



RESEARCH ARTICLE

Mitral Valve Repair with Flexible Band versus Rigid Band in Non Ischemic Mitral Regurgitation.

Sameh E. Saeed, Mamdouh El Sharawy, Mostafa A. El Newihy, Mohamed F. El Gabry and Mahmoud M. Abd Rabo.

Assistant Lecturer Cardiothoracic Surgery Zagazig Faculty of Medicine.

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Abstract

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Introduction:-

The incidence of Mitral regurgitation (MR) is 2% in population. Pathology affecting one or more parts of the mitral valve apparatus can cause mitral regurgitation, but functional type is due to dilatation of mitral valve annulus and disturbed subvalvular apparatus, due to ischemic heart diseases. (1).

The proper surgery for mitral regurgitation caused by degenerative heart diseases is Mitral valve repair but this surgery becomes more complex in case of repair of mitral valve regurgitation caused by rheumatic cause and may have bad results. The long term result can be evident for mitral valve repair in rheumatic heart patient by using long acting penicillin (2)

The most important and critical points in mitral repair are understanding pathology of mitral valve apparatus and mechanism of mitral regurgitation and verifying minor differences between different causes of mitral regurgitation, all these can be achieved by transesophageal echocardiography. (3)

Type of annuloplasty devices that used for repair depend mainly on the choice of the surgeon. Recently many studies prefer rigid bands for mitral valve repair than flexible bands because rigid one maintain the geometry of left ventricle (4).

Many studies carried out on the two techniques for management of mitral regurgitation each technique has some advantages over the other (5).

In our study we are trying to show which of them is more useful for mitral valve repair in patients with non ischemic mitral regurgitation.

Patients and method:-

This study includes 68 patients with non ischemic mitral regurgitation undergoing surgery for mitral valve repair with flexible or rigid annuloplasty device - (34 patients on each group) - attending the Zagazig university hospitals, Egypt and Essen University hospitals, Germany during the period from September 2017 till April 2019. Patients will be distributed randomly into two groups according to a table of random numbers at the time of the operation.

Corresponding Author:-Sameh E. Saeed.

Address:-assistant lecturer cardiothoracic surgery Zagazig faculty of medicine.

group A : patients will be subjected to mitral valve repair with flexible band ,

group B : patients will be subjected to mitral valve repair with rigid band.

Patients included in this study are those who has - moderate to severe or severe - Ischemic , Degenerative , Rheumatic , or Congenital mitral regurgitation .

Patient excluded from the study are those with significant mitral valve stenosis . And those who require aortic or pulmonary valves surgery. After approval of the IRP committee , and a written consent from all patients, patients were subjected to preoperative history taking , clinical examination , investigations as CXR , echocardiography, cardiac catheterization if needed , exclusion of septic foci and routine preoperative laboratory tests .

Surgical technique:

For all patients after the induction of anesthesia, transesophageal echocardiography was done. to assess mitral valve and severity of regurge. A median sternotomy was done ,bicaval cannulation and cardiopulmonary bypass was started after ACT became safe (more than 400) . mild hypothermia ,then myocardial protection was done by warm antegradecardioplegia. Mitral annuloplasty band were implanted with 2-0 ethicon with interrupted horizontal mattress sutures. Another operative technique that has been used is according to the underlying pathology. After weaning from cardiopulmonary by pass, Mitral repair re-assessed by using transesophageal echocardiography.

Data collected as Operative time, Cardiopulmonary Bypass time for mitral valve repair, Intraoperative evaluation of mitral valve repair by trans-esophageal echocardiography .and follow up data as; postoperative hemodynamic evaluation, Postoperative neurological evaluation, Postoperative Echocardiographic evaluation of mitral valve repair before discharge of patients.

All will be presented in a suitable manner and analyzed statistically by SPSS (v 20) package program. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean \pm SD , the following tests were used to test differences for significance;. difference and association of qualitative variable by Chi square test (X^2) .

Results:-

According to demographic data of patients there was no significant differences between both groups ,also regarding pathology and etiology of mitral regurge the commonest cause in the flexible band group and rigid band group is degenerative and restricted posterior mitral valve leaflet (PMVL) is the commonest pathology in flexible band group while prolapse of AMVL, and restricted PMVL were the commonest pathology in the other group. There was no significant differences regarding etiology and pathology of mitral regurgitation as shown in table 1.

Table 1:-Demographic criteria, pathology and etiology of mitral valve regurgitation .

		Flexible group n=53	Rigid group n=53	P value
age		48.2 \pm 10.2	50.4 \pm 10.3	0.3185
gender	Male	20(58.8%)	22(64.7%)	0.3723
	Female	14(41.2%)	12(35.3%)	
Causes of mitral regurgitation(MR)				0.432
	Degenerative	18(26.5%)	22(32.4%)	
	Rheumatic	14(20.6%)	12(17.6%)	
	Congenital	2 (2.9%)	0(0%)	
pathology				0.376
	Prolapse of AMVL	10(14.7%)	12(17.6%)	
	Prolapse of PMVL	8(11.8%)	10(14.7%)	
	Restricted PMVL	14(20.6%)	12(17.6%)	
	Cleft mitral valve leaflet	2 (2.9%)	0 (0%)	

P< 0.05%= significant difference

Preoperative echocardiographic data, as presented in table 2 shows no significant difference between both groups regarding Ejection fraction (EF), Left Ventricular end diastolic diameter(LVEDD) , Tricusped regurgitation (TR) and Left atrial diameter (LAD) .

