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Retrospective Study to Compare Ring Annuloplasty and Suture Annuloplasty in Tricuspid Valve Diseases

Dr. Dwarkanath Kulkarni[1], Dr.Kamlesh Jain[2], Dr. Menander M[3], Dr Uday Jadhav[4]
[1,2,3,4](Department of CVTS, Seth GSMC& KEM Hospital/ MUHS,India)

Abstract: *The Tricuspid regurgitation may be primary or secondary to left sided heart disease Residual tricuspid regurgitation is seen after tricuspid valve annuloplasty(TVA) – both ring and suture anuloplasty. A study was conducted in KEM Hospital as to validate the benefits of ring annuloplasty over suture anoloplasty. 80 patients undergoing MVR and TVA were studied. Of these 50 patients underwent MVR with ring annuloplasty and 30 underwent MVR with DeVegas annuloplasty. 2DECHO was done pre and postoperatively to determine pulmonary artery systolic pressure(PASP), grade of tricuspid regurgitation (TR), LV ejection fraction(LVEF) and tricuspid annulus. 82% of patients of ring annuloplasty group had reduction in PASP postoperatively compared to 56% in DeVegas annuloplasty . Grade of TR improved from moderately severe TR to mild TR in 86% in the ring annuloplasty group compared to53% in DeVegas annuloplasty group. 58% of patients of ring annuloplasty had maintained LV function postoperatively compared to 46% of patients in DeVegas annuloplasty.The mean tricuspid annulus showed reduction from preoperative annulus size of 37.72 to 27.5 in ring annuloplasty group and from 37.9to 27.13 in DeVegas annuloplasty group. Tricuspid ring annuloplasty is a better and durable repaire compared to suture annuloplasty for secondary TR. Aggressive management of secondary TR such as this could hopefully decreas the occurence of late TR following previous left sided valve surgery*

Keywords: *DeVegas annuloplasty, Ring annuloplasty, Tricuspid regurgitation*

I. Introduction

Right sided valvular heart disease was traditionally considered less important clinically than left sided lesions. Aggressive approach has been followed in the recent years owing advances in cardiac imaging in echocardiography (ECHO) and cardiac magnetic resonance imaging(MRI) have led to greater understanding of complex anatomy of tricuspid valve and its involvement in various diseases like Rheumatic heart disease(RHD), myxomatous changes, degenerative changes, Ebstein's anomaly etc. This has led to aggressive management of tricuspid diseases, most notably tricuspid regurgitation (TR)[1].

Tricuspid regurgitation is more common than tricuspid stenosis can be classified as primary or organic due to organic affection of tricuspid valve and secondary or functional as a result of left sided heart disease or pulmonary hypertension in the absence of organic disease of tricuspid valve [2]The most common etiology of secondary tricuspid regurgitation is right ventricular dilation and dysfunction from LHD [3]. Dilated cardiomyopathy and hypertensive pulmonary disease are less frequent causes of functional tricuspid regurgitation [3,4]Various techniques of tricuspid valve repair in secondary tricuspid regurgitation due to Rheumatic heart disease with or without annuloplasty ring have been reported in literature with significant residual TR[5,6,7,8,9.] A study was conducted in KEM hospital as to validate the benefits of ring annuloplasty [TVA] over suture annuloplasty.

II. Aim

To study the superiority of ring annuloplasty over suture annuloplasty in secondary tricuspid regurgitation

III. Material and Method

Retrospective study with 80 patients who have undergone MVR along with tricuspid valve annuloplasty in the form of DeVega's or ring annuloplasty at KEM Hospital Mumbai were included in the study.

Subjects were divided into 2 groups based on the surgical techniques followed.

- Mitral valve replacement with ring annuloplasty
- Mitral valve replacement with Devegas annuloplasty

Subjects were investigated by means of blood investigations- complete blood count, renal and liver function tests, random blood sugar, fasting and post prandial blood sugar levels, Human Immunodeficiency Virus, Hepatitis B surface Antigen and Hepatitis C Virus, electrogardiograph (ECG), echocardiography (2 D-

ECHO), and diagnostic coronary angiogram (CAG) for patients above 40 years and those with risk factors for coronary artery disease (CAD).

