ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 05 | May - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

IS LIMITED TRICUSPID VALVE ANNULOPLASTY ADEQUATE FOR TRICUSPID VALVE REPAIR WITH CONCOMITANT DOUBLE VALVES REPLACEMENT?

Cardiothoracis

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KEYWORDS

Introduction:
In our own surgical experience over the last 6 years, in cases of double valve replacement with tricuspid valve annuloplasty we noticed that:

1. The tricuspid ring sutures placement was of very difficult in antero-septal commissural area as it was obscured by the projections from the aortic and mitral valve prosthesis sewing ring into right atrium.
2. The seating of the annuloplasty ring was hindered and result in intraoperative suture cut through from the annulus.
3. In immediate post-operative period, we observed significant sinus node dysfunction in the form of bradycardia and junctional rhythm.

To address these issues, we devised a J-band cut from the Teflon sheet. The tricuspid annulus was first sized with the help of tricuspid ring sizer. Then the adequate ring sizer was placed on Teflon sheet and the corresponding J- shaped felt is cut out from sheet just medial to the septo-posterior commissure marked from 5' o clock to the 10' o clock position corresponding to the ring sizer and seated to the tricuspid valve annulus with 2-0 polyster suture.

Inclusion criteria: All patient requiring double valve replacement (Aortic and mitral) with tricuspid regurgitation. For tricuspid regurgitation, preoperative evaluation of tricuspid annulus and tricuspid index was calculated. All patient with severe tricuspid regurgitation and moderate tricuspid regurgitation with tricuspid index of 2.2 and more were subjected for annuloplasty.

Material and methods: From August 2019 to August 2021, 7 consecutive patients with diagnosis of rheumatic heart disease who required double valve replacement with tricuspid valve repair using this surgical strategy were includedin the study, in Atal Bihari Vajpayee Institute of Medical sciences (ABVIMS) and associated Dr. R.M.L. hospital, New Delhi, a tertiary care center.

Surgical technique:
Standard median sternotomy and vertical pericardiotomy done in all the patient. After Systemic heparinization and aorto-bicaval canulation, cardiopulmonary bypass was instituted. Myocardial protection was done using cold del Nido cardioplegia delivered through coronary ostia. After the heart was arrested, aortic valve was excised, and annulus was sized using adequate sizer. It was followed by opening of left atrium for mitral valve intervention. In all the patient chordal preservation was done. St. Jude mechanical mitral valve prosthesis was seated using pledgeted 2-0 Ethibond everting sutures. Valve leaflets tested in all the patient. Then LA was closed with 3-0 prolene in single layer. Thereafter, AV annulus was resized and AVR was done using (AGFN and AGN). Aortic Valve Prosthesis seated using pledgeted interrupted everting 2-0 Ethibond sutures. Aortotomy was closed after prosthetic was leaflet was tested with prolene in double layers. Then right atrium was opened after snugging the superior vena cava and inferior vena cava canulae. The tricuspid valve was thoroughly examined. In all the cases annular dilatation was present.

The annulus from 5'o clock to 10' o clock position was already fixed and immobile due to Mitral valve prosthesis and Aortic valve prosthesis. Therefore, placing an annuloplasty ring such as contour 3D annuloplasty ring was difficult. Hence, to address this issue we devised J-shaped flexible band cut out from the Teflon sheet. The correct size was determined by sizing the anterior leaflet of the tricuspid valve using tricuspid valve sizer. Then the adequate ring sizer was placed on the Teflon sheet and J band was cut out from the Teflon sheet. J-band annuloplasty done using Ethibond 2-0 suture which correspond to 5'o clock position to 10'o clock position of the tricuspid valve annulus. Tricuspid valve was checked with saline insufflation for residual tricuspid regurgitation. In all the patient valve was found to be competent. Right atrium closed in single layer. Then weaning off from the cardiopulmonary bypass was done using standard protocol.

Observation:

Table 1. Pre-operative findings of the patients.