Table 2:-preoperative data echocardiography.

		Flexible band	Rigid band	P value
Ejection fraction	M±SD	58.49 ± 12.59	60.45 ± 10.17,	0.368
	Range	30-70	32-71,	
Left ventricle (LVEDD)	M±SD	58.56±10.41	62.08 ± 9.11	0.368
	Range	42-80	48-82	
Tricuspid	No	4(5.9%)	6 (8.8%)	0.499
	Mild	0 (0%)	2 (2.9%)	
	Moderate	5 (7.4%)	8 (11.8%)	
	Trivial	0 (0%)	0 (0%)	
	Moderate to severe	10(14.7%)	6 (8.8%)	
	Severe	15 (22.0%)	10(14.7%)	
LAD	M±SD	50.86±8.14	47.52±7.21	0.340
	Range	35-71	35-70	
PHT	M±SD	48.84±21.41	46.34±13.93	0.616
	Range	Normal-90	30-78	

P< 0.05%= significant difference.

Regarding operative findings there was no significant difference between groups regarding technique of repair . The most common technique of repair used in flexible and rigid band groups was Annuloplasty and artificial chordae with gortex suture (14.7% , 17.6%) respectively. There were different sizes of bands among flexible band group patients. the most common band used was pericardial band 32 (41.2%). The only used rigid band was Carpentier-Edwards Ring (100%).

The most common concomitant surgery among flexible group and rigid group is tricuspid valve repair (44.1% ,35.3%) respectively with no significance of differences shown in table 3.

Table 3:-Operative data in both groups

		Flexible band group	Rigid band group	P value
Operative technique	Annuloplasty and artificial chordae with gortex suture	10 (14.7 %)	12(17.6%)	.645
	Annuloplasty and closure of cleft with interrupted suture	2 (2.9 %)	0 (0%)	
	Annuloplasty and quadrangular resection of p2	6 (8.8%)	6 (8.8)	
	Posterior Leaflet triangular exclusion	2 (2.9%)	4 (5.9 %)	
	Annuloplasty and excision of fibrous peel	14 (20.6 %)	12(17.6%)	
Types of bands flexible band group	Teflon band 32	10(29.4 %)	-	-
	Pericardial band 30	6(17.6 %)	-	-
	Pericardial band 32	14(41.2 %)	-	-
	Cosgroov Edward band 30	4(11.8 %)	-	-
Tricusped repair	NO	4 (5.8 %)	10(14.7%)	0.3719
	Annuloplasty ring 30	0 (0%)	2 (2.9%)	
	Annuloplasty ring 32	2 (2.9%)	0 (0%)	
	Elgabryannuloplasty technique	16 (23.5 %)	12(17.6%)	
	Devageannuloplasty	12 (17.6 %)	10(14.7%)	
ASD closure	No closure	32 (47.1%)	34 (50%)	0.845
	Closure with pericardial patch	2 (2.9%)	0 (0%)	
Other	No	32 (47.1%)	34 (50%)	0.845

	Ligation of PDA	2 (2.9%)	0 (0%)	
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P< 0.05%= significant difference.

There was significant difference between groups regarding post-operative degree of EF and LV (p<0.05) while there was no significant difference between groups regarding post-operative Pulmonary hypertension (PH) , TR , MR and LAD (p >0.05). table 4

Table 4:-Postoperative echocardiography follow up.

		Flexible band group	Rigid band group	P value
Degree of MR	No	10 (14.7%)	8 (11.7%)	0.566
	Mild	12 (17.6%)	12 (17.6%)	
	Trivial	12 (17.6%)	14 (18.9%)	
	Mild to moderate	0 (0%)	0 (0)	
Ejection fraction	M±SD	59.43 ± 9.04%	45.48±11.81%	0.000*
	Range	39-70	25-70	
Left ventricle (LVEDD)	M±SD	50.24±10.33	60.00 ± 10.57	0.000*
	Range	35-84	40-77	
Tricuspid	No	9 (9.4%)	10 (11.3%)	0.1393*
	Mild	12(27.3%)	8(29.2%)	
	Trivial	13 (12.3%)	14 (6.7%)	
	moderate	0 (0%)	2 (2.8%)	
LAD	M±SD	49.72±7.17	50.54±25.77	0.6752
	Range	35-65	32-66	
PHT	M±SD	33.94±11.32	35.52±9.51	0.452
	Range	20 - 65	25-55	

P< 0.05%= significant difference.

In terms of complications the flexible band group had a higher rate of failure to repair, neurological complications and death while the rigid band group had a higher rate of re exploration for control of bleeding. As shown in table 5 .

