

## MITRAL VALVE REPAIR IN A RHEUMATIC POPULATION: AN EXPERIENCE AT AFIC/ NIHD

Muhammad Ahmad, Asif Mahmood Janjuja, M Afsheen Iqbal

Armed Forces Institute of Cardiology/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

### ABSTRACT

**Objective:** To analyze the outcome of mitral valve repair in rheumatic heart disease.

**Study Design:** Retrospective analytical.

**Place and Duration of Study:** Armed forces institute of cardiology/National institute of heart diseases Rawalpindi from Jan 2011 to June 2013.

**Material and Methods:** In this retrospective study of 28 patients (15 females). The mean age was  $20.2 \pm 11.2$  years (range, 11 to 55 years). The cause of mitral regurgitation was rheumatic in all patients, with no congenital myxomatous, infective or ischemic cases. About 68% patients were in New York Heart Association (NYHA) functional class III or IV. In all the cases posterior ring annuloplasty was done with flexible C- Shape rings with size ranging from 20 to 26 mm. Repairs included anterior leaflet repair with cusp shortening & resuspension (n=17), posterior leaflet repair with quadranguloplasty & transpositioning (n=6), commissuroplasty (n=2) and mixed anterior posterior leaflet repair (n=3).

**Results:** There was no operative mortality. Follow-up was carried out for 10 months. The trivial mitral regurgitation was found in 3 cases (10.7%). Four (14.2 %) patients required mitral valve replacement due to valve dysfunction.

**Conclusion:** Mitral valve repair in rheumatic patients, with current techniques, can effectively correct functional and hemodynamic abnormalities with satisfactory results.

**Keywords:** Mitral valve repair, Mitral regurgitation.

---

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

---

### INTRODUCTION

With the current techniques, mitral valve repair has become the procedure of choice for mitral regurgitation<sup>1-5</sup>. Lower operative mortality rates, better preservation of left ventricular function, freedom from the hazards associated with anticoagulation, and continued growth of the valve in young patients are distinct advantages of mitral valve repair over mitral valve replacement<sup>6-9</sup>. Only 75% of the patients with rheumatic mitral valve disease are amenable to reparative procedures<sup>1,10</sup>. Most of the reports available have discussed only degenerative mitral valve disease<sup>3-10</sup>, and rheumatic mitral valve disease experience is less<sup>11-13</sup>. The annual

incidence of degenerative mitral valve disease in developed countries is around 2-3%<sup>14</sup>. Current criteria recommend mitral valve repair when patients develop class II symptoms<sup>15</sup>. In the present study, we present our experience with mitral valve repair in a rheumatic population. Some of the modified surgical techniques described are not in practice<sup>16-17</sup>.

### MATERIAL AND METHODS

We have started retrospective study program of mitral valve repair since Jan 2011 in collaboration with a UK based cardiothoracic surgical team,. till Jan 2013 we had four sessions in which 65 rheumatic mitral regurgitation cases were presented, out which only 34 (52.30%) were selected for repair. Six (9.23%) cases underwent mitral valve replacement on preoperative findings and in 28 (43.07%) cases mitral valve repair was possible. Twenty eight cases were

---

**Correspondence:** Dr Muhammad Ahmad, Cardiac Surgeon, AFIC Rawalpindi Pakistan (Email: a.mjanjuja@yahoo.com)

Received: 19 Mar 2015; revised received: 17 Apr 2015; accepted: 20 Apr 2015

selected by using non-probability consecutive sampling. The cause of mitral regurgitation (MR) was rheumatic in all the cases. MR with congenital, myxomatous, ischaemic causes and those associated with atrial septal defect, aortic valve disease or any other concomitant disease were excluded from the study.

Preoperative transthoracic/ transesophageal echocardiography was performed in all patients. Coronary angiography was performed in patients above 40 years of age<sup>17,18</sup>. In a systematic manner, we assessed the mitral annulus, leaflet thickness and mobility, commissural and chordal fusion, the presence and location of calcific nodules, areas of prolapse and billowing, the direction of the regurgitant jet, thickness and length of chordae tendineae and MR grade.

Midsternotomy approach was used. Moderately hypothermic or normothermic cardiopulmonary bypass was established by ascending aortic and bicaval cannulation. Antegrade, warm blood cardioplegia and topical hypothermia were used for myocardial preservation. Mitral valve was approached through a left atrial incision behind the interatrial groove. After careful evaluation of the mitral valve apparatus, we performed a variety of reparative procedures. These included anterior leaflet repair with cusp shortening & resuspension (n=17) 60.71%, posterior leaflet repair with quadranguloplasty & transpositioning (n=6) 21.42%, commissuroplasty (n=2) 7.14% and mixed anterior posterior leaflet repair (n=3) 10.71%. In all the cases posterior ring annuloplasty was done by using flexible C-shape rings. Most of these techniques are currently in practice<sup>19</sup>.

