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MITRAL VALVE REPAIR WITHOUT RING- OUR CENTRE EXPERIENCE

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Abstract

Background: Mitral stenosis is common pathological entity which followed Rheumatic Heart Disease(RHD). Various other type of manifestations are Mitral Regurgitation(MR), Aortic Stenosis/Regurgitation etc. Our study is focused on predominant mitral stenotic lesion with Left Atrial Appendage(LAA)/Left Atrial(LA) body Clot, with trivial to mild MR, with or without other valvular lesions. Mitral repair without ring yields following benefits. Low perioperative mortality rate, preservation of Left Ventricle function, avoidance of long term anticoagulation therapy, decreased thromboembolic complications, low risk of native-valve endocarditis and long term freedom from replacement of valve. In our original research article, studyof mitral valve repair without ring was done which include commissurotomy decalcification of leaflets or commissure along with papillary muscles and chordal lengthening. **Material and Methods:** Our study includes the mitral valve repair without ring, operated at our centre in from October 2015 to January 2017. **Results:** In this study majority of the patients were males (36) and maximum number of patients were in 3rd and 4th decade. Most of the patients were in New York Heart Association (NYHA) class III. The most common procedure performed was Mitral valve repair without rim with LAA clot removal (26) and the post-operative mitral valve area achieved was in the range of 1.6 cm^2-1.9 cm^2 (33). In our study significant MR occurred in 2 cases during decalcification of leaflets. This MR was managed by annuloplasty ring repair in 1 case and replacement of valve in other case. **Conclusion:** Inour original article we establish that Mitral valve repair without ring is simple, safe and effective and more economical method for management of severe MS with LA/LAA clot. But it requires lot of expertise.

Keywords: Mitral valve stenosis, Mitral valve repair, Mitral valve, Mitral valve repair without ring, Annuloplasty.

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Introduction

Mitral valve complex comprises of Annulus, Leaflet, Chordae tendinea, Papillary muscles and Supporting LV wall. The mitral valve annulus is a Fibroelastic ring encircling the valve in cone like manner. It is elliptical in shape in systole and circular in shape in diastole. It's a dynamic structure. Disease of Mitral Valve or Left Atrium/Left Ventricle can effect Mitral Annulus size and dynamicity resulting in Mitral Regurgitation and increased stress on Mitral Valve(MV). Mitral Annulus measurements include conventional 2-Dimensional parameters and also recently 3-Dimensional geometric parameters of curvature and torsion.

The three leaflets of mitral valve are Anterior /aortic/septal leaflet, Posterior /mural/ventricular leaflet and Commissural leaflet. Combined area of two leaflets is twice that of MV orifice resulting in large area of coaptation. Undue stress on leaflet may lead to rupture of chordae. The anterior mitral leaflet is roughly triangular and inserts to one third of annulus. It does not have true annulus and is continuous with the wall of ascending aorta. There is rough and clear zone. The clear zone free of chordal insertion. The commissure between Left Coronary Cusp and Non Coronary Cusp lies directly over the middle of Anterior Mitral Leaflet. The right andleft trigones don't correspond to commissures of MV. AV node and Bundle of His are at risk of surgical damage adjacent to right trigone. The posterior mitral leaflet has scalloped appearance. It also consists of rough, clear and a basal zone. Basal zone receives chordae directly from left ventricular trabeculae.

The chordea tendinea are the fine fibrous strings arising from Antero-Lateral and Postero- Medial papillary muscles. Chordae from Anterior Papillary Muscle attaches to lateral portion of A2,A1,P1,lateral portion of P2.Chordae from Posterior Papillary Muscle attaches to medial portion of A2 and P2,A3,P3.Commissural chordae arises from tip of Papillary Muscle Mitral stenosis is common pathological entity which followed Rheumatic Heart Disease. Various other type of manifestations are Mitral Regurgitation, Aortic Stenosis and Aortic Regurgitaion etc. Our study is focused on predominant mitral stenotic lesion with Left Atrial Appendage/Left Atrial body Clot, with trivial to mild Mitral Regurgitaion, with or without other valvular lesions.

