

Rheumatic Mitral Valve Disease: Our experience in repair of 47 cases

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Abstract:

Introduction:-Rheumatic Mitral Regurgitation and less commonly stenotic and mixed mitral lesions are repaired more and more in developing countries with good short and long term results. Repair of degenerative mitral regurgitation(MR) is an established procedure but repair of regurgitation and mixed mitral valve lesions are often criticized in literature. In this study we critically assessed the outcome of rheumatic mitral valve repair in isolated mitral regurgitation in our institute.

Materials and methods:-From May 2014 to Aug 2019 we have randomly selected 47 cases of mitral valve repair operated in our Institute by same set of surgeons. We excluded all patients with concomitant tricuspid valve repair, aortic valve replacement, atrial septal defect, coronary artery bypass graft or any other procedure done along with mitral valve repair. Of these 47 cases 34 were female and 13 were male [Male : Female = 13:34]; average age being 23±9.14 years (range 7to 47years,).

Here we have statistically assessed data of these patients upto the period of 6 months post operatively which include post-operative early (within one month)and late deaths (after six months), changes in ejection fraction (EF), Left ventricular end diastolic diameter (LVEDD), Mitral regurgitation (MR) grade, Mitral stenosis(mean gradient across MV more than 5mm Hg), re-operation rate, NYHA class and tricuspid regurgitation (Grade I TR not addressed during primary repair) post operatively.

Results:-From 2014 to 2019, 47 cases (13 male and 34 female)of isolated rheumatic MR repaired in a tertiary care unit. Mean age of the patient were 23± 9.14 years. The mean pre-operative ejection fraction (EF) was59.85±7.15%, at discharge it was 44.28±9.8 % and after 6 months it was 61.30±4.46%. The P value was significant (<0.05)for 6 months post follow up EF when compared to post operative EF.

Decrease of LVEDD was significant at discharge and 6 months post op with p value <0.05. Significant improvements in MR grades and NYHA classeswere observed in this study. No mortality observed in this study up to 6 months post operative and perioperative period.

Discussion:-In this study no mortality was noted up to 6 months follow up. We have encountered one mitral stenosis. Patients improved significantly in NYHA class. We have not observed any thrombo-embolic or bleeding related events in our 6 months follow up. We have observed Gr II+ MR in one patient but were medically well managed thereafter. The initial decreases of EF after correction of MR subsequently increased after 6 months. Significant improvement of LVEDD also observed after 6 months. However,6 patients (12.7)% developed Grade II+ TR but our study design did not allow TR assessment so data was statistically not assessed.All these 6 patients had no TR or Grade I TR in preoperative period hence TR was not addressed during first surgery.

Conclusion:-Repair of Rheumatic mitral regurgitation provides excellent short term results and seems to obviate the need for stringent monitoring of coagulation profile which was required for a mitral valve replacement. However failure of repair in small number of cases has been reality in many centres and the need for repair of concomitant trivial TR requires further assessment.

Key words: – Repair of mitral valve. Rheumatic Mitral regurgitation.

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I. Introduction

Rheumatic fever caused by group A β – haemolytic streptococci causes mitral regurgitation (MR), mitral stenosis (MS) or mixed mitral lesions. Mitral valve repair in degenerative disease is a widely performed and standard procedure. However more and more rheumatic mitral valve diseases such as MR are repaired which is more prevalent in developing nations with affection of younger population. Repair of mitral valve has many advantages over valve replacement such as better preservation of left ventricular function by preservation

of atrioventricular continuity of mitral valve apparatus, low postoperative mortality rates, better survival and obviating the need forlifelong anticoagulation and its antecedent complications.¹⁻³

In comparison to repair of degenerative mitral valve which has become the treatment of choice ⁴⁻⁵, repair in rheumatic MR still raises controversies. Because of thickened valve apparatus, postoperative disease activation especially in children ⁶ and calcification in elderly patients with increased chance of valve failure (MR or MS) and subsequent reoperation and its complications and financial constraints which is a problem in the parts of the world where the disease itself is prevalent. However the benefits of mitral repair should be offered to all rheumatic MR patients. And there are many studies with encouraging results. In this study we repaired isolated mitral regurgitation of rheumatic etiology and assessed the results with favourable outcome.

