

Short-Term Outcome of Tricuspid Valve Annuloplasty Using the Modified De Vega Technique

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Objectives: The aim of this study is to evaluate short-term results and efficacy of tricuspid valve annuloplasty by the modified De Vega technique.

Study design: A prospective cohort study.

Setting: Cardiothoracic Surgery Department in collaboration with general surgery department, Qena University Hospital, South Valley University, Qena, Egypt.

Duration: From October 2018 to January 2020.

Subjects and Methods: 25 patients underwent tricuspid valve annuloplasty for functional TR caused by Rt sided dilatation secondary to the left-sided valvular lesion. Informed consent was obtained from all patients in this study. Pts with mild TR, (organic) tricuspid regurgitation or TV endocarditis, and isolated TV lesions were excluded from the study.

Result(s): Follow-up echocardiography after 6 months did not show any severe tricuspid regurgitation, but otherwise, most of the patients with mild tricuspid regurge 17 pts (68%) and 8 patients (32%) with moderate regurge, as regard ejection fraction and LV dimensions there were no difference, while there was a significant reduction in LA diameter, pulmonary artery pressure, and RV diameter with p value <0.05.

Conclusion(s): Tricuspid valve annuloplasty with a modified De Vega technique in functional TR was associated with a lesser residual degree of TR and could be considered a reliable procedure in TV repair in short term follow-up.

Recommendations: Larger sample size and longer follow-up duration should be done

Key Words: Tricuspid Regurge, Tricuspid Valve Annuloplasty, Modified De Vega Technique.

Introduction

Tricuspid regurge (TR) is one of the most common valvular lesions, and functional TR represents the majority of cases and this is caused by conditions that cause right-sided dilatation. (J. Popelová; et al 2007)

Modified De Vega technique is one of the procedures used in tricuspid annuloplasty and consists of pledget placement between each entry site into the annulus (Dreyfuset al ;2008). The surgical management of TR consists of remodeling of the dilated annulus (suture repair or implantation of annuloplasty ring), and rarely, valvular replacement is performed where repair is not possible. The De Vega annuloplasty, originally described in 1972, was for decades the standard technique for TV repair (De Vega;1972).

Aim of work

The aim of this study is to evaluate short-term results and efficacy of tricuspid valve annuloplasty by the modified De Vega technique.

Patients and Methods

25 Patients were entrapped in this study at Cardiothoracic Surgery Department of Qena university hospital, South Valley University from October 2018 to January 2020. A verbal counseling followed by a written consent was obtained from all patients participated in this study according to the Medical Ethics committee of Faculty of Medicine, south valley university All patients evaluated after 6 months of follow-up.

Inclusion criteria; All patients with functional TR caused by Rt sided dilatation secondary to the left-sided valvular lesion.

Exclusion criteria;(a) Pts with mild TR (b) (organic) tricuspid regurgitation (c) isolated Tricuspid valve lesion. (d) Patients who will need CABG. (e) Patients with re-do open heart surgery.

Operative technique

All surgeries have been performed via conventional median sternotomy, cardiopulmonary bypass with Bicaval cannulation, antegrade cardioplegia with systemic hypothermia. Mitral valve replacement with a mechanical prosthesis was done in all cases except one patient performed double valve replacement. After that, both vena cavae were snared and the tricuspid valve was approached through Rt atriotomy modified De Vega technique was performed using 5 Teflon pledget – not only in both ends but also in the commissures and at the pace of tying up the suture which was in the area of the anterior leaflet, the degree of narrowing of the annulus was controlled over a valve sizer. Injection of Saline into RV through TV to evaluate the degree and direction of TR was performed before and after the modified De Vega technique to evaluate the TV after repair

Statistical analysis

Data will be analyzed using the Statistical Package for Social Sciences (SPSS) software

BMI= Body Mass Index, NYHA= New York Heart Association, AF= Atrial Fibrillation, DM= Diabetes Mellitus, EF= Ejection Fraction, EDD= End Diastolic Diameter, ESD= End Systolic Diameter, LA= Left Atrium, PASP= Pulmonary Artery Systolic Pressure, MS= Mitral Stenosis, TR= Tricuspid Regurge.

program (version 19). The qualitative variable will be recorded as frequencies and percentages and will be compared by the chi-square test. The quantitative measure will be presented as means \pm standard deviation

(SD) and will be compared by Student t-test. P-value < 0.05 will be significant.

Results

This study has been accomplished and conducted on 25 patients (Pts) with rheumatic heart disease underwent mitral valve replacement with a mechanical prosthesis and they had secondary severe tricuspid valve disease that needs tricuspid valve annuloplasty only 2 (8%) Pts have moderate tricuspid regurge, one patient had a double valve replacement.

Preoperative data revealed that 4 pts had dyspnea grade II, while 14 pts had grade III dyspnea, 7 pts with dyspnea grade IV and only one patient with dyspnea grade I, 92% of patients had severe tricuspid regurge (Table 1).

