

Comparison of De Vaga Versus Ring Annuloplasty in Patients with Moderate to Severe Tricuspid Regurgitation

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Abstract

Background: To compare outcome of Tricuspid Regurgitation (TR) between De Vaga technique and ring annuloplasty in term of achieving adequate pulmonary artery pressure (PAP) and functional outcome.

Methods: In this comparative study adult patients (n=100) who underwent Mitral valve surgery with Tricuspid repair were enrolled and divided into two groups. Group A underwent MVR and TR repair using DEVAGA Technique (n=50) and group B had MVR with Tricuspid Repair Ring Annuloplasty (n=50). In the De Vega annuloplasty technique, 2 pledgeted parallel running 4-0 polypropylene stitches are placed at 3-4-mm intervals in a semicircular manner from the postero-septal to the antero-lateral commissure and tied. A valve gauge appropriate to the body surface area was used to determine the amount of anterior and posterior annular constriction.

Results: Females were predominant in this study. The duration of surgery was found out to be 66.4 minutes in group A compared to 71.0 minutes in group B (statistically not significant). Stay in the ICU and overall hospital stay was also found similar in both groups (p-value, 0.68). There was no statistically significant difference in postoperative functional capacity distribution (PAP) according to the surgical technique (p-value, 0.19).

Conclusion: Devaga repair is as durable as prosthetic ring annuloplasty with added benefits of simple, cost effective and time saving technique.

Key Words; Tricuspid regurgitation, Devaga, Ring annuloplasty,

Introduction:

Secondary tricuspid regurgitation (TR), is repaired through adequate treatment of mitral valve disease by performing surgical treatment. It has been reported that even after appropriate correction of the left-sided pathology the secondary TR does not regress in a

number of cases. Thus, it indicates moving towards a more definite intervention for repair of TR. Initially it was considered that in most patients with secondary tricuspid regurgitation (TR), the problems of right side would be corrected after appropriate surgical treatment of mitral valve disease with no touch technique i.e. conservative treatment of tricuspid valve regurgitation was recommended.^{1,2}

In the present circumstances It has been reported that even after appropriate correction of the left-sided pathology the secondary TR does not regress in a number of cases. Thus, the indications for surgery of the TR have progressively moved towards a more definite intervention.³

Isolated Tricuspid valve lesion is very rare, most commonly associated with left heart pathology. Patients most commonly present with dyspnea and lethargy. Systemic venous hypertension, pulsatile hepatomegaly, ascites and peripheral edema may accompany any valve lesion, but are most commonly associated with severe tricuspid valve disease either regurgitation or stenosis. Functional TR invariably reflects right heart failure/ volume overload. As the septal leaflet is part of the central fibrous skeleton, annular dilatation naturally involves the anterior and posteroinferior portion.⁴

The characteristic history of extreme TR incorporates a delayed asymptomatic period with advance development of right atrium and RV because of volume over-burden. Recently, Shiran et al described that expanded pulmonary artery pressure and permanent atrial fibrillation were the most dominant hazard factors for TR progression.⁵

The reconstructive valve surgery is targeted to prevent annular dilatation by preserving leaflet mobility and hence creating a larger surface of coaptation.^{6,7} Tricuspid Valve annuloplasty is the basis of current surgical therapy for severe TR and aims to correct annular dilation and restore annular geometry, resulting in improved leaflet coaptation. In this study two annuloplasty techniques i.e. De Vaga technique and ring annuloplasty were compared in terms of TR outcome.

Patients and Methods

In this comparative study adult patients, who underwent MVR Plus Tricuspid valve repair at Pakistan Institute of Medical Sciences, Islamabad, Bilal Hospital and Quaid-e-Azam International Hospital were included. All patients underwent similar preoperative preparations for different cardiac procedures using standard median sternotomy. Both groups comprised of similar sample of cases (n=50 each). Between September 2010 and September 2016, a total of 100 patients who underwent mitral valve surgery with tricuspid repair were enrolled in this study and divided into two groups: Group A underwent MVR and TR repair using DEVAGA Technique (n=50) and Group B had MVR with Tricuspid Repair Ring Annuloplasty (n=50). In the De Vega annuloplasty technique, 2 pledgeted parallel running 4-0 polypropylene stitches are placed at 3-4-mm intervals in a semicircular manner from the posteroseptal to the anterolateral commissure and tied. A valve gauge appropriate to the body surface area was used to determine the amount of anterior and posterior annular constriction. The suture was fastened in the anterolateral commissure, passing through pledgets at each of the 2 ends. For the suture methods (De Vega and modified De Vega), Hegar dilators were used as valve gauges to estimate the valve size during the tying of the sutures. In ring tricuspid annuloplasty, we used a ring of appropriate size (determined by the length of the base of the tricuspid septal leaflet). To avoid rhythm complications, no sutures were used in the septal leaflet.

