

Outcome of Moderate Functional Tricuspid Regurge Using Tricuspid Valve Suture Annuloplasty vs. Conservative Approach in Patients Undergoing Mitral Valve Replacement

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Objectives : We investigated the early outcome in patients with moderate tricuspid regurge undergoing mitral valve surgery and at 1year after operation to assess weather suture annuloplasty was associated with better results than conservative technique or not.

Methods: We reviewed patients, prospectively, who underwent suture tricuspid annuloplasty (n=34) versus those who had conservative approach(n=34) by leaving the tricuspid valve un attacked in the settings of concomitant mitral valve surgery for rheumatic valve disease with a mean follow up of 12 months.

Results: Thirty day mortality was zero in both groups, tricuspid regurge grade was lower for both groups after 12 months follow up by echocardiography with no significant statistical difference , there was no need for reoperation for tricuspid regurgitation in both groups by the end of the first year post operatively.

Conclusion: Conservative approach was associated with acceptable results, the annuloplasty group showed a tendency for better results in the early post-operative course and for prolonged follow-up periods.

Key words: functional tricuspid regurgitation – suture annuloplasty – rheumatic mitral valve

Significant mitral valve pathology can produce right ventricular pressure and volume overload, leading to right ventricular enlargement and tricuspid annular dilatation resulting in functional tricuspid valve regurgitation. The incidence of functional TR in patients undergoing left heart valve surgery is around 30%⁽¹⁾. Some reports suggest that tricuspid regurgitation can resolve after the diseased mitral valve has been replaced based on well known post-operative regression of pulmonary hypertension⁽²⁾. Others suggest that ignoring a tricuspid valve disease at the time of surgery for left sided pathology can affect the eventual outcome of the patient, and it may be associated with an increase in morbidity and mortality⁽³⁾. Surgical management of moderate to severe TR is widely recommended now to achieve better early and late clinical outcomes⁽⁴⁾. Moderate tricuspid regurge may be controversial during mitral valve surgery, some investigators consider it may regress after successful mitral valve surgery alone while others showed that it may increase in severity later with high possibility of isolated tricuspid intervention with increased morbidity and mortality⁽⁵⁾. In this study we investigated the early postoperative outcome up to 1 year after tricuspid suture annuloplasty for moderate functional TR associated with rheumatic heart disease necessitating valve surgery versus the conservative approach by leaving the tricuspid valve without intervention.

MATERIALS AND METHODS

Patient population:

From September 2012 to August 2014, sixty eight patients underwent mitral valve surgery with or without concomitant tricuspid valve repair. We excluded patients

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with organic tricuspid valve disease. Patients undergoing concomitant CABG, aortic aneurysm and root surgery, infective endocarditis cases, low EF, together with redo cases were also excluded.

Tricuspid regurgitation was scored as follows:

Grade 1: mild regurge

Grade 2: moderate regurge.

Grade 3: moderate-to-severe regurge.

Grade 4: severe regurge.

End points:

The primary end points were:

Postoperative hospital mortality

The degree of tricuspid regurgitation (TR) upon discharge, and at 12 months follow up.

Secondary end points were:

One year survival

Hospital readmission for right-sided heart failure

Need for reoperation for severe TR

Surgical Technique

Conventional median sternotomy, standard cardiopulmonary bypass using bicaval cannulation. Myocardial protection was achieved using antegrade intermittent cold cardioplegia. Mitral valve replacement was performed with preservation of posterior leaflet in all patients. Tricuspid valve annuloplasty was performed under cardiac arrest. Standard DeVega annuloplasty was done in 20 patients, while segmental annuloplasty was done in 14 patients. 2/0 Ethibond sutures were used in all cases of suture annuloplasty group.

Saline infusion test was used to confirm adequate leaflet coaptation and competent valve. Postoperative transthoracic echocardiography was performed upon discharge and 1 year later.

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.

RESULTS

Preoperative characteristics

Preoperative demographics, NYHA class and echocardiography data showed no statistical difference between the 2 groups (Table 1).