Presently percutaneous balloon mitral valvuloplasty (BMV) is the method popularly performed for exclusive, uncomplicated mitral stenosis with favorable anatomical morphology.[1] Open- heart surgical procedures are usually indicated in the severely diseased and calcified mitral valves, or to the patients needing left atrial clot removal. Earlier many such patients underwent open mitral commissurotomy (OMC),[2,3] but recently, this has reduced, and more number of mitral valve replacements take place with an appropriate prosthesis.[4] Also the durability of prosthetic valve, preservation of the chordal apparatus at the time of mitral valve replacement (MVR),[5,6] has further increased the chances of MVR.[4,7,8]

In above subset of patients Mitral repair without ring yields following benefits. Low perioperative mortality rate, preservation of LV function, avoidance of long term anticoagulation therapy, decreased thromboembolic complications, low risk of native-valve endocarditis and long term freedom from replacement of valve. In our study mitral valve repair without ring was done which include commissurotomy decalcification of leaflets or commissure along with papillary muscles and chordal lengthening.

Methodology

Study Overview

This prospective cohort study was conducted at the Department of Cardiothoracic & Vascular Surgery from October 2015 to January 2017. The aim of the study was to preserve the mitral valve as far as possible by a specific technique instead of straight forward replacement of mitral valve and demonstrate it's efficacy.

During this time, a total of 64 patients (after sample size estimation) who presented to the outpatient department and met the inclusion criteria were included in the study. They were treated with Mitral valve repair without ring and were followed up every week in the first month post procedure and thereafter on monthly basis for follow up visits i.e. for one year and during every visit patients were evaluated clinically and were also subjected to echocardiography to rule out or check for recurrence/regurgitation following procedure. **Study Criteria**

The inclusion criteria included patients with age at least 14 years, patients willing to consent (for the patients in the age groups 14-18 years consent was obtained from the parents), patients with Rheumatic Heart disease with Mitral Stenosis with or without other valvular lesions and with Left

atrial/left atrial appendage clot, as demonstrated by Trans-Thoracic echocardiography / Trans-oesophageal echocradiography, and patients ready to follow-up for 1 year after the treatment, were included in the study.
Exclusion criteria included patients without rheumatic Mitral stenosis, mitral stenosis with severe mitral regurgitation patients with poor health who are non-compliant with severe illnesses and patients who were not candidates for mitral valve repair.

Methods

Our study includes the mitral valve repair without ring, operated at our centre in 1 year from October 2015 to September 2016.

Study Procedure

The diagnosis was made by combination of physical examination, Echocardiography (Trans- thoracic and Trans-oesophageal).

There were 64 patient where mitral valve repair without ring was carried out. Patients included: (a) MS with LAA clot (26) (b) MS with LA clot (22) (c) MS with TVR (07) (d) MS with

AS/AR (09)

Surgical Technique

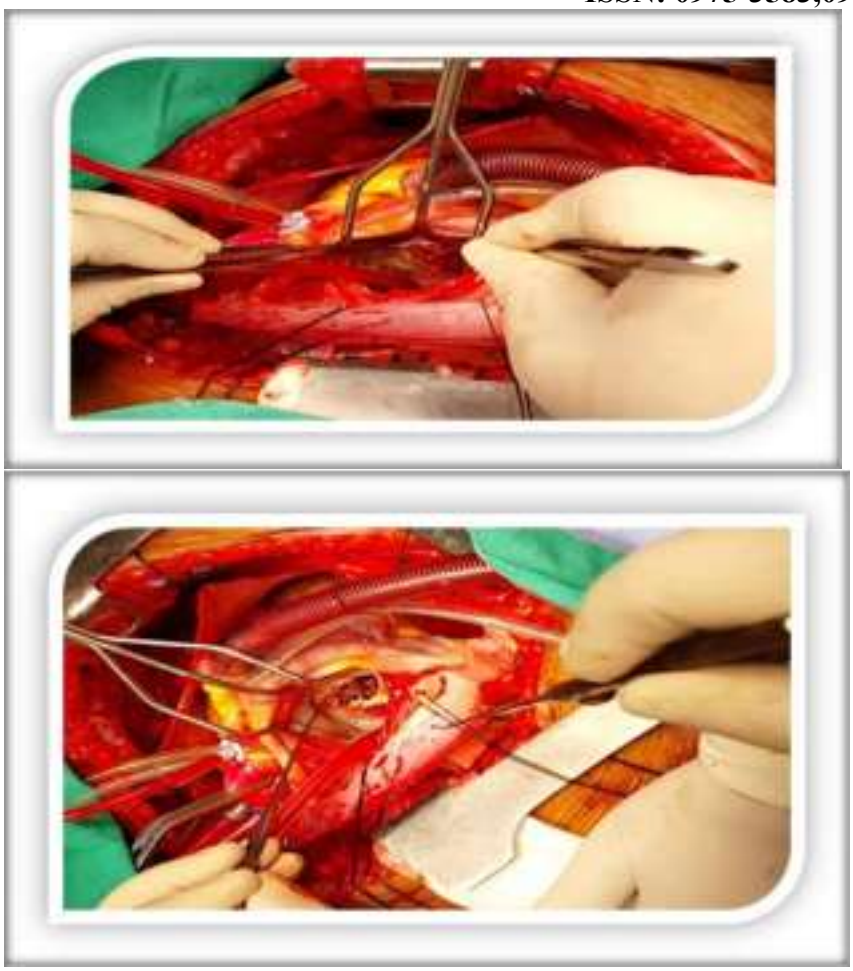
Operations were performed through median sternotomy under cardiopulmonary bypass (CPB). Myocardial protection is achieved via the administration of antegrade or in selective cases coronary perfusion where aortic valve replacement was done. Classical approach for opening of LA was Selected in most of the cases but when LA is very small then superior septal approach was chosen for better exposure of mitral valve.