Euro score was used in preoperative assessment of all patients for standardizing the risk and expected outcome. Elective valvular heart surgery patients and age over 18 years were kept as inclusion criteria. Exclusion criteria for the patients were, patient with MVR OR DVR without tricuspid involvement Redo valvular surgery and endocarditis vegetation MVR with CABG. Patients were evaluated with the help of daily progress parameters. Later on selected patients were followed up in outdoor clinic first weekly then following two weeks and monthly basis follow up for initial half year post operation for PT/INR and overall check up. Chi square test was applied to compare categorical variables whereas student's t-test was applied to compare continuous numerical variables.

Results

Female gender was predominant in this study. Out of the total 50 cases in group A, 15 (30.0%) were male and

35 (70.0%) were female whereas in group B, there were 18 (36.0%) males and 32 (64.0%) female patients. The mean age of patients was 32.5 ± 11.2 years in group A compared to 29.4 ± 10.3 years in group B. The clinical parameters like hypertension, diabetes mellitus, COPD were found equal between the two study groups (Table 1).

Table 1: Demographic and Clinical Characteristics of Patients in the Two Groups

	De Vega group (n=50)	Ring Annuloplasty group (n=50)	p-value
Age (years)			
<40	22 (44.0%)	23 (46.0%)	0.84
>40	28 (56.0%)	27 (54.0%)	
Sex			
Male	15 (30.0%)	18 (36.0%)	0.63
Female	35 (70.0%)	32 (64.0%)	
Hypertension	3 (6.0%)	2 (4.0%)	1.0
DM	0 (0.0%)	2 (4.0%)	0.49
Tricuspid annulus diameter (mm)	47.5±3.2	43.4±3.6	0.27
NYHA class			
III	38 (76.0%)	32 (64.0%)	0.27
IV	12 (24.0%)	18 (36.0%)	
COPD	6 (12.0%)	8 (16.0%)	0.77
PAP mmHg	45.6±11.2	43.8±10.0	0.76
Creatinine			
<1.7	42 (84.0%)	39 (78.0%)	0.19
>1.7	8 (16.0%)	11 (22.0%)	
AFR			
AFR	35 (70.0%)	33 (66.0%)	0.83
SR	5 (10.0%)	6 (12.0%)	
LVEF			
<40	9 (18.0%)	13 (26.0%)	0.46
>40	41 (82.0%)	37 (74.0%)	

The duration of surgery was found out to be 66.4 minutes in group A compared to 71.0 minutes in group B. Though De Vega group had slightly shorter operative time, this difference was not statistically significant (p-value, 0.27). Similarly, the stay in the ICU and overall hospital stay was also found similar in both groups (p-value, 0.68) (Table 2). Medium-term (25.4 ± 10.3 mo) freedom from the development of recurrent grades 3 and 4 Tricuspid Insufficiency in the De Vega, annuloplasty groups and Ring annuloplasty group was 76.9%, and 83.9% respectively (p-value, 0.30).

Table 2: Comparison of operative and perioperative findings between the two groups

	De Vaga group (n=50)	Ring Annuplasty group (n=50)	p-value
Operative time			
Cross X clamp time (min)	66.4 ± 23.4	71.0 ± 18.3	0.27
TPT time(min)	91.2 ± 26.3	98.3 ± 29.4	0.18
ICU stay(days)	2.4 ± 1.2	2.6 ± 1.2	0.39
Hospital stay (days)	7.2 ± 1.2	7.4 ± 1.4	0.68
Concomitant procedure			
MVR	32 (64.0%)	34 (68.0%)	0.83
DVR	18 (36.0%)	16 (32.0%)	
Hemorrhage	3 (6.0%)	2 (4.0%)	1.0
Renal failure	2 (4.0%)	3 (6.0%)	1.0
Infection	1 (2.0%)	2 (4.0%)	1.0
In hospital mortality	2 (4.0%)	1 (2.0%)	1.0
Heart block	4 (8.0%)	6 (12.0%)	0.74
Reverted	3 (6.0%)	4 (8.0%)	1.0
PPM	1 (2.0%)	2 (4.0%)	1.0
Persistent AF	2 (4.0%)	3 (6.0%)	1.0
Recurrent AF	5 (10.0%)	6 (12.0%)	1.0