Modified Cooley's Annuloplasty<sup>14</sup> (fig-1). The anterior mitral leaflet is measured with a circular valve sizer. A "C"-shaped, 3-to 4-mm-wide collar is fashioned from 0.6-mm-thick polytetrafluoroethylene (PTFE) felt (IMPRA, Inc.; Tempe, Ariz), with the same internal diameter as that of the anterior mitral leaflet. This collar is sutured along the posterior mitral annulus using

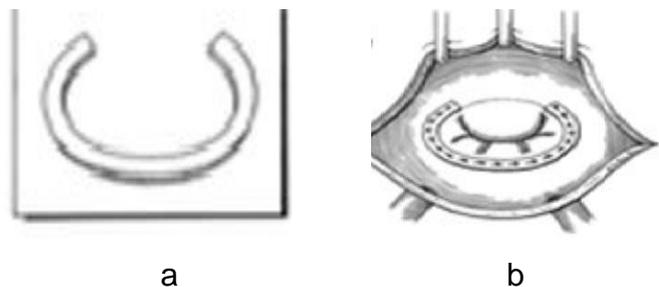
2/0 proline interrupted sutures. This produces optimal coaptation of the mitral valve leaflets and reduction of annular diameter.

Cusp-level chordal shortening<sup>15</sup>. The technique of cusp-level chordal shortening is shown in fig-2. This effectively shortens the elongated chorda and thus corrects the cuspal prolapse

At the completion of repair, mitral valve competence was assessed by injecting cold saline with a bulb syringe into the left ventricle directly through the mitral valve. Transesophageal echocardiography was used in all cases to assess mitral valve function intraoperatively.

Transthoracic echocardiography was performed before discharge from the hospital and subsequently at regular intervals after every 3 months. All the patients received antiplatelet agents (aspirin).

All data were entered and analyzed using



**Figure-1: A) The semicircular ( C-shape ring) B) The completed posterior annuloplasty.**

SPSS version 17. Continuous or interval-related variables were expressed as mean  $\pm$  standard deviation. Categorical variables were expressed as frequencies and percentages.

## RESULTS

The mean age was  $20.2 \pm 11.2$  years (range, 11 to 55 years). There were 13 (46.4%) males & 15 (53.6%) females. Atrial fibrillation was present in 6 (21%) patients. Dyspnea on exertion was the predominant symptom, and 19 patients (68%) were in New York Heart Association (NYHA) functional class III or IV and rest 32% were in NYHA class I or II.

Anterior leaflet repair with cusp shortening & resuspension 17 (60.7%), posterior leaflet repair with quadranguloplasty & transpositioning 6 (21.4%), commissuroplasty 2 (7.1%) and mixed anterior posterior leaflet repair 3 (10.7%).

All patients survived the operation. For mitral valve repair, the mean aortic cross-clamp time was  $44.5 \pm 11.6$  minutes (range, 22 to 71 minutes), and the mean cardiopulmonary bypass time was  $45.7 \pm 12.4$  minutes (range, 34 to 87 minutes). 3 patients (10.7%) required inotropic support which included injection dobutamine and injection epinephrine for 72 hours. Patients were ventilated for a period of 14 to 74 hours (median, 22 hours), and the mean stay in the hospital was  $7.2 \pm 2$  days.

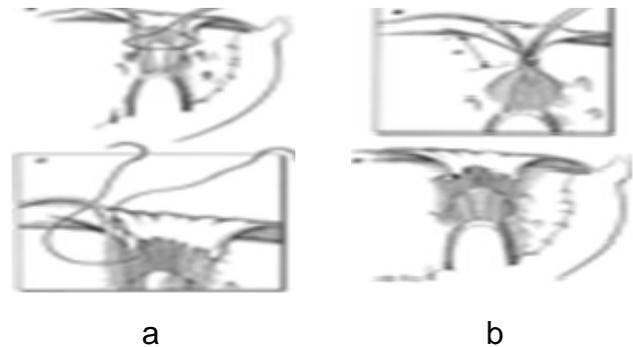
There were no early deaths (<30 days after surgery). Patients were followed up for 10 months and follow-up was 98% complete. One patient had a thromboembolic complication, 3 (10.7%) had trivial MR, and 4 (14.3%) required reoperation due to severe valve dysfunction. In all these cases the reoperation was carried out within four months of surgery and the most likely cause was suture dehiscence and suboptimal repair. These patients demonstrated progressive disease and had mitral valve replacement with a prosthetic valve. There was no case of hemolysis, infective endocarditis or congestive cardiac failure.

