

Functional Moderate Mitral Regurge in Patients Undergoing AVR

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Objectives: Functional Mitral regurgitation (MR) is common in patients with severe aortic pathology and can predispose to atrial fibrillation, heart failure, and a need for mitral valve surgery during aortic valve replacement (AVR). Coexistent mitral regurgitation may adversely influence both the morbidity and mortality in patients undergoing aortic valve replacement. It is accepted that concomitant mitral surgical intervention is required in severe, symptomatic mitral regurgitation. However, in cases of moderate non-structural mitral regurgitation, improvement may be seen following aortic valve replacement only, avoiding the increased risk of double valve surgery. The precise benefit of such a conservative approach is yet to be adequately quantified. In our study we used to compare results of mitral valve repair versus the conservative approach by leaving the mitral valve without intervention in patients with moderate functional mitral regurgitation in the setting of AVR.

Methods: Between April 2012 and March 2014, 32 patients underwent aortic valve replacement with mechanical valves and had moderate functional mitral regurgitation were classified into 2 groups, group A 16 patients underwent concomitant mitral valve repair with Carpentier rigid ring, group B 16 patients underwent only AVR without approaching mitral valve. All Patients had severe aortic pathology candidate for AVR and have grade 2 functional mitral regurge. Patients with Mitral regurge due to primary valvular etiologies, Mitral regurge grade 3 or 4 or Redo cases were excluded.

Results: 30 days post-operative survival was 100%. At 1 year postoperative follow-up only 2 patient in group B were in NYHA class III (12%) and both were AF pre-operatively. Only one patient in group B (6%) needed re-hospitalization for symptoms of congestive heart failure. No patients in both groups required re-operation during the 1-year follow up period. There was a tendency for better MR regression in group A compared to group B but without statistical significance. 1 year Post-operative follow-up data showed no significant statistical difference between both groups (p value > 0.05).

Conclusion: Management of moderate functional MR in setting of AVR is still controversial, the conservative approach seems acceptable with no deleterious effects on survival and regression of MR was sufficient. However, mitral annuloplasty was associated with early perfect results, presence of AF may be an indication for mitral intervention in this cohort of patients.

Key words: AVR – FMR- AF- Mitral Annuloplasty.

AVR: Aortic Valve Replacement.

FMR: Functional Mitral Regurge.

AF: Atrial Fibrillation.

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Mitral regurgitation (MR) is a common finding in patients undergoing aortic valve replacement (AVR) with an incidence of more than half of patients being evaluated preoperatively. Functional Mitral regurgitation (MR) is common in patients with severe aortic pathology and can predispose to atrial fibrillation, heart failure, and a need for mitral valve surgery during aortic valve replacement (AVR). Co-existent mitral regurgitation may adversely influence both the morbidity and mortality in patients undergoing aortic valve replacement⁽¹⁾. It is accepted that concomitant mitral surgical intervention will be required in severe, symptomatic mitral regurgitation, however in cases of moderate non structural mitral regurgitation, improvement may be seen following aortic valve replacement only, avoiding the increased risk of double valve surgery. The precise benefit of such a conservative approach is yet to be adequately quantified. Some studies suggested that coexistent moderate MR may significantly increase both early and late mortality after AVR, studies also suggested that concomitant mitral surgical intervention should be considered even in the presence of moderate MR, whatever the aetiology of MR is. However, several lines of evidence have documented that MR often occurs as a result of altered ventricular performance and hemodynamics associated with aortic valve disease and that improvement in the degree of MR can occur after isolated AVR⁽²⁾. Functional MR is a common finding in patients with severe aortic pathology, with an incidence more than 60%. Its management, therefore, is of great importance as simultaneous repair or replacement of MR maybe associated with higher postoperative morbidity and mortality according to some investigators⁽³⁾. In our study we used to compare results of mitral valve repair versus the conservative approach, by leaving the mitral valve without any surgical intervention in patients with moderate functional mitral regurgitation in the setting of AVR.

METHODS

Study Population

Between April 2012 and March 2014, 32 patients with severe AR and moderate MR were operated upon in Kasr Al Ainy Hospital, 32 patients underwent aortic valve replacement with mechanical valves and had moderate functional mitral regurgitation were classified into 2 groups , group A 16 patients underwent concomitant mitral valve repair with Carpentier rigid ring, group B 16 patients underwent only AVR without approaching mitral valve. FMR was graded preoperatively by echocardiography into 4 grades by measurement of absolute regurgitant jet area, and/or regurgitant jet area relative to left atrial size. The severity of mitral regurgitation (MR) was graded as: mild, 1+ (jet area/left atrial area <10%); moderate,

2+ (jet area/left atrial area 10–20%); moderately severe, 3+ (jet area/left atrial area 20–40%); and severe, 4+ (jet area/left atrial area >40%). Based on regurgitant jet area, moderately severe FMR was defined as grade 3 with regurgitant jet area equal or more than 7cm.