LA or LAA clot was gently removed along with pseudo-intima then mitral valve was assessed.

Figure 1: Commisurotomy using 11 no. surgical blade

5.0 prolene stich were taken in the mid of AML & mid of PML near margin then commissurotomy was done with help of 11 no. surgical knife.

Figure 2: Subvalvular apparatus being examined with a nerve hook.

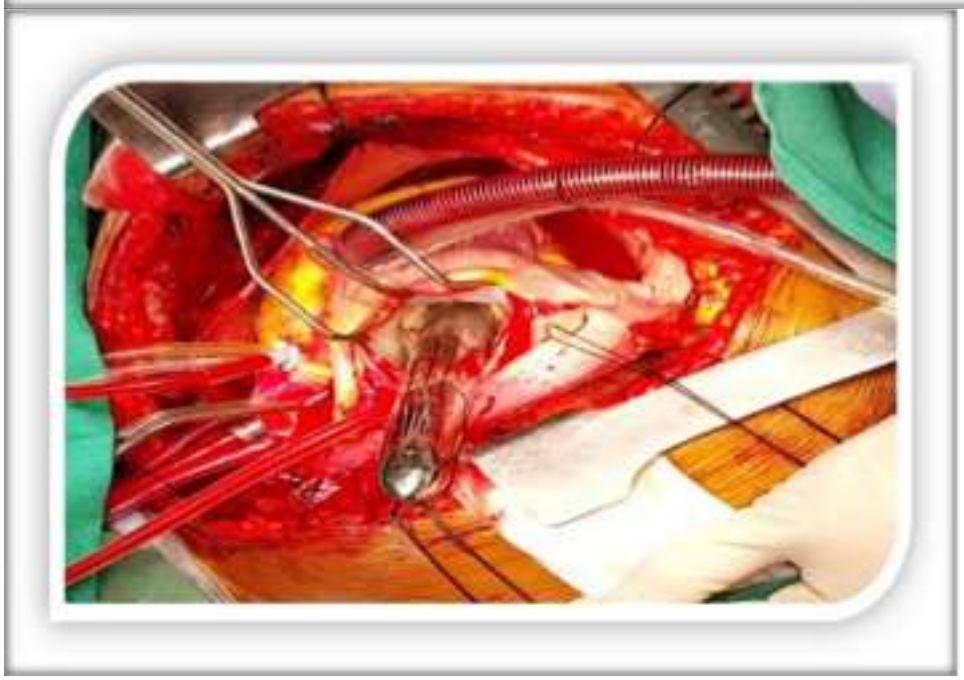


With help of two nerve hooks anatomy of chordae and papillary muscles was assessed.
Sub valvular apparatus was reassessed for chordal fusion and papillary muscle shortening. If the chordae is normal and papillary muscle is shortened then papillary muscle lengthening by simple splitting the papillary muscle head with help of pot scissor up to lateral free wall of ventricle was done.

Figure 3: Chordal and papillary muscle lengthening.

If the chordae are also fuse and papillary muscles are also shortened then 2-3 fenestrations in between fused chordae were made followed by papillary muscle splitting up to free wall of ventricle.
If there was little bit of calcification in the cusps or at commissures was decalcified very gently.

Figure 4: Mitral annulus being measured by Hegar's dilator.