II. Materials And Methods

In this study 47 cases were selected who had isolated rheumatic MR and underwent repair during, May 2014 to August 2019 in Medical College, Kolkata, India. Of these patients 27.66% (13) were male and 72.34% (34) were female. The mean age was 23± 9.14 years (Range 7 to 47 years). See Table 1.

Table 1

Gender	Males	Females
47 (100%)	13 (27.66%)	34 (72.34%)
Mean Age		
23± 9.14 years (Range 7 to 47 years)		
NYHA Class distribution pre-operatively		
NYHA Class	Number of Patients	Percentage of patients
I&II	22	46.81 %
III&IV	25	53.19 %

All the repairs were done by same group of surgeons.

EXCLUSION CRITERIA—

- Concomitant repair of tricuspid valve
- Replacement of aortic valve
- Concomitant repair of ASD
- Concomitant coronary artery bypass graft (CABG)
- Mixed mitral lesions (MR+MS)
- Mitral Stenosis (MS)
- Age more than 50 years
- Rheumatic MR with AF (atrial fibrillation)

All patients were assessed preoperative with transthoracic echocardiography (TTE) ⁷ and patients above 40 years were assessed with coronary angiography. Transesophageal echocardiography (TEE) ⁸ was also employed after induction of anesthesia and after repair of mitral valve. More than Grade I+MR was not accepted in our study and valves were replaced in these cases. Co-aptation length of >10mm ⁹ was accepted as ideal. Co-aptation height of more than 15 mm from annular plane ⁹ was also accepted as an indicator of late valve failure and in such cases repair was either revised or valve was replaced.

SURGERY

All selected cases were approached through median sternotomy and standard aortic and bicaval calculations, moderate hypothermia (28°centigrade to 32°centigrade) and ante grade cold Del Nido cardioplegia ⁹. As per preoperative as well as intra operative (TTE+TEE) assessment valves were repaired accordingly. The various techniques followed are thinning of leaflet ¹⁰ by making an incision 2 mm away from hinge point of leaflet up to commissure gently with no-15 blade to facilitate peeling, taking care not to perforate the leaflet. After peeling, assessment of subvalvular apparatus was done. Shortened chordae were cut, elongated chordae were shortened with 4-0 PTEE (polytetrafluoroethylene) sutures. Torn chordae were repaired with PTEE sutures, papillary muscle splitting done as per requirement. Fixed posterior leaflets ¹¹ were augmented with treated pericardium (0.6% glutaraldehyde for 6 minutes) with 6-0 polypropylene. Some patients required augmentation of anterior leaflets too. ^{12,13}. As per requirement proper sized mitral rings (complete rigid saddle

ring) were placed with 2-0 Ethibondsutures. Intra operative saline test was routinely¹¹ done for assessment for any other corrections which may require intervention. After satisfactory repair

weaning off from pump was done in standard fashion. After that final TEE assessment was done and anyGrI+ MR was not accepted and repair was revised/ valve replaced; because Grade I+ or Gr II MR usually heralds valve failure within 1-2 years. Patients were shifted to ITU with supports and usually extubated after overnight ventilation.

In the postoperative period patients were assessed with TTE before discharge. Patients were put on oral anticoagulation with acenocoumarol/ warfarin with target INR of 2-3 for 3 months after that patients were put on aspirin for whole life. In our institution we administer prophylactic penicillin (injBenzathine penicillin) or other substitutes in patients allergic to penicillin lifelong¹⁴. All patients were followed up monthly for at 3 month interval. We here present data up to 6 months of follow up; but patients have been following up regularly in our valve clinic and we shall soon statistically assess data for longer follow up periods.

Due permission was taken from hospital ethical committee for this study.

