate.[2] Mitral stenosis is the commonest manifestation of rheumatic heart disease[3,4] and frequently leads to atrial fibrillation and severe pulmonary hypertension which may potentially be irreversible if the disease has been long standing.[5,6,7] In Pakistan, as opposed to the West, patients frequently present in the later stages of their disease as well as both extremes of age.[8] In addition, socioeconomic constraints of these patients severely limit their ability to undergo timely surgical valve replacement. There are no local studies that have looked at a preoperative model that could predict adverse postoperative outcome and thus allow the physicians to offer surgical valve replacement to only those patients in whom the benefits of surgery would outweigh the risks of the procedure, particularly for those patients who present in advanced stages of their disease. We sought to determine such a preoperative model.

## MATERIAL AND METHODS

This Descriptive study was carried out at Shifa International Hospital, Islamabad on a total of 34 patients who underwent mechanical valve replacement for rheumatic valve disease as sole indication for valve replacement surgery from February 2003 to December 2006. Baseline clinical characteristics, comorbidities, preoperative and postoperative echocardiographic findings, surgical data, length of hospitalization, complications and both early and mid-term outcome were determined. Special emphasis was given to specific echocardiographic parameters like pulmonary artery systolic pressure (PASP), left atrial (LA) and right ventricular (RV) size, left ventricular ejection fraction (LVEF), left ventricular end systolic and end diastolic dimensions (LVEDS, LVEDD). Patients who underwent valve replacement due to non-rheumatic valvular disease or isolated aortic valve disease were excluded from the study. Patients were followed up for a mean period of more than 2 years.

Data obtained from the patient's files was collected on specially designed Performa and analyzed by using statistical software SPSS version 13.0 for windows (SPSS Inc. Chicago, IL USA). Categorical variables were presented as counts and percentages and were compared using chi-square test. Continuous variables were presented as means with standard deviations (SD) and were compared using paired sample T test. The level of statistical significance was $p < 0.05$.

## RESULTS

A total of 34 patients were included in the study. Mean age of the study population was 35.09±10.52 years with female predominance (n =23, 67.6%). Prevalence of smoking, hypertension and diabetes mellitus were 11.8%, 8.8% and 5.9% respectively in the study population. Preoperative echocardiography revealed 30 (88.2%) cases of isolated rheumatic mitral valve and 4 (11.8%) cases of both mitral and aortic valve involvement by the rheumatic process. Predominant types of prosthetic valve used were Carbomedics (n=18, 52.9%), ON-X (n=8, 23.5%) and both Sorin Biomedical Cardio and ATS Medical Inc (n=3, 8.8%) each, in the order of frequency. Double valvular replacement was done in 4 (11.8%) patients. Tricuspid Jostra ring annuloplasty was carried out in 12 (35.3%) patients during same operative setting. Mean hospital stay was 11.82±6.2 days. Mean ICU stay was 3.3±1.56 days. For study purpose, preoperative echocardiographic parameters were not compared to the initial in-hospital postoperative echocardiography but rather the late study which was carried out after a mean period of 187.2±17.51 days.

Table-1 shows the comparison between preoperative and postoperative echocardiographic parameters. Significant reductions were seen postoperatively in all major parameters including PASP, LA size, LVEDS & LVEDD. Table-2 shows the change in RV dimensions in preoperative vs. postoperative echocardiography. Statistically significant reduction in right ventricular size was noted in 25 (73.5%, p-value 0.0013) out of 34 patients. Of remaining 9 (26.5%) patients in whom right ventricular size increased post operatively, 6 patients had undergone tricuspid valve repair at the time of mitral valve replacement (odds ratio=0.105). More over 5 patients of the 9 had severe mitral regurgitation as well at the time of valve replacement surgery.

However, there was no difference in outcome in both

*Table -1 : Comparison of pre-operative and post-operative echocardiographic parameters of important outcome*
*n = Number of the patients in whom post-operative parameters improved as compared to pre-operative echocardiographic data*

| | Number (n) | Pre-op echo (mean ± SD) | Post-op echo (mean ± SD) | Mean Reduction | 95% confidence interval | p-value* |
|---|---|---|---|---|---|---|
| PASP (mmHg) | 28 | 69.05 ± 27.11 | 38.11 ± 15.89 | 30.93 ± 19.14 | 23.51-38.36 | <0.001 |
| Left atrium (mm) | 31 | 54.17 ± 7.71 | 41.79 ± 8.98 | 12.38 ± 6.46 | 10.01-14.75 | <0.001 |
| LVEDS (mm) | 25 | 50.11 ± 7.14 | 42.60 ± 7.24 | 7.51 ± 4.53 | 5.64-9.38 | <0.001 |
| LVEDD (mm) | 23 | 37.00 ± 7.06 | 30.74 ± 6.68 | 6.26 ± 5.48 | 3.89-8.63 | <0.001 |

*Paired sample t-test applied.