Inclusion criteria

- Patients with severe aortic pathology candidate for AVR and have grade 2 functional mitral regurge.

Exclusion criteria

- Mitral regurge due to primary valvular etiologies.
- Mitral regurge grade 3 or 4.
- Redo cases.

End points

Primary end points: 30 days post-operative survival .

Secondary end points: 1-year survival, need for re-hospitalization and degree of mitral regurgitation.

Surgical technique

Conventional median sternotomy, standard cardiopulmonary bypass . Myocardial protection was achieved using antegrade intermittent cold cardioplegia. Standard Aortic valve replacement was performed using bileaflet mechanical valves, in patients who underwent mitral valve surgery had mitral repair with rigid Carpentier ring through classical left atriotomy incision.

Follow-up

Patients were seen and followed-up in an out patient clinic with physical examination, electrocardiography and echocardiography. All patients had an echocardiographic assessment at 1-year follow-up.

RESULTS

The mean age of the patients was 39 ± 11.5 yrs. The mean ejection fraction (EF) was 49 ± 7.8 % . Most of the patients were in sinus rhythm (81 %). All patients were in NYHA grade I- II (100%). Table 1 summarizes the preoperative patient characteristics.

All patients (n=32) underwent aortic valve replacement by a mechanical bi-leaflet valve. Three sizes were used, size 23 in 21 patients (66%) , size 25 in 8 patients (25%) and size 27 was used in 3 patients (9%). Concomitant mitral valve ring annuloplasty was performed in all patients of group A , rigid Carpentier ring size 30 was used in 7 patients (44%), size 32

was used in 7 patients (44%) and size 34 was used in 2 patients (12%). mean cross clamp time was 73 ± 16 minutes in group A compared to 48 ± 17 minutes in group B with statistically significant difference (p value 0.05). The base line clinical and echocardiographic characteristics, together with the relevant operative data are summarized in table 1.

Age (mean \pm SD)	29 \pm 9.5 yrs
EF %	49 \pm 7.8 %
LVEDD (mm)	68 \pm 3.4
LVESD (mm)	54 \pm 4.6
PAP (mmHg)	36 \pm 10.5
AF (%)	6 (9%)
Aortic valve size 23	21 (66%)
Aortic valve size 25	8 (25%)
Aortic valve size 27	3 (9%)
Mitral ring size 30 in group A	7 (44%)
Mitral ring size 32 in group A	7 (44%)
Mitral ring size 34 in group A	2 (12%)

AF: atrial fibrillation; EDD: left ventricle end diastolic dimension; EF: ejection fraction; ESD: left ventricle end systolic dimension; NYHA: New York heart association; PAP: pulmonary artery pressure;

Table 1. Preoperative and operative patient characteristics

30 days post-operative survival was 100 %. At hospital discharge there was no significant difference in NYHA functional class compared to preoperative values. All patients were NYHA class I- II (100%).

The Echocardiography study done at 1-year post-operative period showed decreased left ventricular dimensions (EDD 54 ± 3.7 , ESD 35 ± 3.1) as compared to the preoperative values (EDD 68 ± 3.4 , ESD 54 ± 4.6) with statistically significant difference (p=0.03). Nevertheless, there was a significant improvement in EF at 1- year follow-up it went up from a mean of 49 ± 7.8 % to a mean of 59 ± 6.7 (p=0.04).

At 1 year postoperative 5 patients were not able to come for follow up (2 in group A and 3 in group B). Only 2 patient in group B were in NYHA class III (12%) and both were AF pre-operatively. Only one of these two patients needed re-hospitalization for symptoms of congestive heart failure. He had chronic AF. The patient was admitted to the hospital at 9

months for de-compensated heart failure, received intravenous diuretics and was later discharged after 6 days after losing the excess edema fluid and improvement of his clinical condition.

The NYHA class of the patients at 1-year did not differ much as compared to hospital discharge data. Other than the single patient who needed re-hospitalization for CHF, no other patient needed re-hospitalization. No patients in both groups required re-operation during the 1-year follow up period. There was a tendency for better MR regression in group A compared to group B but without statistical significance. 1 year postoperative follow-up data showed no significant statistical difference between both groups (p value > 0.05).

Table 2 reports postoperative data at 1-year follow up.