	Suture group (n=34)	Conservative group (n=34)	p Value
Age (yrs)	39 \pm 12	37 \pm 11	0.85
Gender			
Male	16 (47%)	19 (56%)	0.7
Female	18 (53%)	15 (44%)	0.6
CPB Time (Min)	80 \pm 27	64 \pm 23	0.15
Cross-Clamp Time (Min)	64 \pm 23	50 \pm 22	0.1
NYHA Functional Class	3.2 \pm 0.6	3 \pm 0.9	0.5
PAP (mmHg)	67 \pm 18	64 \pm 29	0.7
Right vent. diameter	23 \pm 6	23 \pm 5	0.9
EF	64 \pm 4.5	63 \pm 5	0.8

Table 1. Pre-operative patients characteristics

Endpoints:

Primary endpoints:

Hospital mortality:

All patients in both groups were discharged from hospital in a good condition with no hospital mortality.

Postoperative TR grade:

There was significant improvement of TR grade postoperatively in group A compared to group B. The mean TR at discharge for the suture group was 1.1 \pm 0.33 and the mean TR grade for the conservative group was 1.9 \pm 0.43 (p value 0.045).

TR grade	Suture group (n=34)	
	At discharge (n=34)	12 month post op (n=28)
1	27	12
2	7	14
3	0	2
Mean \pm SD	1.1 \pm 0.33	1.7 \pm 0.55

Table 2. Postoperative TR grade for suture annuloplasty group

Conservative group (n=34)		
TR grade	At discharge (n=34)	1 yr post op (n=27)
1	6	6
2	28	18
3	0	3
Mean ± SD	1.9 ± 0.43	2.14 ± 0.79

Table 3. Highlights TR grades at time of discharge and at 1 year for conservative group.

The mean TR grade for the suture group at 12 months was 1.7±0.55, and for the conservative group was 2.14 ± 0.79 with statistically significant difference between the 2 groups (p value 0.04). Tables 2 and 3 capture the detailed hospital discharge and 12 months TR grades for both groups.

	Suture group (n=34)	Conservative group (n=34)	p Value
NYHA Functional Class	1.4± 0.6	1.6± 0.9	0.5
PAP (mmHg)	33 ± 18	38 ± 29	0.1
Right vent. diameter	21±6	22±5	0.3
EF	65±4	63±6	0.7

Table 4. Post-operative patients characteristics

Secondary endpoints:

12 months survival:

1 patient in the suture group died. patient died due to massive retro- peritoneal hemorrhage complicating warfarin toxicity 8 weeks after discharge).

In the conservative group 2 patient died. One patient 3 weeks after discharge. The patient was admitted in the ER suffering from cardiac tamponade and an INR of 8. He went rapidly into cardiac arrest with failed attempts of resuscitation. The other patient died from prosthetic valve endocarditis 3 month after surgery.

Hospital readmission for right-sided heart failure:

Over the 12 months period of the study, none of the patients in both groups needed to be readmitted to the hospital to control right-sided heart failure.

Re-operation:

After 1 year follow up and despite that some patients had tricuspid regurg grade 3 there was no need for reoperation and patients were compensated on anti-failure measures.

DISCUSSION

The incidence of moderate functional TR in patients undergoing left heart valve surgery is 27 – 30%⁽⁶⁾. Functional TR occurs primarily due to annular dilatation and subsequently failure of leaflet coaptation. Annular tricuspid dilatation occurs mainly in its anterior and posterior aspects, which may cause significant functional TR as a result of leaflet mal-coaptation.⁽⁷⁾ In the setting of severe functional TR surgery for tricuspid valve is highly recommended by surgeons and guidelines. Many authors suggested that tricuspid annular dilatation is an ongoing pathology that once the tricuspid annulus is dilated, its size may not spontaneously return to normal and may dilate further⁽⁸⁾. They advise early surgical correction regardless of the severity of TR. This is due to the fact that uncorrected TR even without severe annular dilatation may worsen or persist after mitral valve surgery, which leads to progressive heart failure and poor survival⁽³⁾.