Table 3: Comparison of Pulmonary Artery Pressure Between the Two Study Groups

	Preoperative	Immediate postoperative
DEVAGA	50.9 ± 12.4	44.0 ± 13.6
Ring Annuplasty	45.6 ± 14.5	40.6 ± 12.6
P-value	0.06	0.19

In echocardiographic results at the medium-term follow-up, it was revealed that the ratio of freedom from recurrent TI grades 3 and 4 was similar with both the De Vega group and the ring annuplasty group (p-value, Symptom-free survival was 79.3% in the De Vega group, 88.4% in the ring group (*P-value*, 0.28). There was no statistically significant difference in postoperative functional capacity distribution (PAP) according to the surgical technique (*P-value*, 0.19), however, in both groups, immediate postoperative improvement was highly significant when compared with preoperative New York Heart Association (NYHA) classifications (p-value, 0.02) (Table 3).

Discussion

Tricuspid repair can be challenging for cardiac surgeons due to its indications and opting ideal surgical technique. Various surgical options are in use with varying outcomes. The aim of TR is to remodel annular structures by maintaining a trileaflet valve that is more physiologic, to maintain flexibility of right ventricular (RV) pumping action, and which can prevent redilation.⁷

In the present study outcome of TR repair was compared among De Vega technique and Ring annuplasty techniques and it was found out that both are similarly effective. The operative time, hospital stay were also found similar, moreover, fewer side effects were monitored and the rate of recurrence was also found equally distributed among the two study groups. Previous evidence supports the findings of current study. Huang X et al found that modified De Vega tricuspid annuloplasty is acceptable for TR and improvements in terms of echocardiographic status on long-term basis.⁸ Khallaf AN et al witnessed that Tricuspid repair with ring annuloplasty has excellent outcome, however, with no significant benefits over DeVega annuloplasty as observed at one year.⁹ Bhagwan et al reported no significant difference between ring and De vega annuplasty, they found similar results with both the techniques of TV repair when applied to functionally significant TR in a predominantly rheumatic population.¹⁰ Jung W et al witnessed that TR with the Tri-Ad ring corrected functional outcome effectively and provided good early clinical and echocardiographic results without ring-related complications.¹¹ Guenther T and colleagues witnessed that Tricuspid valve repair with a ring annuloplasty is associated with improved survival and a lower reoperation rate than that with a suture annuloplasty.¹² Bernal et al showed lesser reoperation rate after ring annuloplasty compared to De Vega repair.¹³ Carrier et al showed similar outcome with both ring annuloplasty and De Vega techniques.¹⁴ The above scientific evidence is comparable to the current study findings, however, there is slight variation also witnessed by many previous investigators.

The current study describes both techniques equally successful in the recovery of TR. However, keeping the fact that Pakistan is a lower middle income country with limited healthcare facilities and low spending status of communities, De Vega technique is more suitable for our local settings. De Vega technique is effective, simple, easy and cost effective when compared with ring annuplasty.^{15,16} There is concern

regarding the recurrence rates associated with De Vega annuloplasty, however, modified options of this procedure can be used to overcome this limitation.¹⁷ This study revealed no significant difference with respect to residual significant TR, neither in immediate follow-up nor at 6-month follow-up or later follow-ups. These results could be attributed to single surgeon surgical technique and standardized post-operative management and close follow-ups. In present study an adequate sample of patients was selected and followed up for a long period of 5 years which gave an in-depth view of the effect of the two study interventions.

Conclusion

1. Devaga repair is as durable as prosthetic ring annuloplasty with added benefits of simple, cost effective and time saving technique.
2. Significant improvements both in overall and event-free survival are conferred by Devaga technique.

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Key for Contribution of Authors : A= Conception/ Study/ Designing /Planning; B= Experimentation/Study conduction;C=Analysis/Interpretation/ Discussion; D= Manuscript writing;E= Critical review;F= Facilitated for reagents/Material/Analysis