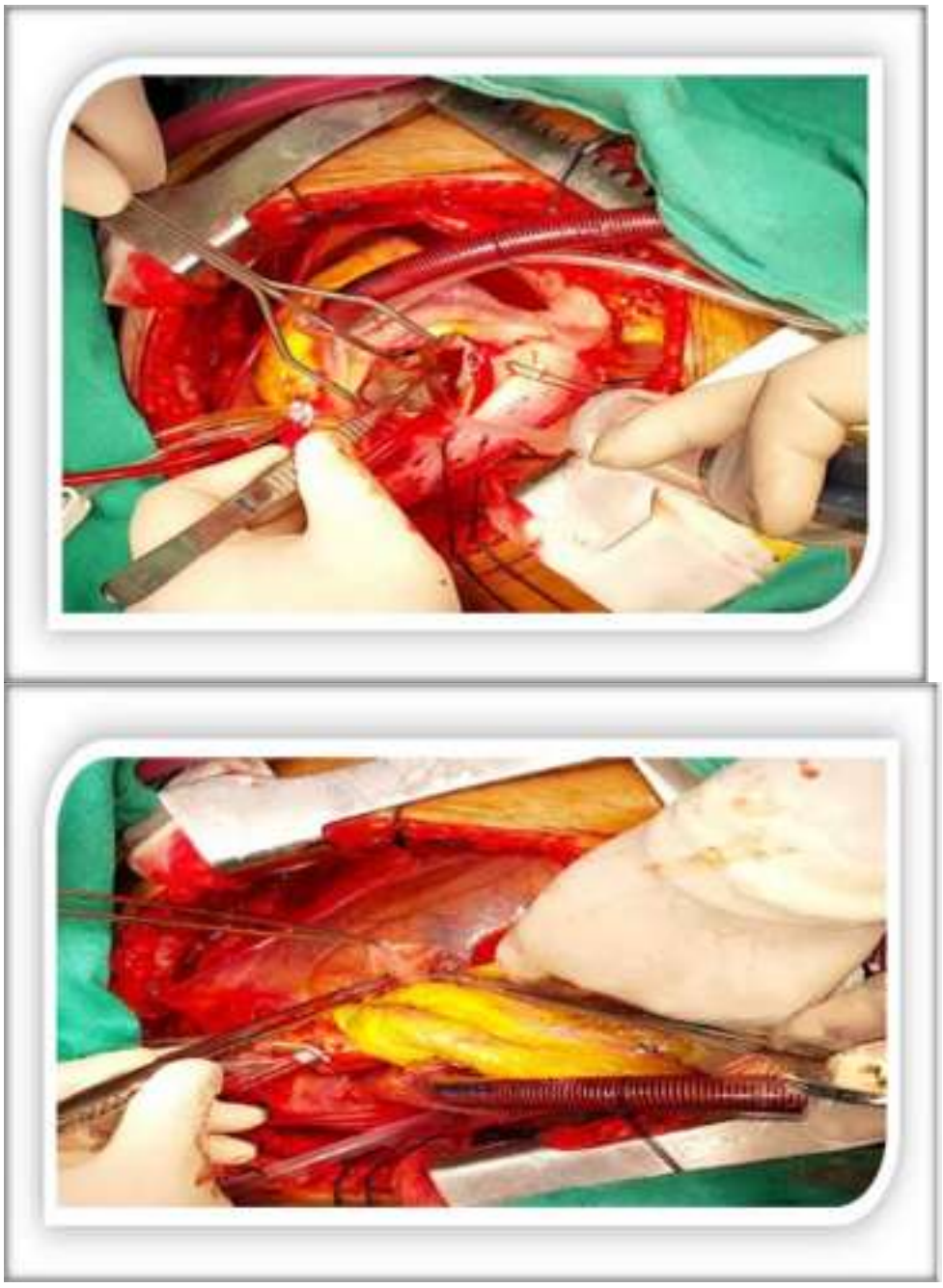
Then mitral valve area was assessed by passing the Hegar no. 24 size through orifice. Whereas cuspal mobility and degree of MR was assessed by WATER COMPULSION test.

Figure 5: Water compulsion test being performed.

LA appendage was plicated both from inside and outside.

Figure 6: External and internal plication of Left atrial appendage.

In chronic AF patients con-commitant MAZE procedure by classical method/ electro cautery method was done as a routine. If other valve pathology present it was corrected same time like AVR/ TV repair. Post-operative mitral valve was reassessed by TEE after CPB for mitral valve area, associated MR, trans mitral end diastolic gradient and Function of other valve if replaced/repaired.



All patients required anti platelet and warfarin together for three months.

Sample Size & Statistical Analysis

Continuous or interval-related variables indicated as means +/- standard deviation. Percentages were used for categorical variables. Univariate analysis was done using Student‘s t test and Fisher’s exact test. The Kaplan-Meier technique and Mantel-Cox (log-rank) test used for Actuarial estimation. Mitral valve failure was designated as the end point. Mitral valve failure comprised of development of severe mitral regurgitation, and development of severe mitral stenosis (mitral valve area 1.0 cm2) mitral valve–related death and mitral valve related reoperation. Cox’s proportional hazard model was utilized for identifying prognostic factors for mitral valve failure. The SPSS for Windows 7.5 software package (SPSS Inc., Chicago, IL) was used for statistical analysis.