Inclusion Criteria:
Age more than 12 years History of RHD in the past Patients with significant mitral valvular disease

Exclusion Criteria:
Patients with associated CAD Patients with mitral and aortic valve disease Patients with severely depressed left ventricular function with risks of surgery out weighing benefits

IV. Surgical Technique

Patients underwent median sternotomy/anterior thoracotomy under general anesthesia. Cardiopulmonary bypass was established using ascending aortic and bicaval annulation and through femoral vessels in minimally invasive cases. Cardioplegia was established through cold antegrade sanguinous cardioplegia with systemic hypothermia. MVR TVA was done either through bi atrial approach, wherein tricuspid was approached by opening right atrium once concomitant mitral procedure was done through left atrium. The other approach was through right atrium and to approach mitral valve transeptally by incising interatrial septum and proceeding with tricuspid valve repair once mitral valve was replaced and interatrial septum was closed.

ECHO was done pre operatively, and three months after discharge.

Criteria Of Study

Patients were studies with the following criteria based on ECHO Preoperative and post operative PASP Preoperative and post operative Grade of Tricuspid regurgitation Preoperative and post operative left ventricular ejection fraction Tricuspid annulus size

V. Result

1. 82% of patients of ring annuloplasty group had reduction in PASP post operatively compared to 56% in DeVegas annuloplasty group
2. Grade of regurgitation improved from moderately severe TR to mild TR in 86%, moderately severe TR to moderate TR in 10% in ring annuloplasty group compared to 53% and 40% in DeVegas annuloplasty group
3. 58% of patients of ring annuloplasty had maintained LV function post operatively compared to 46% of patients in DeVegas annuloplasty group
4. The mean tricuspid annulus showed reduction from pre op annulus size of 37.72 to 27.5 in ring annuloplasty group to 37.9 to 27.13 in DeVegas annuloplasty group

VI. Discussion

Management of secondary tricuspid regurgitation includes optimization of right ventricular preload and afterload adjunct to surgical methods[3]. Neither suture nor ring annuloplasty consistently eliminate functional tricuspid regurgitation [10,11]. The recurrence rate of significant tricuspid insufficiency after tricuspid annuloplasty has been attributed to several factors, including the severity of preoperative tricuspid regurgitation , pulmonary hypertension, the presence of pacemakers, left ventricular dysfunction, increased left ventricular remodelling, severe tethering of the tricuspid leaflets and the use of suture rather than ring annuloplasty [10,11,12,13]

Both the American College of Cardiology/American Heart Association (ACC/AHA) and the European Society of Cardiology (ESC) recommend (Class I) performing mitral valve surgery with tricuspid annuloplasty for patients with severe TR.[14,15] The ESC also recommends (Class IIa) simultaneous tricuspid annuloplasty for patients with a tricuspid valve diameter > 40 mm or moderate TR [15]. In contrast, the ACC/AHA recommends (Class IIb) simultaneous tricuspid annuloplasty for patients with moderate or mild TR [14]. The ESC also recommends (Class IIa) tricuspid annuloplasty before right heart failure and severe pulmonary hypertension if there are isolated symptoms of TR after left heart valve surgery[15]. Antunes and Barlow have suggested that tricuspid annuloplasty should be performed for patients with greater than mild TR and at least one of the following: rheumatic valve disease; tricuspid valve annulus diameter > 21 mm/m^2; expansion of the right heart chamber; expansion of the inferior vena cava; or right ventricular overload. [16]

Among the variables studied for the recurrence of TR, annuloplasty type (De Vega procedure) and high preoperative PASP were risk factors for TR recurrence. Low left ventricular ejection fraction was also a risk factor for TR recurrence. Age, gender, preoperative NYHA class, right ventricular dysfunction (high right ventricular diameter and body edema) was not a risk factor for TR recurrence. [17]

A novel index for implanting tricuspid ring known has TARI(Tricuspid Annuloplasty Ring Index) has been proposed by Fujita et al. TARI is the ratio of implanted ring size to BSA. TARI less than 18.9 is better in controlling TR post surgery.[18]

VII. Conclusion

There is no quantitative index available for determining whether surgery for TR is necessary in patients undergoing mitral valve replacement. Tricuspid ring annuloplasty is a durable repair compared to suture annuloplasty for secondary tricuspid regurgitation. Aggressive management of secondary tricuspid regurgitation such as this could hopefully decrease the occurrence of late tricuspid regurgitation following previous left sided valve surgery.

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