Table 1: Patient Characteristics and pre-operative Data.

Variable	Mean \pm SD
Age	42.4 \pm 10.91
Gender	
• Male	7 (28%)
• Female	18 (72%)
BMI	25 \pm 5.66
NYHA	3 \pm 0.79
AF	9 (36%)
DM	10 (40%)
Pre-Operative Echo Findings:	
• EF %	58% \pm 4.24
• EDD (cm)	4.6 \pm 0.35
• ESD (cm)	3 \pm 0.28
• LA (cm)	5.2 \pm 0.3
• PASP (mm/hg)	62.52 \pm 4.24
• RV diameter (cm)	2.85 \pm 0.36
MS	
• Severe	21 (84%)
• Tight	4 (16%)
TR	
• Moderate	2 (8%)
• Severe	23 (92%)

The majority of the patients were in functional class NYHA III preoperatively, while after the surgery there was a remarkable improvement of symptoms the

majority of patients reported functional class NYHA I or II).

Weaning of Cardiopulmonary bypass was smoothly in 21 (84%) patients while defibrillator used in 4 (16%) patients, and there were no intraoperative complications. Follow-up echocardiography after 6 months did not show any severe tricuspid regurgitation, but otherwise, most of the patients with mild tricuspid regurge 17 Pts (68%) and 8 Pts (32%) with moderate regurge (Table 2).

Postoperative echocardiography did not show any difference in ejection fraction and LV dimensions after 6 months follow up, while there was a significant reduction in LA diameter, pulmonary artery pressure (Figure1) and RV diameter. None of these patients died after 6 months after surgery (Table 3).

Table 2 Pre and Postoperative Echocardiography Findings.

	Preop ECHO	6 Months Follow up	P-Value
EF	58%±4.24	61.44±5.21	0.070
EDD	4.6±0.35	4.58±0.47	0.167
ESD	3±0.28	3.3±0.37	0.993
LA	5.2±0.3	4.74±0.57	0.001
PASP	62.52±4.24	35±3.96	0.001
RV diameter (cm)	2.85±0.36	2.59±0.30	0.023

EF= Ejection Fraction, EDD= End Diastolic Diameter, ESD= End Systolic Diameter, LA= Left Atrium, PASP= Pulmonary Artery Systolic Pressure, TR= Tricuspid Regurge.

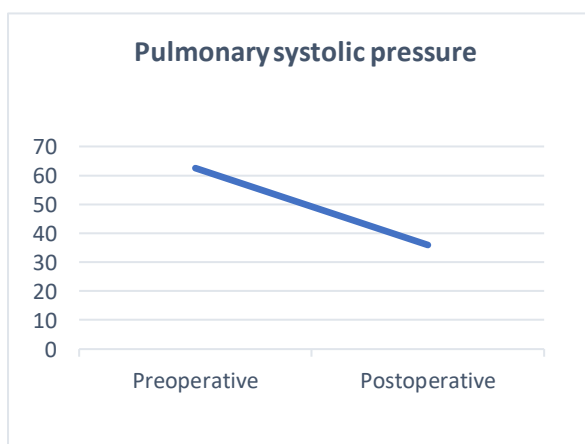


Figure 1 Reduction in Pulmonary Pressure

Table 3:Early Results of Postoperative Follow-up.

Variable	Mean±SD
CPB	110.5±28.99
CCT	97.7±30.85
Weaning of ventilation	6.8±2.67
ICU Stay	5.04±1.73
Bleeding	414.4±155.28
Hospital Stay	11.48±6.50
6 months follow up	
NYHA	1.32±0.48
ECHO:	
• EF %	61.44±5.21
• EDD (cm)	4.58±0.47
• ESD (cm)	3.3±0.37
• LA (cm)	4.74±0.57
• PASP (mm/hg)	35±3.96
• RV diameter (cm)	2.59±0.30
Degree of TR.	
• Mild	17 (68%)
• Moderate	8 (32%)
• Severe	0
AF Present	10 (40%)
AF Absent	15 (60%)

CPB= Cardiopulmonary Bypass, CCT= Cross Clamp Time, ICU= Intensive Care Unit, NYHA= New York Heart Association, EF= Ejection Fraction, EDD= End Diastolic Diameter, ESD= End Systolic Diameter, LA= Left Atrium, PASP= Pulmonary Artery Systolic Pressure, RV= Right Ventricle, TR= Tricuspid Regurge, AF= Atrial Fibrillation.

Discussion

Repair of the tricuspid valve is challenging for functional TR as regard indications and the best surgical techniques (Raja, et al 2008). According to AHA/ACC guidelines, surgery for functional TR is indicated in cases with severe TR who are being subjected to surgery for left-sided valvular disease (Class I, level evidence C)(Nishimura,et al 2014) The De Vega's tricuspid valve repair is a simple surgical

procedure using a double-ended 2-0 Ethibond suture buttressed with a Teflon felt pledget and including the plication of the tricuspid ring from the anteroseptal to the posteroseptal commissure (**Morishita et al;2002**). Other studies have reported however a high incidence of recurrence, especially in patients with severe annular dilatation and recommended the use of annuloplasty rings to obtain a durable repair (**Yada et al; 1990**).