RESULTS

Table 1: Male: Female

Male	Female
36	28

Majority of patients in our study were male.

Table 2: Age of 46 patients:

Age ranges from 16 to 55 years.
Maximum no. of patients in our study were in 3rd and 4th decade.

Age	No of Patients
0-10	0
10-20	0
20-30	9
30-40	26
40-50	23
50-60	6
60-70	0

Table 3: NYHA functional class on drugs

Most of the patients in our study were in NYHA class III.

NYHA Class	No of Patients
III	48
IV	16

Table 4: Procedures performed

MAZE procedure by RF ablation/electrocautery method was done in all the cases for chronic AF.

Procedures Performed	No of Pt.
Mitral repair with LAA clot removal	26
Mitral repair with LA and LAA clot removal	22
Mitral repair with TV repair	7
Mitral valve repair with AVR	9

Table 5: Post-operative mitral valve area (MVA)

Post-operative mitral valve area was between 2.0 to 2.2 cm2 in 29 patients and 1.6 to 1.9 cm2 in 33 pt.
In 4 patients there was Trivial to mild MR that was not significant.

MVA (cm^2)	No. of Pt.
2.0 – 2.2	29
1.6 - 1.9	33

Table 6: Complications

Complication	No. of Pt.
Mitral regurgitation (mod to severe)	2
Low cardiac output	0
Thromboembolism	0
Post-operative endocarditis	0
Re-exploration	1
Death	0

In our study significant MR occurred in 2 cases during decalcification of leaflets. This MR was managed by annuloplasty ring repair in 1 case and replacement of valve in other case.
Thus in this study majority of the patients were males (56%) and maximum number of patients were in 3rd (40%) and 4th decade (36%). Most of the patients were in NYHA class III (75%). The most common procedure performed was Mitral valve repair without rim with LAA clot removal (40%) and the post-operative mitral valve area achieved was in the range of 1.6 cm^2- 1.9 cm^2 (52%). In our study significant Mitral Regurgitation occurred in 2 cases during decalcification of leaflets. This Mitral Regurgitation was managed by annuloplasty ring repair in 1 case and replacement of valve in other case.

DISCUSSION

Ankeney (1967) once said “To have the greatest number of patients live the longest time, in the best possible condition “ . Seventy-three percent of the world wide burden of rheumatic heart disease (RHD) alone is prevalent in India and other South East Asian nations. When prevalence is Age-standardized it is estimated to be highest in females in the reproductive age group.[9] The occurance of heart disease in pregnant female in developing nations is 0.65% (mitral stenosis due to RHD being the highest in

number).[10] According to the American College of Cardiology (ACC) and European Heart Journal valvular heart disease guidelines emphasises on the grading the severity of the disease and earliest intervention.[11] Early intervention is indicated even in patients without symptoms but with moderate lesions.[12] Hazards of anticoagulation, and poor health care referral facilities warrant us to opt for palliative intervention with comparable short and long term results.

Closed mitral valvotomy was first done in 1923 by Cutler when he inserted valvotome.[13] Digital dilatation of stenotic lesion was performed by Soutter. It was only after thirty years that Bailey in 1949 advanced this method.[14] In 1957 Tubb's dilator became popular, and the restenosis cases has reduced since then.[15] Autopsy and pathology studies of the mitral valve, was the source of Carpentier's technique of mitral valve repair directed to regain normal parameters of the mitral valve complex,[16] popularly known as anatomic approach or the "French correction."[17] When imaging technology progressed and better information of the dynamic structure and function of the mitral valve has increased, Lawrie and colleagues,[18] brought about the functional correction of MR, which is called as the "American correction."[19,20]
As with the mitral regurgitation, in patients with mitral stenosis our technique of repair proved to provide similar benefits. As experienced by Eguaras and colleagues,[21] we also discovered that with some expertise and knowledge, a number of valves could be saved from replacement.

Limitations of the Study

Further prospective research on this subject would be beneficial, taking into consideration aspects like 3-dimesnsional geometric parameter measurement and with a long follow up period as in the present study we excluded those patients who didn't follow up for a period of 1 year.

CONCLUSION

Mitral valve repair without ring is simple, safe and effective method for management of severe MS with LA/LAA clot. But it require lot of expertise.

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