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TO DO, OR NOT TO DO: TRICUSPID VALVE REPAIR (IN FUNCTIONAL TR SECONDARY TO MITRAL DISEASE)

Cardiovascular

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ABSTRACT

Introduction: Functional TR has historically been left untreated based on the assumption that TR will improve if primary pathology is corrected. Data has suggested that this practice leads to poorer long-term outcomes. There is still ongoing debate over the optimal treatment of TR secondary to mitral valve disease. We at Dr. RML Hospital, New Delhi present our retrospective analysis of 140 patients undergoing MVR who had moderate or more TR, as well as a short review of literature on management of TR at the time of mitral valve replacement

Methods: A retrospective analysis of 140 consecutive patients who underwent MVR with moderate or more TR from 2018 to 2021. Patients were divided in 2 groups depending upon if they received primary TVr (treated group) or not (untreated group). At our centre, the need for tricuspid repair was guided by the severity of TR and tricuspid index. Patients requiring DVR or correction of other pathologies were excluded. Patients were followed-up on clinical assessment as well as echocardiography.

Results: 92 patients were in group A and 48 in group B. There was no statistically significant difference between the 2 groups in terms of demographics, length of hospital stay, need for inotropic support postoperatively. There was no perioperative mortality. 59 patients in group A had decreased TR on follow up whereas 30 had no change with only 3 having increased TR. In group B 15 had increased TR with no change in 31 with only 2 patients having decreased TR.

Conclusion: Concomitant tricuspid valve repair with mitral valve surgery offers optimal long term results with acceptable short term morbidity and mortality and should be offered to patients with moderate or severe TR with tricuspid index >2.1 cm/m2

KEYWORDS

Secondary TR, TV Regurgitation; Functional TR; Tricuspid Annuloplasty

INTRODUCTION

Functional Tricuspid Regurgitation is regurgitation secondary to left sided valvular lesions owing to raised PA pressures and RV dilatation and dysfunction. It is a common entity associated with mitral stenosis with a reported incidence of up to 40%.(1) Functional TR has historically been left untreated based on the assumption that it will improve if primary pathology is corrected.

In late 1950s, Angelino et al studied the "effect of mitral valvulotomy on tricuspid insufficiency associated with mitral stenosis" and reported "resolution of TR after mitral valvulotomy."(2) In 1960s, Braunwald (3) recommended conservative management of severe TR in mitral valve replacement patients reasoning that improvement in pulmonary artery hypertension will decrease associated RV dysfunction and TR.

In 1976 Breyer group compared the outcomes of conservative approach with tricuspid annuloplasty and TV replacement and found higher incidence of clinically significant TR and congestive heart failure in patients managed with conservative approach and recommended TV replacement as ideal treatment option for patients who have moderate or more TR.(4)

Now, with decades of clinical experience, widely available echocardiography, ever improving treatment guidelines and surgical outcomes, there is still debate over management of this common entity with the final decision resting with the individual surgeon and their experience.

We at Department of Cardiothoracic and Vascular surgery, Dr. RML Hospital, New Delhi present our retrospective analysis of 140 patients undergoing MVR who had moderate or more TR as well as a short review of literature on management of TR at the time of mitral valve replacement.

METHODS

We included 140 consecutive patients who underwent mitral valve intervention due to rheumatic heart disease at Dr. RML Hospital, New Delhi in the form of Mitral Valve Replacement with or without Tricuspid valve repair, who had moderate or severe TR from January 2018 to December 2021 for this retrospective analysis.

Patients were divided into 2 groups depending upon if they received primary Tricuspid valve repair (Group A - MVR + TV repair group; n=92; 65.7%) or not (Group B - Only MVR group; n=48; 34.3%).

At our centre, the need for tricuspid repair was guided by the tricuspid index; an index of >2.1 cm/m^2 was taken for TV repair. Tricuspid index was calculated by dividing tricuspid annulus in cm by body surface area in m^2. Tricuspid annulus diameter was measured by 2D echo in apical four chamber view in diastole. Rigid ring annuloplasty was done in all patients in group A.