There was trivial-to-mild mitral regurgitation in 2(7%) cases at the time of their last follow-up visit at 10 months post surgery.

## DISCUSSION

Rheumatic heart disease is the commonest form of cardiovascular ailment that affects younger people in developing countries<sup>20</sup>. Either repair or replacement of the regurgitant rheumatic mitral valve has been reported by various investigators<sup>11-18</sup>. In valve diseases associated with other concomittant pathology requires additional procedure as well. If atrial fibrillation present at time of surgery patient should undergo modified Maze procedure<sup>21</sup>. In ischemic mitral incompetence valve surgery along

with concomittant coronary revascularization or isolated revascularization longer term clinical outcomes remain to be defined<sup>22-23</sup>. Replacement of the diseased mitral valve with a prosthesis is associated with the risks attendant upon anticoagulation, and with suboptimal preservation of ventricular function and reduced survival<sup>18,19</sup>. Besides these, poor compliance with an anticoagulation regime, baby growth in pregnancy, remain important issues in young patient populations, especially in developing countries<sup>24</sup>. Though mitral valve repair has become the procedure of choice for degenerative mitral regurgitation<sup>25</sup>, its use for correction of rheumatic mitral regurgitation has remained scant<sup>11-13</sup>, because repair is technically more difficult and is associated with a high failure rate in this group.



**Figure-2: Technique of chordal shortening:** A) a silk suture was passed around both the chorda to be shortened and the opposite (posterior cusp) chorda; B) after the left ventricle was filled with saline solution, the silk suture is tightened.

Our experience with mitral valve repair in rheumatic patients has been encouraging. Considering the young age of our patients and the problems of anticoagulation, we have tried to repair almost all noncalcified regurgitant valves, found fit for repair preoperatively. Intraoperative 2D and 3D transesophageal echo applied to guide procedure and confirm a good result<sup>26</sup>.

In our series, 14.2% developed moderate or severe MR. Younger age, mixed lesion, ventricular dysfunction, and cuspal thickening were the important predictors for development of

MR. In univariate analysis, rheumatic cause was identified as a risk factor for development of moderate-to-severe MR, but in multivariate analysis it was eliminated, for most patients with a rheumatic cause had either mixed lesions or thickened cusps. Others have also found younger age and mixed lesions as the chief indicators for valve failure<sup>11-13</sup>. In the majority of patients with moderate or severe MR, the valve failed within the first 6 months after surgery. The early failure may be attributed to suboptimal repair or to the inherent complexity of the disease process, which often results in gross deformity of the valve. Recurrence and progression of the rheumatic process may have contributed to the failures.

We have used a number of techniques to repair the valve. The modified Cooley's annuloplasty has proved an easy, reliable, satisfactory, and cost-effective technique. The ideal candidate for annuloplasty alone is a patient with early stage of disease. Cusp-level chordal shortening is also an effective and simple technique for correction of cuspal prolapse in rheumatic patients, because the elongated chorda is usually quite thickened and capable of holding the suture. Recently reconstruction rates for MR as high as 97% in minimally invasive procedures were noted in a study<sup>27</sup>.

## CONCLUSION

Valve repair is possible in a large majority of patients with rheumatic mitral regurgitation, and current techniques can effectively correct the hemodynamic and functional abnormalities with satisfactory results.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