*Table-2 : Pre-operative and post-operative comparison of RV size on echocardiography*

| RV size | Pre-op (number, percentage) | Post- op (number, percentage) | p-value* |
|---|---|---|---|
| Normal RV | n = 14 (41.1%) | n = 19 (55.8%) | 0.003 |
| Mild enlargement | n = 3 (8.8%) | n = 6 (17.6%) | |
| Moderate enlargement | n = 6 (17.6%) | n = 1 (2.9%) | |
| Severe enlargement | n = 11 (32.4%) | n = 8 (23.5%) | |
| Total number | 34 | 34 | |

*Chi square test applied.

groups during early or late post operative period and subsequent follow up for mean duration of 25.76±17.62 months.

Immediate postoperative complications included anemia requiring blood transfusions (n=5, 14.7%), acute renal failure (n=1, 2.9%) and atrial tachycardia (n=1, 2.9 %). There was no intraoperative or postoperative death encountered. Major complication encountered during longterm follow up period was prosthetic valve thrombosis that was reported in 6 patients (17.6%) with mean INR of 1.50. Of these, 4 patients responded well to streptokinase and subsequent echocardiography revealed resolution of thrombus with complete regression of clinical and echocardiograghic anomalies. However 3 out of 4 developed re-thrombosis of prosthetic valve after mean period of 260 days due to poor compliance with warfarin and aspirin (Mean INR was 1.45). They were re-thrombolysed with reteplase with excellent results. 2 patients (5.8%) expired due to pulmonary edema though they were thrombolysed with streptokinase. Other complications during long term follow up were congestive heart failure (n=5, 14.7%), thromboembolic events e.g. TIA (n=4, 11.8%) and atrial tachyarrhythmias (n=4, 11.8%). Average INR noticed in follow up period was 2.7±0.49 in total study population.

## DISCUSSION

Rheumatic mitral stenosis remains the predominant valvular pathology in patients with rheumatic carditis.[9] The effected age group ranges from 12-70 years. Percutaneous transeptal mitral commisurotomy (PTMC) remains the first line treatment for those patients who are candidates for this less invasive procedure as opposed to surgical valve replacement. While the prevalence of rheumatic heart disease has dramatically declined in the West, it remains at an alarming 5.7 per 1000 population in rural Pakistan.[10]

Rheumatic fever and the resultant rheumatic heart disease selectively effects patients belonging to lower socioeconomic status[11] which becomes a major impediment in the timely delivery of appropriate treatment with either PTMC or surgical valve replacement, both of which are expensive modalities. In addition, many patients present years after successful PTMC with recurrence of their mitral stenosis.[12] Most of the published data on outcome in patients undergoing valve replacement is from the West. The limitation of applying this data to our population is that patients in Pakistan frequently present quite late in their disease because of the above mentioned financial factors. The most important questions for the treating physician in these patients is whether surgical valve replacement even in advanced

stages of the disease will lead to as good an outcome as in those who undergo earlier diagnosis and treatment, as in the Western data.

While repair of mitral valve is the preferred treatment in patients with predominantly myxomatous mitral valve,[13] repair is extremely challenging in mitral stenosis with little published data to support its widespread use. Surgical valve replacement using bioprosthesis is not recommended below forty years of age.[14] In view of predominantly young population in our study and financial constraints, all the patients were explanted with mechanical prosthetic valves.

All patients were discharged after patient education sessions regarding adherence to oral anticoagulation and monthly penicillin prophylaxis. This study was aimed to investigate the ability of preoperative clinical and echocardiographic data to predict early and late outcome and to determine the timing and degree of reversal of the abnormal echocardiographic parameters after successful surgery. We found that despite presenting late in their disease stage, there were no perioperative deaths .The most common late complication was valvular thrombosis in follow up period that occurred in 6 patients.

In general, there was no significant difference in survival after mono and multivalvular replacement. This is in keeping with studies conducted earlier among the rheumatic population that double valve replacement offers excellent symptomatic improvement and favorable late survival.[15]

Our study also showed that while there were statistically significant reductions in all major echocardiographic parameters like LA and RV size, PASP, LV dimensions etc., even after the passage of a mean of 25.76±17.62 months, residual abnormalities persist in all of these parameters.