Patients with mild TR as well as those requiring double valve replacement or correction of other pathologies such as ASD were excluded from this review. Patients who had presented with heart failure were also excluded.

The average follow-up period was 1.5 year, ranging from 3 months to 3 years.

Patients were followed up clinically as well as with echocardiography at out center.

Surgical Procedure

All patients were operated under general anaesthesia. Midline sternotomy was utilised in all the cases with total CPB with aorto-bicaval cannulation as standard approach. Del Nido Cardioplegia was

used in all cases. Mitral valve was replaced with mechanical prosthesis (St. Jude Medical's MVP) in both the groups using interrupted pledgeted sutures. Rigid, incomplete ring annuloplasty (Carpentier-Edwards Physio Tricuspid annuloplasty ring) with interrupted pledgeted sutures was used in group A for Tricuspid valve repair.

RESULTS

92 (65.7%) patients were in group A and 48 (34.3%) in group B. 85 were females and 55 were males with age ranging from 12 years to 70 years (median age 35). There was no perioperative mortality. There was no statistically significant difference between the 2 groups in terms of demographics, length of hospital stay, need for inotropic support postoperatively. Patient data is given in Table 1.

97 patients had severe MS, 8 had Moderate MS, 61 had Severe MR, 25 had moderate and 12 had mild MR (Figure 1-2). TR was severe in 82, moderate in 58 patients (Figure 3). Average Tricuspid index was 2.1 cm/m^2. 11 patients had a history of previous intervention for mitral valve in the form of PTMC in 6, CMV in 4 & OMV in 1 case.

59 patients in group A had decreased TR on follow up whereas 30 had no change with only 3 having increased TR. In group B 15 had increased TR with no change in 31 with only 2 patients having decreased TR (Figure 4).

All the patients in the review reported symptomatic improvement at follow-up (NYHA III/IV to NYHA I/II) with no statistically significant difference between the 2 groups.

Table 1. Patient Data

	Group A	Group B	Total
Sex			
Male	35 (38%)	20 (41.7%)	55 (39.3%)
Female	57 (62%)	28 (58.3%)	85 (60.7%)
Age	12-66 (Median 35.5)	13-70 (Median 34)	12-70 (Median 35)
MS			
Mild	0	0	0
Moderate	6	2	8
Severe	65	32	97
MR			
Mild	10	2	12
Moderate	17	8	25
Severe	39	22	61
TR			
Moderate	23	35	58
Severe	69	13	82
Average Tricuspid Index	2.5 cm/m^2	1.7 cm/m^2	2.1 cm/m^2
Previous mitral intervention	9 (9.8%)	2 (4.2%)	11
Post Op TR			
Increased	3 (3.3%)	15 (31.3%)	18 (12.8%)
Decreased	59 (64.1%)	2 (4.2%)	61 (43.6%)
No change	30 (32.6%)	31 (64.5%)	61 (43.6%)

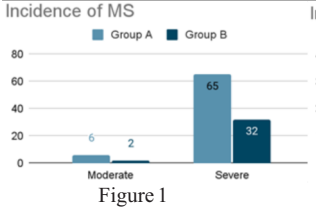

Figure 1

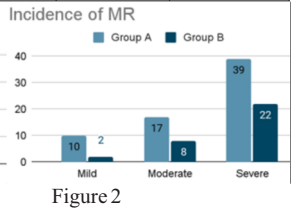

Figure 2

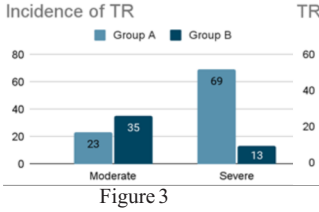

Figure 3

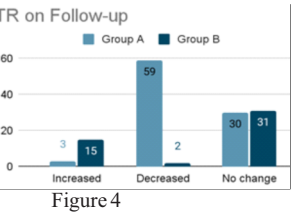

Figure 4

DISCUSSION

Functional or secondary tricuspid regurgitation without an organic cause is commonly associated with mitral disease of all causes.