III. Result

In this study (May 2014 to August 2019) data was collected from hospital records and OPD (out patient department) follow up of 47 cases selected for analysis retrospectively. There were 13 males (27.66%) and 34 females (72.34%). The youngest patient of this group was 7 years old and the oldest were 47 years with mean age of 23 ± 9.14 years (7 years to 47 years). See table 1

In this study ejection fraction (EF) as assessed in pre-operative (preOP) period was 59.85 ± 7.15 %, postoperatively (before discharge) mean 44.28 ± 9.80 % and at 6 months post operatively mean 61.30 ± 4.46 %. We observed a significant fall in EF ($p < 0.05$) in immediate post OP period; obviously because of exclusion of MR fraction which was calculated in pre OP period with transthoracic echocardiography. Significant improvement ($p < 0.05$) in EF occurred after 6 months when compared to post OPEF. (See Figure 1) There was pre OP left ventricular end diastolic diameter of mean 56.62 ± 5.89 ; it was assessed (LVEDD) post operatively, (54.19 ± 5.47) and at 6 months (49.89 ± 4.89) after operation. There was significant decrease ($p < 0.05$) of LVEDD at the time of discharge. However at 6 months post OP decrease of LVEDD was maintained significant $p < 0.05$ as compared to pre -op. (See Figure 2). (Refer to Table 2 for results)

Figure 1

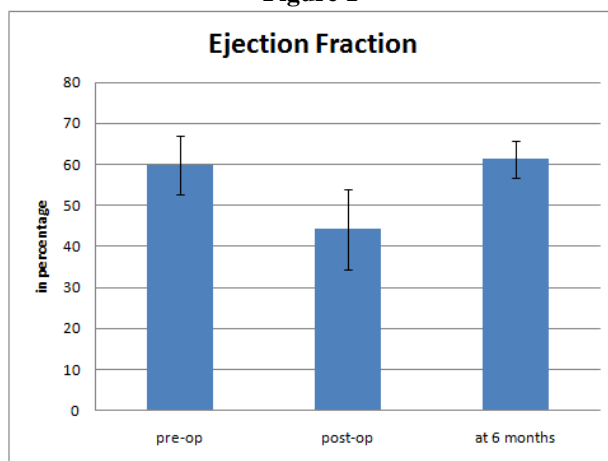
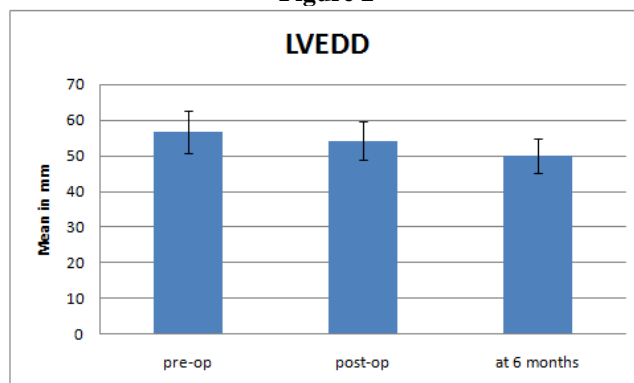
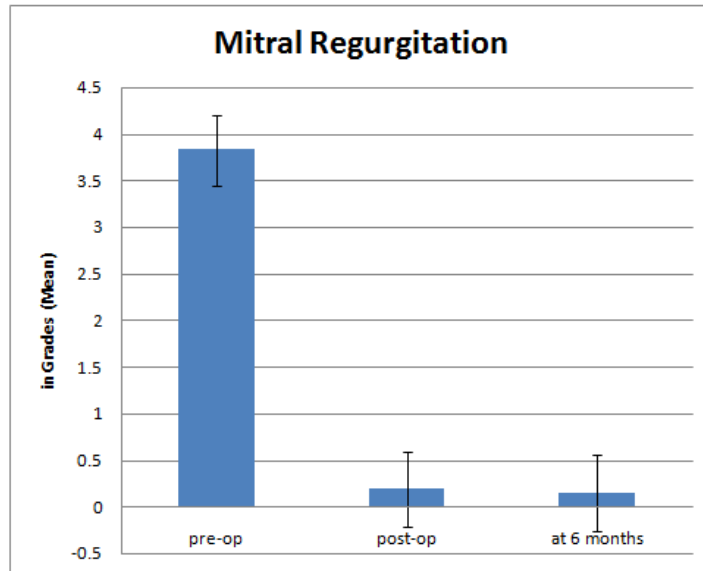


Figure 2



In pre OP period 39 patients (82.98%) had Grade 4, (17.02%)Grade 3, 0 (0%) Grade 2 and 0 (0%) Grade 1 MR. During discharge (day 8.25±2.37) 9 (19.15%) patients had Grade 1 MR. After 6 months follow up only 5 (10.64%) patients had Grade 1 MR and 1 (2.13%) had Grade 2 MR. Significant improvement in MR grades were observed at discharge and after 6 months. (both $p < 0.05$) (See Figure 3)

Figure 3.