In the setting of moderate functional TR it remains controversial, some authors find annuloplasty is a better option to avoid late progression to severe regurg with increased morbidity and mortality specially if a redo isolated tricuspid surgery become mandatory⁽³⁾, others stated that moderate functional TR is well tolerated after correction of the mitral valve pathology in long standing affection as post-operatively there was a marked reduction in pulmonary arterial pressures and pulmonary vascular resistance, and an improvement in cardiac indices and NYHA status^{(2),(13)}. Few surgeons suggest that even in presence of mild TR surgery is recommended if a patient has atrial fibrillation or pulmonary hypertension⁽⁹⁾. Some investigators see that complete right ventricular remodeling may not occur, and normalization of pulmonary arterial pressures alone may be insufficient to eliminate functional TR⁽¹⁰⁾. Severe functional TR requires intervention during surgery of the mitral valve, and this is a class I indication. The current ESC guidelines (2012) have been modified and suggest that 'surgery should be considered in patients with moderate secondary TR with dilated annulus (>40 mm) undergoing left-side valve surgery' (Class IIa indication, level of evidence C)⁽¹¹⁾.

The American Heart Association/American College of Cardiology (AHA/ACC) guidelines (2014) give very similar recommendations, in addition indicating that 'tricuspid valve repair may be considered for patients with moderate functional TR and pulmonary artery hypertension at the time of left-side valve surgery' (Class IIa indication, level of evidence C)⁽¹²⁾. In case of moderate functional tricuspid regurg there are no strict guidelines and it remains controversial.

In our study we found that annuloplasty had better immediate and 1-year post-operative follow up results regarding the degree of TR echocardiographically. However, clinically no patient required re-hospitalization for management of considerable heart failure and there was no indication for re-operation in both groups.

And although a higher proportion of patients in the conservative group was in grade 2 or 3 tricuspid regurgitation compared to the annuloplasty group, all of them were kept compensated on small doses of anti failure measures.

This was convenient with data obtained by Yilmaz, et al. and who concluded that TV annuloplasty is rarely necessary for MV disease because TR progression after MV surgery is unlikely. They insisted that progression of TR was clinically insignificant and did not lead to the risk of further surgery⁽¹³⁾. Those patients often require substantial doses of diuretics to maintain Euvolemia⁽⁸⁾.

There were no differences in survival and freedom from major cardiac or cerebro-vascular adverse events between the two groups.

Nath et al. found that The 1-year survival rates for patients were 90.3% with mild TR, 78.9% with moderate TR and 63.9% with severe TR. Patients with moderate and severe functional TR had a 15 and 30% lower 1-year survival, respectively, than those without secondary tricuspid regurgitation, independent of left ventricular ejection fraction or pulmonary arterial pressures⁽¹⁴⁾. Kim *et al.* found that in patients with moderate functional TR who underwent isolated mechanical MV replacement for the first time with a median follow-up of 48.7 months, freedom from moderate-to-severe TR at 5 years was 92.9±2.9% in the repair group, and 60.8 ± 6.9% in the conservative group⁽⁵⁾.

Matsuyama found that repair of moderate functional tricuspid regurgitation in the setting of mitral valve surgery is better, in order to avoid future progression specially in the presence of atrial fibrillation and a huge atrium⁽¹⁵⁾.

Limitations

Small number of patients.

Short period of follow up.

Single institution experience .

There was no chance to examine effect and results of ring annuloplasty which is considered 1st level of care to repair tricuspid valve.

CONCLUSION

Conservative approach in cases of moderate functional tricuspid regurgitation in the settings of mitral valve surgery is an accepted option in terms of immediate and 1-year

post-operative follow up with tendency for better results in cases of concomitant suture annuloplasty for prolonged follow up period on a larger cohort of patients to confirm.

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