A review of STS database of around 88000 patients who received mitral valve repair or replacement had 17.2% incidence of moderate TR and 8.5% incidence of Severe TR.(5) Patients having significant MS have a higher incidence of TR due to higher pulmonary artery pressures. One third of the patients with severe MS can have clinically significant TR defined as moderate or above.(6) Other publications suggest 30% patients of secondary mitral regurgitation (MR) have moderate or greater TR.(7)

The causes of functional TR after mitral valve surgery may include:
1. Continuing expansion of right ventricle and tricuspid annulus;
2. Persistent pulmonary artery hypertension that may cause right ventricular dilatation and dysfunction(8);
3. Residual stenosis and insufficiency of mitral valve lead to functional TR;
4. Myocardial fibrosis in patient with rheumatic heart disease that can aggravate the right ventricular dysfunction, which is followed by TR;
5. Severe cardiac arrhythmia that worsens the right ventricular function;
6. Right ventricular dysfunction following intraoperative or postoperative ventricular ischemia.(9)

Recent data suggests not performing tricuspid repair at the time of mitral valve surgery is associated with progressive TR with rheumatic etiology responsible for highest incidence of worsening of TR.(10,11) Our data shows 31.3% incidence of worsening TR in Group B vs 3.3% in Group A.

Although there is symptomatic improvement in both the groups, it must be noted that Tricuspid Regurgitation is an independent risk factor for decreased long term survival.(12) Correction of mitral valve lesion may reduce TR transiently with gradual increase over years. This is responsible for decreasing exercise tolerance.(13)

Kim et al in 2012 reported significantly higher cardiac related complications as well as mortality associated with TR after mitral surgery based on clinical and echocardiographic findings.(11)

In our data, 9 patients in group A had a history of previous mitral valve intervention versus 2 in group B. Mean interval between previous mitral intervention and replacement was 16.4 years in group A and 10.2 years in group B. This indicates patients with longer disease courses eventually need tricuspid repair.

In 2005, Dreyfus's group introduced the concept of "prophylactic tricuspid annuloplasty" regardless of degree of TR. They reported high incidence of abnormal dilatation of TV annulus in mitral valve repair patients and that there was progressive TR in untreated patients.(14)

Current guidelines provided by ACC/AHA and European societies give a class IIa recommendation for patients with mild or moderate TR at the time of left sided valve surgery with tricuspid annular dilation (which is defined as tricuspid annulus >40 mm or indexed annulus >21 mm/m^2 or >70 mm on direct intraoperative measurement) and a class I recommendation for repair of severe TR at the time of left-sided valve surgery.(15–17)

Sordelli in 2016 and David(18) in 2018 opposed the notion that dilated TV annulus predicts progression of TR. Data by the Sordelli's group showed dilated TV annulus at the time of mitral valve surgery was not predictive of progression of TR at a mean follow-up of 2 years.(18) They recommended against prophylactic annuloplasty in the absence of TR. David et al found Tricuspid annulus ≥40 mm is not predictive of the development of postoperative TR after MV repair after a follow-up of almost 7 years. They concluded that pre-operative moderate TR is the most consistent predictor of regurgitation post-operatively.(19)

Due to conflicting data, personal preferences and experience of the surgeon often guides the decision on management of functional TR. Badhwar's study based on Society of Thoracic Surgeons database showed TV intervention was performed in 75% of patients with severe TR and 3% with mild TR with overall incidence of 14% with all MV surgeries. They also concluded TV repair at the time of mitral valve surgery is not associated with increased mortality and long term benefits might outweigh short term increase in morbidity (higher incidence of conduction abnormalities with TR repair).(5)

CONCLUSION

Based on the data and available literature, concomitant tricuspid valve

repair with mitral valve surgery offers optimal long term results with acceptable short term morbidity and mortality and should be offered to patients with moderate or severe TR with tricuspid index >2.1 cm/m^2

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