Before operation 3 (6.38%) patients were in NYHA Class 4, 21 (44.68%) in NYHA Class 3, 22 (46.81%) were in NYHA Class 2 and 0 (0%) were in NYHA Class 1. After 6 months 2 patients were in NYHA Class 2 and rest (45) were in NYHA Class 1. Significant improvement in NYHA Class observed in this study ($p < 0.05$). (See Figure 4)

Figure 4.

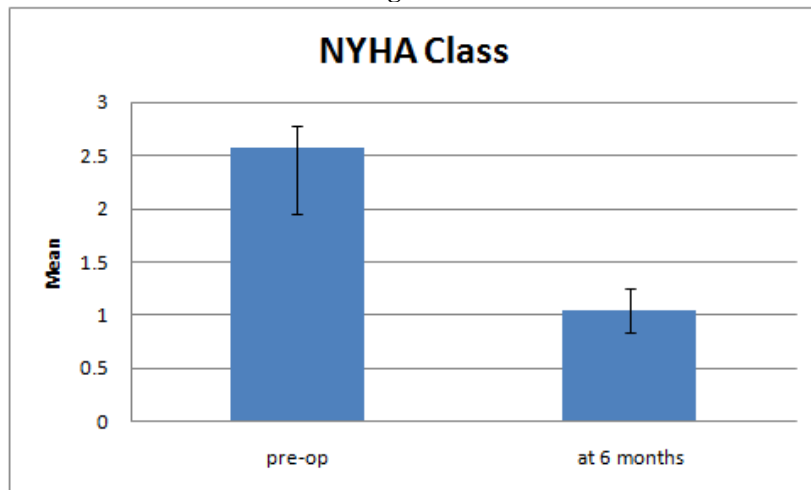


Table 2

EJECTION FRACTION	Mean	SD	P Value
pre-op	59.85106	7.15049	
post-op	44.2766	9.797298	<0.05 (compared to pre-op)
at 6 months	61.29787	4.461989	=0.242885 (compared to pre-op) <0.05 (compared to post-op)
LVEDD			
pre-op	56.61702	5.892343	
post-op	54.19149	5.471818	=0.041469 (compared to pre-op)
at 6 months	49.89362	4.895579	<0.05 (compared to pre-op)
MITRAL REGURGITATION			
pre-op	3.829787	0.379883	
post-op	0.191489	0.397727	<0.05 (compared to pre-op)
at 6 months	0.148936	0.415918	<0.05 (compared to pre-op) =0.61341 (compared to post-op)
NYHA			
pre-op	2.574468	0.616606	
at 6 months	1.042553	0.20403	<0.05 (compared to pre-op)

In this study six patients (12.77) patient developed Grade ≤ 2 TR after six months. Preoperatively 9 (19.14%) patients had trivial or Grade 1 TR.

IV. Discussion

Rheumatic heart disease is the commonest cause of valvular heart disease in developing countries like India and mitral valve is affected in more than 50% of cases, it might be MR,MS or mixed lesion^{15,16,17}. Excision of the diseased valve and replacement with prosthetic valve (artificial or bio-prosthesis) carries high mortality, left ventricular dysfunction, arrhythmia, anticoagulation related complications and increased morbidity.¹⁸