## REFERENCES

- David TE, Armstrong S, Sun Z, Daniel L. Late results of mitral valve repair for mitral valve regurgitation due to degenerative disease. *Ann Thorac Surg* 1993;56:7-14.
- Carpentier A, Chauvaud S, Fabiani JN, Deloche A, Relland J, Lessana A, et al. Reconstructive surgery of mitral valve incompetence: ten-year appraisal. *J Thorac Cardiovasc Surg* 1980;79:338-48.
- Deloche A, Jebara VA, Relland JY, Chauvaud S, Fabiani JN, Perier P, et al. Valve repair with Carpentier techniques. The second decade. *J Thorac Cardiovasc Surg* 1990;99:990-1002.
- Cohn LH, Couper GS, Aranki SF, Rizzo RJ, Kinchla NM, Collins JJ Jr. Long-term results of mitral valve reconstruction for regurgitation of the myxomatous mitral valve. *J Thorac Cardiovasc Surg* 1994;107:143-51.
- Galloway AC, Colvin SB, Baumann FG, Esposito R, Vohra R, Harty S, et al. Long-term results of mitral valve reconstruction with Carpentier techniques in 148 patients with mitral insufficiency. *Circulation* 1988;78(3 Pt 2): 197-105.
- Loop FD. Long-term results of mitral valve repair. *Semin Thorac Cardiovasc Surg* 1989;1(2):203-10.
- Enriquez-Sarano M, Schaff HV, Orszulak TA, Tajik AJ, Bailey KR, Frye RL. Valve repair improves the outcome of surgery for mitral regurgitation. A multivariate analysis. *Circulation* 1995;91:1022-8.
- Akins CW, Hilgenberg AD, Buckley MJ, Vlahakes GJ, Torchiana DF, Daggett WM, et al. Mitral valve reconstruction versus replacement for degenerative or ischemic mitral regurgitation. *Ann Thorac Surg* 1994;58:668-76.
- Galloway AC, Colvin SB, Baumann FG, Grossi EA, Ribakove GH, Harty S, et al. A comparison of mitral valve reconstruction with mitral valve replacement: intermediate-term results. *Ann Thorac Surg* 1989;47:655-62.
- Gillinov AM, Cosgrove DM, Lytle BW, Taylor PC, Steward RW, McCarthy PM, et al. Reoperation for failure of mitral valve repair. *J Thorac Cardiovasc Surg* 1997;113: 467-75.
- Duran CM, Gometza B, Saad E. Valve repair in rheumatic mitral disease: an unsolved problem. *J Card Surg* 1994;9 (23Suppl):282-5.
- Skoularigis J, Sinovich V, Joubert G, Sareli P. Evaluation of the long-term results of mitral valve repair in 254 young patients with rheumatic mitral regurgitation. *Circulation* 1994;90(5 Pt 2): II-167-74.
- Antunes MJ, Magalhaes MP, Colsen PR, Kinsley RH. Valvuloplasty for rheumatic mitral valve disease. A surgical challenge. *J Thorac Cardiovasc Surg* 1987;94:44-56.
- Enriquez-Sarano M, Akins CW, Vahanian A. Mitral regurgitation. *Lancet* 2009; 373: 1382-94.
- Adams DH, Anyanwu AC. Seeking a higher standard for degenerative mitral valve repair: begin with etiology. *J Thorac Cardiovasc Surg* 2008; 136: 551-6.
- Kumar AS, Kumar RV, Shrivastava S, Venugopal P, Sood AK, Gopinath N. Mitral valve reconstruction. Early results of a modified Cooley technique. *Tex Heart Inst J* 1992; 19:107-11.
- Kumar AS, Bhan A, Kumar RV, Shrivastava S, Sood AK, Gopinath N. Cusp-level chordal shortening for rheumatic mitral regurgitation. Early results. *Tex Heart Inst J* 1992; 19:47-50.
- Kumar AS, Rao PN. Restoration of pliability of the mitral leaflets during reconstruction. *J Heart Valve Dis* 1995; 4:251-3.
- Grossman W. Profiles in valvular heart disease. In: Baim DS, Grossman W, editors. *Cardiac catheterization, angiography, and intervention*. 5th ed. Baltimore: Williams & Wilkins; 1996. p. 742-4.
- Padmavati S. Epidemiology of cardiovascular disease in India. I. Rheumatic heart disease. *Circulation* 1962;25: 703-10.

21. Lee AM, Melby SJ, Damiano RJ, Jr The surgical treatment of atrial fibrillation. *Surg Clin North Am* 2009; 89: 1001-20.
  22. Hetzer R, Delmo Walter EM. Mitral valve repair for ischemic mitral incompetence. In: Hetzer R, Rankin JS, Yankah CA. eds. *Mitral Valve Repair*. Springer-Verlag Berlin Heidelberg, 2011:176.
  23. Chan KM, Punjabi PP, Flather M. Coronary artery bypass surgery with or without mitral valve annuloplasty in moderate functional ischemic mitral regurgitation: final results of the Randomized Ischemic Mitral Evaluation (RIME) trial. *Circulation* 2012; 126: 2502-10.
  24. Kim JB, Kim HJ, Moon DH. Long-term outcomes after surgery for rheumatic mitral valve disease: valve repair versus mechanical valve replacement. *Eur J Cardio thorac Surg* 2010; 37: 1039-46.
  25. Madesis A, Tsakiridis K, Zarogoulidis K. Review of mitral valve insufficiency: Repair or Replacement. *Journal of Thoracic disease*. *J Thorac DTS*.2014 (suppl L): S39-551.
  26. Adams DH, Anyanwu AC, Sugeng L. Degenerative mitral valve regurgitation: surgical echocardiography. *CurrCardiol Rep* 2008; 10: 226-32.
  27. Hetzer R, Delmo Walter EM. Repair of congenital mitral valve insufficiency. *Oper Tech Thorac Cardiovasc Surg A Comparative Atlas* 2010; 15: 260-72.
- .....