In our study, 68% of patients after 6 months had mild TR, 32% had moderate TR with NYHA class I or II and no patients had severe TR. A small size sample and short follow-up period represent limiting factors in this study.

Kunová et al. studied the short-term and medium-term results of TR using De Vega modified technique and reported 53.3% of patients with mild TR, 13.3% with moderate TR and no patients had severe TR after 1 year of follow-up(**Kunová et al; 2016**).

Hamdy et al. reported in their study that compared DeVega versus ring annuloplasty in severe functional tricuspid insufficiency and their impact on RV function, They divided the patients into two groups: group A (n=34) underwent DeVega suture repair and group B (n=17) with ring annuloplasty six months follow up concluded that 50% of patients in group A had mild TR, 26.5% had moderate TR, and 11.8% had severe TR (**Hamdy et al ;2019**).

Shinn et al. reported in their study the probability of residual TR grade 0 or 1 declined comparably overtime for the ring- and suture-annuloplasty patients. At 1 year, the estimated probability of a TR grade 3 or 4 was <10% for patients in both groups. McCarthy et al reported the surgical outcomes of TV repair using four different techniques were compared in patients undergoing the operation. While, the Severity of TR regurgitation was similar to the four procedures in early follow-up, but over time residual TR worse more rapidly in patients with DeVega suture repair (P-Value 0.002) (**McCarthy et al ;2004**). In

our study, we detect a statistically significant difference in RV diameter after 6 months follow up (p value=0.023) and these outcomes support that accompanying tricuspid annuloplasty secondary to left-sided valve disease is essential for RV remodeling. Some studies reported a high rate of recurrence after suture annuloplasty especially in cases with marked annular dilatation and recommend band annuloplasty to gain durable repair (**Konishi et al;1983**).

Our study has some limitations as it is a small study involving a single center with short term follow up duration.

Conclusions

Tricuspid valve annuloplasty with a modified De Vega technique in functional TR was associated with a lesser residual degree of TR and could be considered a reliable procedure in TV repair in short term follow-up.

References

- [1]**Popelová J, Benešová M, Brtko M, Černý S, Krupička J, Čerbák R ,et al (2007):**Dopručené postupy pro diagnostiku a léčbu chlopenních srdečních vad v dospělosti, Cor et Vasa 49;K195–K234
- [2]**Dreyfus GD,Raja SG, Chan KMG(2008):**Tricuspid leaflet augmentation to address severe tethering in functional tricuspid regurgitation. Eur J Cardiothorac Surg;34: 908–910
- [3] **Raja SG, Dreyfus GD (2010)** Basis for intervention on functional tricuspid regurgitation. In Seminars in thoracic and cardiovascular surgery Mar 1 (Vol. 22, No. 1, pp. 79-83). WB Saunders.
- [4] **Nishimura RA, Otto CM, Sorajja P Sundt TM, Bonow RO, Carabello BA, et al. (2014):** AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal*

of the American College of Cardiology, **63**, e57-e185.

[5] **Morishita A, Kitamura M, Noji S, Aomi S. (2002):** Long-term results after De Vega's tricuspid annuloplasty. *Journal of Cardiovascular Surgery*. 1;43(6):773.

[6] **Yada I, Tani K, Shimono T, Shikano K, Okabe M, Kusagawa M.(1990):** Preoperative evaluation and surgical treatment for tricuspid regurgitation associated with acquired valvular heart disease. The Kay-Boyd method vs the Carpentier-Edwards ring method. *The Journal of cardiovascular surgery*. 31(6):771-7.

[7] **Kunová M, Frána R, Toušek F, Mokráček A, Pešl L. (2016):** Tricuspid annuloplasty using De Vega modified technique—Short-term and medium-term results. *Cor et Vasa*. Aug 1;58(4):e379-83.

[8] **Hamdy Y, Mostafa MM, Elminshawy A. (2019):** DeVega versus ring annuloplasty in severe functional tricuspid insufficiency and their impact on the right ventricle. *The Egyptian Cardiothoracic Surgeon*. Oct 1;1(4):133-9.

[9] **McCarthy PM, Bhudia SK, Rajeswaran J, Hoercher KJ, Lytle BW, Cosgrove DM, Blackstone EH(2004):** Tricuspid valve repair: durability and risk factors for failure. *The Journal of thoracic and cardiovascular surgery*. Mar 1;127(3):674-85.

[10] **Konishi Y, Taksuta N, Mirami K, Matsuda K, Yamazato A, Chiba Y, et al (1983) :** Comparative study of Kay- boyd's, DeVega's and Carpentier annuloplasty in the management of functional tricuspid regurgitation. *Jpn Circ J* 47:1167e72.