

Comparative Study between DE Vega and Pericardial Band Annuloplasty in Management of Functional Tricuspid Valve Regurge

Zakaria Moustafa AL mashtoly¹, Medhat Ahmed Refaie Mohamed¹,
Ismail Nasr El sokkary¹, Ahmed H. Mohamed²

¹Cardiothoracic Surgery department, Faculty of Medicine, Al Azhar University, Cairo, 11311 Egypt,

²Cardiothoracic Surgery department, Faculty of Medicine, Beni Suef University, Beni-Suef, 62514 Egypt

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Abstract

Dilated annulus tricuspid regurgitation is a frequent pathology mostly with functional right ventricular impairment. Our study was to compare result of De Vega (DV) repair Versus Band Annuloplasty (BA) in patients with severe functional Tricuspid valve regurge. A total of 80 patients underwent TV repair at Beni-Suef university Hospital with 40 DV and 40 had BA; accompanying interventions done for mitral valve or double valve replacement. Clinical and echocardiographic follow-up data were obtained. Follow-up after 6months was done completely. A higher proportion of grade 0 and I of tricuspid regurge post-operatively in BA group and a higher proportion of TR grade II among DV group. After 6-12 months follow-up, The NYHA higher grades (I, II, III) were significantly more prevalent in the DV. There was no statistical difference between the BA group and the DV group regarding the proportion of morbidity and mortality. The 2 interventions are considerable in tricuspid valve repair although good evidence in support of BA compared with DV suture repair for treatment of moderate to severe TV regurgitation; longer follow up durations is recommended for better post-operative evaluation to morbidities and mortalities.

Keywords: Tricuspid regurgitation; band annuloplasty; De Vega; interventions; follow-up.

Introduction

Tricuspid valve (TV) function plays an important role in a number of clinical disease states, including left-sided valve disease and heart failure, and the development of functional tricuspid regurgitation (TR) is directly associated with increased morbidity

and mortality [1]. Optimal management of tricuspid valve TR remains a challenge among cardiologists and cardiac surgeons [2].

The most frequent pathology affecting this structure is functional (TR) because of a dilated annulus, whereas organic TR is less frequent.

Corresponding Author: Ahmed H. Mohamed, Department of Cardiothoracic Surgery, Faculty of Medicine, Beni Suef University, Beni-Suef, 62514 Egypt.

E-Mail: Surgeon_Ahmad2022@hotmail.com

Tel: +2 01111552364

Dilatation of the right ventricle and impaired right ventricular function are important prognostic indicators in a number of cardiac conditions.³

With isolated TR, patients experience the classic symptoms of "right-sided heart failure" from elevated right atrial pressures, such as ascites, congestive hepatopathy, peripheral edema, decreased appetite, and abdominal fullness. Atrial fibrillation is common as a result of right atrial enlargement.⁴ Although repair is preferred, valve replacement is often necessary when the valve leaflets themselves are diseased, abnormal, or destroyed.⁵ The main surgical approaches to rectify functional TR involve rigid or flexible ring, which are used to reduce annular size and achieve leaflet coaptation, as with mitral valve disease. Another less commonly used technique involves posterior annular bicuspidalization.⁶

Other approaches include edge-to-edge (Alfieri-type) repairs and partial purse-string suture techniques to reduce the anterior and posterior portions of the annulus; DeVega techniques. DeVega and flexible rings annuloplasties appear to have a lower freedom from recurrent TR than rigid annuloplasty rings.⁷

Significant residual tricuspid valve insufficiency may also contribute to a poor postoperative hemodynamic result, even after successful mitral valve repair.⁶

The present study was designed to evaluate and compare the different surgical techniques in repair of functional TR that can affect the outcome of intervention in these patients and to assess performance of tricuspid valve following these techniques.

Patients and Methods

80 patients with severe functional TR or any degree of TR with the presence of severe annular dilatation (>40 mm TTE) were categorized according to management technique of TR: Group A: 40 patients with BAND annuloplasty, Group B: 40 patients with De-Vega.