Si. No.	Age in yrs/Sex	Wt. in kg	Mitral Lesion	Aortic Lesion	Tricuspid Lesion	Tricuspid Index
1	22/F	36	Severe MR	Severe AR	Severe TR	
2	36/F	39	Severe MR	Severe AR	Moderate TR	2.5
3	40/F	51.5	Severe MR	Severe AS	Moderate TR	2.4
4	30/M	60	Severe MR	Severe AR	Severe TR	
5	21/F	55	Severe MR	Mod AR	Moderate TR	2.6
6	28/M	65	Severe MS	Severe AR	Severe TR	
7	41/M	61	Severe MS	Severe AR	Severe TR	

Table 2. Pre-operative clinical presentations:

Clinical Feature	No. of patient	Percentage
Dyspnea	7	100%
Angina	1	14%
Edema	7	100%
Fatigue	7	100%
NYHA functional class II	2	28.5%
NYHA functional class III	4	57%
NYHA functional class IV	1	14.5%
Atrial fibrillation	7	100%
Sinus rhythm	0	0

The mean age of the patient is 33.3 year and out of 7 patient 3 patient were male. All patient with rheumatic heart diseases presented as dyspnea, easy fatiguability, palpitation and bilateral pedal edema. Patient presented with NYHA class IV, III and class II were 1, 4 and 3 respectively. On preoperative ECG, all patients were in atrial fibrillation.

Table 3. Surgical procedures performed:

Patients	MVR	AVR	Tricuspid Valve Repair	Left Atrial Appendage Ligation
No. 1	SJM 31 mm	AGN 21 mm	J Band annuloplasty	Internal Ligation
No. 2	SJM 29 mm	AGFN 19 mm	J Band annuloplasty	External Ligation
No. 3	SJM 27 mm	AGFN 19 mm	J Band annuloplasty	External Ligation
No. 4	SJM 29 mm	AGN 23 mm	J Band annuloplasty	External Ligation
No. 5	SJM 29 mm	AGFN 19 mm	J Band annuloplasty	Not Done
No. 6	SJM 31 mm	AGN 23 mm	J Band annuloplasty	Internal Ligation
No. 7	SJM 29 mm	AGN 21 mm	J Band annuloplasty	External Ligation

In all patient J-band annuloplasty was done. Mitral valve and aortic valve were replaced with St. Jude Medical mechanical prosthetic valves (Master series and Regent series). Mitral valve prosthesis size ranges from 27 to 31 mm and Aortic valve prosthesis size range from 19 to 23 mm. Left atrial appendage was ligated in 6 patients. One patient did not require left atrial appendage ligation.

Table 4. Intraoperative data

Mean CPB time (min)	186
Mean Cross clamp time (min)	156

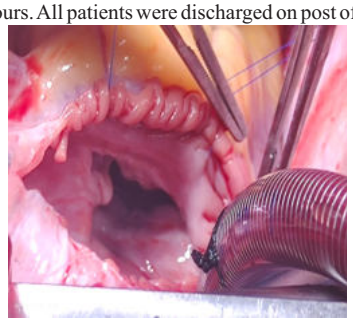
Mean Aortic Cross clamp time was 156 minute and mean cardiopulmonary bypass (CPB) time was 183.6 minutes.

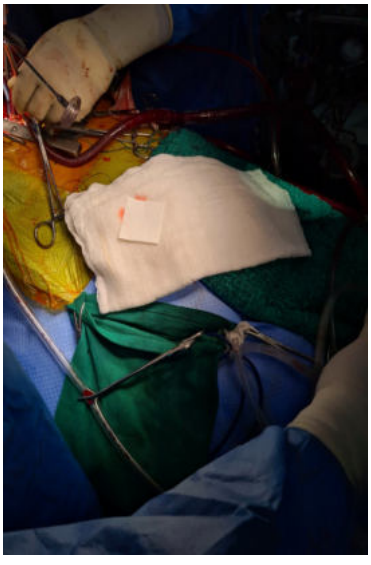
Table 5. Post operative complications and Course

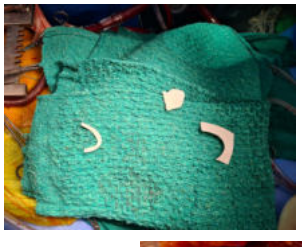
1	Re-exploration for bleed	0
2	RBBB	0
3	Complete Heart block	0
4	Wound infection	1
5	Neurological complication	0
6	Early mortality	0
7	Average Intubation hours	12
8	Average ICU stay (Hours)	72
9	Hospital Stays (Days)	5