	Group A	Group B
Death	0 (0%)	0 (0%)
NYHA class		
I-II	14(100%)	11(85%)
III	0(0%)	2(15%)
Re-hospitalization for HF	0(0%)	1 (6 %)
EF %	61 \pm 7.1	58.2 \pm 6.7
LVEDD (mm)	53 \pm 4.2	56 \pm 4.0
LVESD (mm)	34 \pm 3.0	37 \pm 4.1
Trivial MR	9(63%)	4(38%)
Grade 1 MR	5(37%)	7(50%)
Grade 2 MR	0(0%)	1(6%)
Grade 3 MR	0(0%)	1(6%)

EF: ejection fraction; HF: heart failure; LVEDD: left ventricle end diastolic dimension; LVESD: left ventricle end systolic dimension; NYHA: New York heart association

Table 2. 1-year follow-up data :

Statistical Methods

Data were statistically described in terms of mean \pm standard deviation (\pm S.D), frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student t test for independent samples. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. p-values less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

Discussion

Mitral valve regurgitation is usually associated with severe aortic valve pathology, Double valve surgery is indicated when there is associated severe MR, but unlike with aortic valve replacement alone, the mortality rate associated with this procedure is higher⁽⁴⁾. Controversy in the literature is still present as whether to operate or not on the mitral valve in patients with moderate MR associated with aortic valve pathology requiring Aortic valve replacement. Many authors have concluded that only patients with functional MR might improve after aortic valve replacement, in patients who underwent isolated aortic valve replacement, it was found that when moderate MR is associated with the aortic pathology, improvement of MR was eminent only in patients with a functional aetiology, while MR due to other aetiologies (rheumatic, calcific, ischaemic, myxomatous) remained the same or even worsened⁽⁵⁾. It was found that moderate MR was an independent risk factor affecting the long-term survival in patients undergoing aortic valve replacement. In a systematic literature review and meta-analysis of 3053 patients undergoing aortic valve replacement with co-existing MR, it was found that moderate to severe MR adversely affects both early and late mortality rates following aortic valve replacement, therefore a concomitant mitral intervention should be considered in the presence of moderate MR whatever the aetiology is⁽³⁾. Conversely, others from the Mayo clinic found that, in 686 patients with at least moderate MR undergoing aortic valve replacement, moderate functional MR improved in the majority of patients after aortic valve replacement and that residual MR did not affect survival irrespective of left ventricular function⁽⁶⁾. There is evidence suggesting that relief of the aortic valve disease results in some reduction in MR without mitral valve surgery. The regression of left ventricular size and resolution of volume overload may promote further reduction in MR. Several studies demonstrated that functional MR have decreased in the majority of patients postoperatively⁽⁷⁾. In our study, the primary end point regarding 30 day postoperative mortality showed no difference between both groups as we had no mortalities in both groups, however echocardiography results at time of discharge showed early perfect correction of MR in patients who underwent mitral annuloplasty. At 1 year postoperatively, our secondary end point showed no difference in survival as both groups showed no mortalities. Only one patient in group B needed re-hospitalization for symptoms of congestive heart failure for 6 days, salt and fluid restriction with intravenous diuretics and atrial fibrillation rate control were sufficient to improve his condition. Echocardiography was done at 1 year postoperatively, 5 patients (2 in group A and 3 in group B) were missing in the setting of echocardiogram. Most patients in group A showed regression of MR degree to trivial or grade 1, most patients in group B showed regression of their MR degree with only 2 patients who did not show any regression and even one patient showed progression to grade 3 MR and experienced symptoms of congestive heart failure, there was no statistical significant difference between both

groups regarding improvement of the degree of MR, however there was a tendency for better results for the annuloplasty group even as early as the time of discharge from the hospital. Our results were convenient with Gonçalo F. Coutinho et al, who concluded that without mitral valve surgery, secondary MR improved after AVR. Concomitant mitral surgery had no significant impact on survival but was significantly associated with greater improvement of postoperative MR⁽⁸⁾. On the other hand, Ramdas G. Pai et al, concluded that MR is a common finding in patients with severe AR. It is an independent predictor of reduced survival. Performance of AVR together with mitral valve repair is associated with better survival. Development of MR should be considered as an indication for AVR even in asymptomatic patients⁽⁹⁾. In many studies AVR was followed by significant reverse cardiac remodeling regardless of mitral valve surgery being performed or not. However, the degree of improvement was greater in those who had mitral valve surgery. Cardiac remodeling and improvement of MR after surgery are directly related to each other and go hand in hand. It was documented that the decrease in MR observed in most patients after AVR was associated with the degree of left ventricular reverse remodeling⁽¹⁰⁾. We found that preoperative AF was associated with poor and unfavorable outcome in group B, Matsumura and Gilinov also found that the presence of long term AF was an independent predictor of the severity of postoperative MR. This delineates the importance of taking this pathology into serious consideration during the decision making regarding moderate functional MR in the setting of AVR⁽¹¹⁾.

In conclusion, management of moderate functional MR in setting of AVR is still controversial, conservative approach seems acceptable with sufficient regression of MR as well as no deleterious effect on survival. However, mitral annuloplasty was associated with early perfect results as proven by echocardiography. The presence of AF may be an indication for mitral intervention in this cohort of patients.

LIMITATIONS OF THE STUDY

1. Longer period of follow up may be needed to collect more precise data.
2. Lack of precise guidelines in the literature regarding clear indications for management of functional MR in the setting of AVR.

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