Inclusion criteria: Patients with mitral valve disease necessitating surgery with moderate or more than moderate TR. Patients with double valve disease

necessitating surgery with moderate or more than moderate TR

Exclusion criteria: Patients with recurrent TVD, Cases of endocarditis affecting TV., Organic TVD, Presence of associate tricuspid stenosis

In all patients, left sided lesions (mitral with or without aortic valve lesion) were corrected during the same surgical procedure before tricuspid valve repair using Mitral valve repair or replacement, Aortic valve replacement.

Evaluation parameters:

History of socio-demographic data, NYHA class-LL edema Preoperative, intraoperative and post-operative (immediately, during hospital stay, ICU stay and 6 months after operation); Ascites -AF- Peripheral edema- Jugular venous distention- Palpable hepatomegaly- CTR and manifestations of Pul.HT, RV enlargement, Right atrial enlargement, serum bilirubin, albumin and Prothrombin concentration. CXR: PA / L-view, ECG and Transthoracic echocardiography, mortality rate.

Statistical analysis:

SPSS v. 25, variables was as mean, SD, No. and %. Comparisons were by t-test and Chi-Square. The Significant results when P-value ≤ 0.05 .

Results and Discussion

TR is a significant clinical problem that may be undertreated by surgeons.⁸ Moderate and severe TR has been associated with poor short-term and long-term survival, independent of ventricular function and pulmonary arterial pressure.⁹

Our study showed no statistical difference between band annuloplasty and De Vega group regarding age and sex. Table 1

Our demographic data are partially similar to Abdelgawad et. al.¹⁰; Abdelfatah and Omar.¹¹ The younger mean age in our study may be attributed to earlier affection by rheumatic heart disease; a cause of cardiac morbidity in Egypt.¹²

Our study showed that there was no statistical difference between 2 groups regarding their preoperative parameters (p value 0.494). Similar

results were noticed that no significant difference in baseline (NYHA) functional classes.¹³⁻¹⁶ Table 1

In this study 62.5% patients had AF (P value 0.644). Grade III TR was 53.75% while grade IV was 46.25% (P value 0.823). Most patients in other studies were +3 and +4 TR^[7,10,11,15,17], and most patients had AF ^[16], it is postulated that right atrial dilatation associated with AF may drive annular dilatation that can ultimately lead to severe FTR.¹⁸ Table 2

In our study, no statistical difference found between groups regarding their echo parameters (P-value>0.05). Similar results reported by other studies that EF was around 50%.^{7,8,13,16,17,19} Table 2

In our study, the DVR was significantly more in De vaga group while MV repair was significantly more in annuloplasty group (P-value <0.05). Cross clamp and the total bypass time were significantly longer among band annuloplasty group (P-value <0.05). Our results were comparable with others with similar conclusions ^[10,13,17]. The benefits of using a flexible band include; better early postoperative LV systolic function, allows annular size and configuration to adapt to changes throughout cardiac cycle, better diastolic blood flow across the mitral valve, less stress on the sutures during systole, minimizing the likelihood of dehiscence.²⁰

The immediate postoperative results showed in Table 3 that post-operative heart rate, PASP, vena contracta and the jet area were significantly lower among band annuloplasty than De vaga (P-value <0.05). There was no statistical difference between band annuloplasty group and De Vaga group regarding their need for diuretics, ascites and lower limb edema (P-value>0.05). There was a significant higher proportion of grade 0 and I of tricuspid regurge post-operatively in annuloplasty group and a higher proportion of TR grade II among De Vaga group. Ghanta et. al.⁷ reported that PASP decreased from 55.0±18.1 mmHg to 33.5±10.5 mmHg. Kara, et. al.²¹ reported a Postoperative PAP significantly lower than preoperative in ring annuloplasty and modified De Vega groups. Lafçı et. al. ^[13] found early postoperative improvement in the grade of TR in all patients.