Table 5:-Complications rate :

		Flexible band group	Rigid band group	P value
Failure of repair		2(2.9%)	1 (1.8%)	0.495
Neurological complication	Lt sided hemiparesis	2 (2.9%)	Zero (0%)	0.125
	Brain stem infarction	2 (2.9%)	Zero (0%)	
Bleeding and reexploration		2 (2.9%)	5 (7.4%)	0.436
Death	after 2 days	2 (2.9%)	Zero (0%)	0.074
	after 5 days	Zero (0%)	2 (2.9%)	
	after 7 days from HF	2 (2.9%)	Zero (0%)	

P< 0.05%= significant difference.

Discussion:-

Diseases of the mitral valve (MV) are the second-most common clinically significant form of valvular defect in adults. In particular, MV regurgitation occurs with increasing frequency as part of degenerative changes in the aging process . The annual incidence of degenerative MV disease in industrialized nations is estimated at around 2% to 3% (6) .

Mitral valve repair is the ideal procedure for mitral regurgitation in comparasion to mitral valve replacement. All Previous surgical studies stated that mitral valve replacement has higher rate of death than mitral valve repair (7) .

In this study , the commonest pathology in flexible band group was restricted posterior mitral valve leaflet (PMVL) while prolapse of AMVL, and restricted PMVL were the commonest pathology in the other group, BUT there was no significant differences. In study that was done by David et al , there was prolapsed anterior leafler in 21% of cases , posterior leaflet prolapse in 28% , bileaflet prolapse in 51% (8) . According to salvador et al. study , there was prolapse of anterior leaflet in 7.7% of cases , posterior leaflet prolapse in 50.7% , bileaflet prolapse in 41.6% (9) .

Our study shows that reoperation and recurrence of Mitral Regurgitation were lower in the Rigid band group, but this difference was statistically insignificant. Among 34 patients who required repair with flexible band, (2.9%) of patients need reoperation, the cause of recurrence of MR was dislodgment of artificial chordae from papillary muscle due to inappropriate surgical technique.

But, In study performed by Chang et al., reoperation and recurrence of MR were higher in the Duran ring group, but this difference was not statistically significant. There were 8 patients who required reoperation, the cause of reoperation in 2 patients was dilated mitral annulus due to abnormal shape of the Duran ring, that caused in improper annular fixation (10). In study performed by Kanemitsu et al., mortality rate and freedom from reoperation were not significant. The causes of reoperation in three patients were recurrent leaflet prolapse in two and leaflet sclerosis in one (11).

In our study, regarding early morbidity occurred in our patients, in rigid band group 5 (7.4%) cases were re-explored but there were 2 (2.9%) cases among flexible band group. Also, there were neurological complications in form of 2 cases with left-sided hemiparesis and 2 cases with brain stem infarction among flexible band group but no neurological complication among rigid band group.

In study performed by Kuntze et al., early morbidity was re-exploration for bleeding in 3.6%, postoperative renal failure was 2.1%, required dialysis, postoperative stroke in 1.7% (12). Also in study done by Salvador et al., early morbidity was re-exploration for bleeding was 34%, renal failure 9.6%, heart failure was 24%, post-operative stroke 10% (9).

No Intraoperative mortality was found in our study. As regards early mortality (with 30 days of operation) in our study, in flexible band group, 4 cases died (5.9%), 2 cases mortality at second day postoperatively occurred due to bleeding, 2 cases mortality at 7th day postoperatively occurred due to heart failure. But in rigid band group, 2 cases died (2.9%), the two cases mortality at 5 day postoperatively occurred due to bleeding.

In study performed by Kuntze et al., early mortality was 1.4% due to Congestive Heart Failure (2.5%) (12). Also in study performed by Salvador et al., early mortality was 1% all related to low cardiac output (9).

Chang et al., stated that Mitral valve repair with rigid and flexible annuloplasty devices showed good early results. There were no statistical differences between both groups, the Carpentier and the Duran ring, and the early postoperative left ventricular dimensions were significantly reduced and also left ventricular function was significantly improved in both groups (10).

In our study, There were no statistical differences between the rigid and flexible band group, regarding postoperative pulmonary hypertension and left atrial dimension, but there were statistical clinical differences between them, regarding postoperative left ventricular dimensions, early postoperative left ventricular dimensions were reduced, also left ventricular function was significantly improved in flexible band group more than rigid one. Long-term data should be required to assess which of these annuloplasty bands is superior to the other.

Conclusion:-

Mitral repair shows good early results in our prospective randomized study, in spite of the type of annuloplasty device. There was no difference between the rigid and flexible bands regarding left atrial dimensions but there were statistical clinical differences between both bands according to postoperative left ventricular function and left ventricular dimensions which was significantly improved in flexible group.

Patients with mitral regurgitation having a rigid annuloplasty device have lower rate of developing recurrent mitral regurgitation (MR) that need reoperation. The use of a rigid annuloplasty device appears to reduce the need for repeat surgical procedures.

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