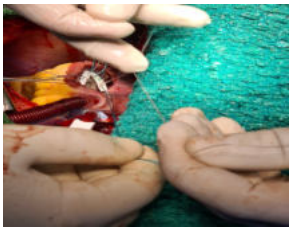
There was no immediate post operative mortality. Late sternal wound infection was present in one patient, who presented after 7 days of surgery. No patient developed any rhythm issue in immediate post op period. Post-operative period:

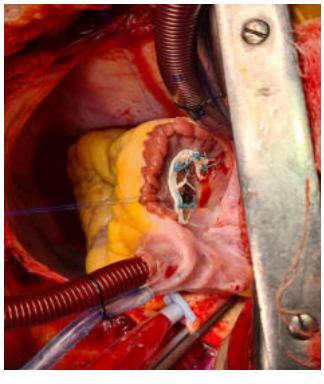
Average intubation period was 12 hours and average duration of ICU stay was 72 hours. All patients were discharged on post of day 3.











DISCUSSION:

The characteristics of rheumatic heart disease affecting both the mitral and aortic valves include a long-lasting course, serious myocardial

attack, as well as secondary high systemic venous pressure and pulmonary hypertension. Subsequently tricuspid regurgitation develops due to left sided lesions. The two main types of tricuspid regurgitation (TR) are primary and secondary (functional). The most common etiology of TR is secondary (functional), and its incidence is approximately 90% among patients with TR[1]. The most common causes of secondary TR are left-sided valvular or myocardial pathologies and pulmonary hypertension. Echocardiography his also proved useful in assessing tricuspid valve lesions but attempts to do this quantitatively have not been validated.[3] For mild functional tricuspid valve insufficiency, Braunwald's opinion[4] that functional tricuspid valve insufficiency will regress after left-sided valve replacement, is generally accepted. Pluth and Ellis[5] found that approximately 40% of patients who did not undergo operative correction of the tricuspid valve at the time of mitral valve replacement had persistent right ventricular failure. Duran and associates[6] noted persistent functional regurgitation in 53% of patients whose tricuspid valve lesion was not repaired at the time of mitral valve operation. Moreover, if reoperation is required for tricuspid disease in this group of patients, the mortality is high. Tricuspid valve repair is indicated in severe TR and in moderate TR with tricuspid index >2.2 in patient in patient undergoing left sided valve surgery. Therapeutic options include tricuspid valve replacement[7]; annuloplasty by the method of KaY[8], De Vega[9] or Carpentier[10-11] and their associates; or no treatment at all[12].

The orifices of the tricuspid and mitral valves are in proximity with the aortic valve. When mitral and aortic valves are replaced with prosthetic valves, it distorted the tricuspid annulus approximately from antero-septal commissure to the postero-septal commissure corresponding to 5'o clock position to 10'o clock. This distortion of annulus makes it difficult for semi-rigid annuloplasty ring like 3D Contour or MC3 ring to be seated. Therefore, changing the material of annuloplasty ring from semi-rigid to more flexible Teflon will allow better and easier placement of the desired annuloplasty ring. This modification of of tricuspid repair technique is of more important when larger sized prosthetic valves are used for mitral and aortic valve replacement. As the tricuspid valve lies in a lower position, the AvP interferes with the tricuspid annulus at the level of the anteroseptal commissure. This area becomes vertical and partially hidden by the rigid AVP, making suture placement on the tricuspid annulus difficult[2].

CLINICAL EXPERIENCE:

There was no difficulty in placing the MVP and AVP. No postoperative valvular and paravalvular leak was detected at the level of the mitral and aortic valve prostheses. The sutures of the Tricuspid J-band were easy to tie. Intraoperative saline insufflation test was done for all the patients and tricuspid valve was found to be competent. There was no post-operative heart block and rhythm issue in all the patients. Post operative 2D-echocardioraphy showed no residual TR.

Conclusions: In conclusion, when tricuspid valve repair is indicated in the presence of aortic and mitral valve replacement, flexible Teflon J-shaped band can be used instead of semi-rigid annuloplasty ring. And short-term follow-up of the patients showed excellent result.

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