In our study; pre-discharge Eco assessment revealed no significant difference among groups in TR

grades and residual TR (p>0.05). None of the patients underwent early or late reoperation due to recurrent TR. Table 3. Ghoreishi et al.¹⁷ reported a small increase in mean TR compared with pre-discharge echo. Abdelfatah and Omar ^[11] reported TR grade for the suture group at 12 months; 2.5 ± 0.8, and 2.2 ± 0.79 for band group, while grade of TR decreased to 0.8±0.6 at follow-up by Ghanta et al.⁷. Abdelgawad et. al.¹⁰ observe a significant improvement in TR grade in all groups. Table 4

Table 4 showed a significant increase in ED and PASP in De vaga group; while ejection fraction and TAPS were significantly higher in the annuloplasty (P-value<0.05); but no change in vena contracta. No statistical difference were between groups regarding TR grade, need for diuretics, ascites, and LL edema after 6-2 months post-operatively (P-value>0.05). NYHA (I, II, III) were significantly more prevalent in De gava group (P-value <0.05). Many studies reported a NYHA class decrease +3 to +1.^{7,11,19} Kara, et. al.²¹ reported a highly significant postoperative improvement when compared with preoperative NYHA classifications and a decrease in PASP in De Vega group. Ghoreishi et. al.¹⁷ reported a small increase in mean TR grade during follow-up.

Table 4 showed that there was no statistical difference between the band annuloplasty group and the De Vaga group regarding their stay in ICU (P-value>0.05) the proportion of morbidity and mortality (P-value>0.05), but the needed time for mechanical ventilation was significantly higher in De vaga group (P-value<0.05). Lafçı et. al.¹³, found that; postoperative need for positive inotropic support, duration of mechanical ventilation, and length of intensive care unit and hospital stay were significantly higher in the de Vega annuloplasty group, no intraoperative mortality. The in-hospital mortality rate was 2.6%, the de Vega annuloplasty group had significantly the highest late-mortality rates.

In our study the results show that the 2 groups had improvement in LV and RV function, V C, PASP, NYHA class and mean degree of TR and low complication and recurrence rates. However, patients in band Group had better results than suture group.

Van de Veire et. al. and Morishita et. al.; supported DeVega repair with short and long-term success.^{22,23}

Few studies were against the DeVega technique and reported a relatively high recurrence rate particularly in patients with severe tricuspid annular dilation and/or pulmonary hypertension [4,8].

Many studies, supported the use of BAND annuloplasty over De Vega's suture annuloplasty,

suggested that; an annuloplasty band or ring is recommended in patients undergoing TV repair, particularly in those with more severe TR, to avoid future recurrence as compared to merely suture based techniques.^{10,15,24}

Table 1: History, clinical characteristics and Echo parameters of the studied groups:

Items	Band annuloplasty group (no=40)	De vega group (no=40)	P-value
Age (mean±SD)	31±5	32.5±7	0.079
Sex			
Male	23(57.5%)	27(67.5%)	0.356
Female	17(42.5%)	13(32.5%)	
Need to diuretics	40(100%)	40(100%)	----
Pre-operative NYHA			
III	40(100%)	38(95%)	0.494
IV	0(0%)	2(5%)	
Pre-operative LL edema	0(0%)	0(0%)	---
Pre-operative ascites	0(0%)	0(0%)	---
Pre-operative AF	24(60.0%)	26(65.0%)	0.644
Pre-operative TR grade			0.823
III			
IV	21(52.5%)	22(55.0%)	
	19(47.5%)	18(45.0%)	
Pre- operative EF	56.1±5.1	56±5.9	0.920
Pre- operative ED	5.9±0.6	5.8±0.6	0.434
Pre- operative PASP	50±6.5	52.8±7	0.067
Pre- operative TASE	1.8±0.1	1.7±0.2	0.349
Pre- operative Vena Contracta	5.5±1.01355	5.4±1.2	0.542
Pre- operative jet area	10.5±1.9	10.7±2.7	0.664

Table 2: Comparison between both groups regarding the technique used:

Technique	Band annuloplasty group (no=40)	De vega group (no=40)	P-value
D V R	0(0.0%)	7(17.5%)	0.002*
M V R	29(72.5%)	30(75.0%)	
M V repair	11(27.5%)	3(7.5%)	
D V R	0(0.0%)	7(17.5%)	0.006*
M V R	40(100.0%)	33(82.5%)	
CCT (minutes)	82.5±13.7	72.60 19.091	0.010*

Technique	Band annuloplasty group (no=40)	De vaga group (no=40)	P-value
Bypass time (minutes)	104.4±18.5	96.00 18.666	0.048*
Intra- operative findings (number(%))	1(2.5%)	19(47.5%)	<0.001*

*P-value is significant

Table 3: Early post-operative circumstances and examination of the studied groups:

Items (mean±SD)	Band annuloplasty group (no=40)	De vaga group (no=40)	P-value
Heart rate	88±5	93±6	<0.001*
Need to pacemaker	0(0%)	0(0%)	----
Immediate post- operative PASP	31.4±4.7	34.7±5.9	0.007*
Immediate post - operative Vena Contracta	1.4±1	2.8±1.7	0.002*
Immediate post - operative jet area	2.4±2	4.3±2.6	0.043*
Need to diuretics	40(100%)	40(100%)	----
Early post-operative LL edema	0(%)	2(5%)	0.494
Early post -operative ascites	0(0%)	0(0%)	---
Early post-operative TR grade	(no=39)	(no=39)	0.002*
0	20(51.3%)	8(20.5%)	
I	12(30.8%)	9(23.1%)	
II	6(15.4%)	20(51.3%)	
III	1(2.6%)	2(5.1%)	

*P-value is significant

Table 4: Follow up post-operative parameters at 6-12 hours of the studied groups:

6-12 hours (mean±SD)	Band annuloplasty group (no=40)	De vaga group (no=40)	P-value
HR	71±11	83±5	<0.001*
EF	67.8±12.4	55.74 9.293	<0.001*
ED	5.5±0.3	5.9±0.4	<0.001*
PASP	28.8±5	35.87 8.065	<0.001*
TAPSE	1.9±0.2	1.771 .2217	0.023*
Vena Contracta	2.1±2.5	2.208 1.8495	0.874
Jet area	1.3±1	3.8±3	<0.001*
NYHA	(no=37)	(no=38)	0.001*
0	37(100.0%)	18(47.4%)	
I	0(0.0%)	12(31.6%)	
II	0(0.0%)	6(15.8%)	
III	0(0.0%)	2(5.3%)	
Need to diuretics	(no=37)	(no=38)	0.480
	8(21.6%)	13(34.2%)	

6-12 hours (mean±SD)	Band annuloplasty group (no=40)	De vega group (no=40)	P-value
LL edema	(no=37) 0(0%)	(no=38) 2(5%)	0.480
Ascites	0(0%)	2(5%)	0.192
TR grade	(no=37)	(no=38)	0.316
0	19(51.4%)	13(34.2%)	
I	9(24.3%)	8(21.1%)	
II	7(18.9%)	11(28.9%)	
III	2(5.4%)	4(10.5%)	
IV	0(0.0%)	2(5.3%)	
MV (hours)	4.8±1.3	5.5±1.1	0.014*
ICU stay (days)	2.2±0.8	2.4±0.9	0.314
Morbidity			0.364
No	38(95.0%)	36(90.0%)	
Aortic root abscess	1(2.5%)	0(0.0%)	
CVS	1(2.5%)	0(0.0%)	
Deep ST W infection	0(0.0%)	1(2.5%)	
STR	0(0.0%)	2(5.0%)	
Stuck M	0(0.0%)	1(2.5%)	
Mortality			0.615
Alive	37(92.5%)	39(97.5%)	
Died	3(7.5%)	1(2.5%)	

*P-value is significant

MV mechanical ventilation

Conclusion

Our study demonstrated that evidence in support of band annuloplasty compared with De Vega's suture repair for treatment of moderate to severe TR.

Declarations of interest: None

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