In addition, failure of reduction in right heart dimensions in a subset of patients may likely be due to the fact that they had their right heart operated upon for concomitant tricuspid valve repair and coexistent preoperative significant mitral regurgitation.

In-hospital complications, ICU/hospital stay, and postoperative congestive heart failure functional class did not differ in relation to gender, BMI, single or double valve replacement, or the timing of surgery.

## CONCLUSION

This study suggests that no independent preoperative echocardiographic characteristics predict significantly adverse postoperative outcome and patients who present late in their disease should still be offered surgical valve replacement with excellent mid-term outcome expected. The most critical factor remains optimal oral anticoagulation to minimize the potentially catastrophic valve thrombosis.

We intend to follow all of these patients for extended duration i.e. ten years to determine long-term outcome as well.

## REFERENCES

1. Carapetis JR, Steer AC, Mulholland EK. The global burden of group A streptococcal diseases. Lancet Infect Dis. 2005; 5: 685-94.

2. Zohair Al Halees, MD. The Choice of Valve Prosthesis: Are the Guidelines for Everyone? Asian Cardiovasc Thorac Ann 2007;15:457-458.

3. Khalil Ullah, Syed Afzal Ahmed, Shahida Badsha, Ashur Khan, Masood ur Rehman Kiani. Rheumatic Heart Disease - A Study of surgically excised cardiac valves and biopsies. J Coll Physicians Surg Pak.Sep 2002;12(9):542-5.

4. Hamzullah Khan. Rhuematic heart diseases. Professional Med J. Jan - Mar 2009;16(1):100-4.

5. Mohammad Faheem, Mohammad Hafizullah, Adnan Gul, Hikmatullah Jan, Mohammad Asghar Khan. Pattern of valvular lesions in rheumatic heart disease. J Postgrad Med Inst.Apr - Jun 2007;21(2):99-103.

6. Pande S, Agarwal SK, Dhir U, Chaudhary A, Kumar S, Agarwal V. Plmonary artery hypertension in rheumatic mitral stenosis: does it affect right ventricular function and outcome after mitral valve replacement? Interact Cardiovasc Thorac Surg. Sep 2009;9(3):421-5.

7. Shantanu Pande, Surendra K. Agarwal, Udgeath Dhir, Amit Chaudhary, Sudeep Kumar, Vikas Agarwal. Pulmonary artey hypertension in rheumatic mitral stenosis: does it affect right ventricular function and outcome after mitral valve replacement? Interact CardioVasc Thorac Surg 2009;9:421-425.

8. Mumtaz Ali Shaikh. Cardiac valvular lesions in patients with Rheumatic Heart Disease. J Pak Inst Med Sci. Jul 2004;15(1):862-5.

9. Mumtaz Ali Shaikh, Rafi Ahmed Ghori, Bikha Ram Devrajani. Sequelae of chronic rheumatic heart disease among patients at two teaching hospitals in Sindh, Pakistan. J Liaquat Uni Med Health Sci. Sep - Dec 2006;5(3):114-8.

10. Rizvi SF, Khan MA, Kundi A. Status of rheumatic heart disease in rural Pakistan. Heart. 2004; 154-57.

11. Rizvi El. Rheumatic heart disease in rural Pakistan. Heart. 2004; 90(4): 361-62.

12. Igor F. Palacios, Pedro L. Sanchez, Lari C. Harrell, Arthur E. Weyman, Peter C. Block. Which Patients Benefit From Percutaneous Mitral Balloon Valvuloplasty? Prevalvuloplasty and Postvalvuloplasty Variables That Predict Long-Term Outcome. Circulation. 2002;105:1465-1471

13. Walls MC, Cimino N, Bolling SF, Bach DS. Persistent pulmonary hypertension after mitral valve surgery: does surgical procedure affect outcome? J Heart Valve Dis. 2008 Jan;17(1):1-9

14. E A Grossi, A C Galloway, J S Miller, G H Ribakove, A T Culliford, R Esposito et al. Valve repair versus replacement for mitral insufficiency: when is a mechanical valve still indicated? J Thorac Cardiovasc Surg 1998;115:389-396

15. Kenji Kuwaki, Nobuyoshi Kawaharada, Kiyofumi Morishita, Tetsuya Koyanagi, Hisayoshi Osawa, Toshiyuki Maeda et al. Mitral valve repair versus replacement in simultaneous mitral and aortic valve surgery for rheumatic disease. J Thorac Cardiovasc Surg. 1992 Sep; 104:786-95.