As per Cetinkaya et al 10 year survival was 77.1% in replacement with artificial prosthetic valve 62.4% with biological valve. Currently operative mortality for mitral valve replacement is 5.5% and it was 1.5% for mitral valve repair. David TE et al reported five deaths out of 701 repairs over two decades.¹⁹ In another study with repair of Isolated mitral regurgitation the reported 30 day mortality was 2%, actuarial survival at 10 years was 89 \pm 11% and at 20 years it was 82 \pm 18%²⁰. Jin-Tao Fu et al reported 30 day mortality of 1.9%, long term survival of 97.3% and freedom from reoperation rate of 93.6%.²¹ So repair of rheumatic mitral regurgitation provides fairly good short and long term outcome in terms of mortality and survival when compared with repair of degenerative mitral regurgitation. However reoperation rate is higher in repair over replacement. In our study we had no operative mortality or any death in 30 days after operation. Failure of repair in young patients observed in some cases. This might be due to disease reactivation leading to valve failure.^{6, 22, 23}

In one study left ventricular end-diastolic and end systolic diameters reduced significantly in first 6 months after surgery. The decrease is more rapid for LVEDD than end systolic diameter. This study found decreases of 5.7 \pm 0.80 to 4.9 \pm 1.6 cm (p<0.0001) within 6 months²⁴

We have also found significant decrease of LVEDD at 6month post OP and at discharge. So reverse remodelling is significant in rheumatic mitral repair because of less fibrosis and less dilatation of left ventricle because of younger age of the patients and early intervention before left ventricular dilatation, LV hypertrophy or LV dysfunction set in. Symptomatic patients with MR 2+ should be repaired in our experience with optimal medical management for better result after repair. Another important aspect was preservation of mitral valve apparatus and selection of isolated MR in our group which contributed excellent outcome in terms of restoration of LV function and remodelling (reverse).

Suri et al in their study also recommended early intervention for better result.²⁵ Another study also showed better LV mass regression, better improvement of ejection fraction and tricuspid regurgitation (functional) in early surgery.²⁶ In our study we noticed decrease of LVEF from 59.85 ± 7.15 to 44.28 ± 9.80 which recovered over course of time and it was 61.30 ± 4.46 at 6month. Similar experience observed by another study.²⁷ In this study significant improvement in New York Heart Association functional class observed after repair after 6month post operation period. Similar experience found in another study.²⁸

Zhao et al in this study also found mitral valve repair had better improvement in NYHA class than mitral valve replacement. So benefit of repair should be extended to rheumatic mitral valves. Cases should be thoroughly assessed and approach to be individualised with combination of different techniques of repair provides optimal result with excellent outcomes.

We employed cusp thinning (peeling), commissurotomy, different procedures for release of restricting chordae and elongated chordae, neochordae, splitting of papillary muscles, extension (augmentation of posterior or anterior leaflets and used complete rigid ring placed with interrupted 2-0 ethibond(polyester) for repair of mitral valve with preoperative and post op trans-oesophageal echocardiography in addition to pre op and post op transthoracic echo (at discharge) for satisfactory assessment of repair. In this study isolated mitral regurgitation cases of rheumatic origin selected and patients with tricuspid regurgitation (TR) (grade 2 or more) excluded.

After 6 month follow up six patients had less than grade 2 TR (2 grade II and 4 grade I). However our study failed to clearly show whether tricuspid annuloplasty required or not in patients undergoing mitral valve procedure with rheumatic aetiology, AF and Right Atrial Diameter >30mm as recommended by David TE²⁹ because of short follow up period.

V. Conclusion

Thorough preoperative assessment and peroperative TEE with adoption of appropriate techniques and placement of complete rigid ring along with proper medication provided excellent perioperative and 6 month follow up result for repair of rheumatic isolated mitral regurgitation in our study. Our study revealed excellent NYHA class and LV function in postoperative period. Another advantage of MV repair is, it obviates the need for lifelong anticoagulation and its antecedent complications like bleeding or thromboembolic events and the requirement for monthly monitoring of international normalised ratio (INR) and prothrombin time.

Mitral valve repair in rheumatics is far better than replacement and it is comparable with MV repair in its degenerative counterpart.

CONFLICTS OF INTEREST: The authors declare no conflicts of interest.

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COMPLIANCE WITH ETHICAL STANDARD: Permission taken from ethical committee of the institute. Individual patient consent waived for the retrospective nature of the study.

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