

Original article

Study of DeVega's Tricuspid Annuloplasty for Moderate Secondary Tricuspid Regurgitation

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Abstract

Background - Tricuspid regurgitation (TR) is a prevalent valvular condition often secondary to left-sided heart diseases, pulmonary hypertension, or right ventricular dilation. DeVega's tricuspid annuloplasty is a surgical technique utilized to manage moderate secondary TR by reducing the annular diameter and improving leaflet coaptation.

Methods- A one-year prospective study was conducted involving 20 patients with moderate secondary TR. Preoperative assessments included clinical evaluations, echocardiography, and right heart catheterization. All patients underwent DeVega's tricuspid annuloplasty. Follow-up evaluations were conducted at one month, six months, and one year post-surgery, focusing on TR severity, right ventricular function, and clinical outcomes.

Results- Postoperative results indicated a significant reduction in TR grade from 2.8 ± 0.4 preoperatively to 1.4 ± 0.7 at one year. Right ventricular end-diastolic diameter decreased from 45.6 ± 8.2 mm to 40.2 ± 7.6 mm. Right atrial pressure and pulmonary artery systolic pressure also showed significant reductions. Complications included arrhythmias (15%) and residual TR (10%), with no reoperations or mortalities. At one year, 90% of patients exhibited improved functional status (NYHA Class I/II), and 95% reported improved quality of life.

Conclusions- DeVega's tricuspid annuloplasty effectively reduces TR severity and improves right ventricular function and quality of life in patients with moderate secondary TR, with a low complication rate.

Keywords- Tricuspid regurgitation, DeVega annuloplasty, right ventricular function

Introduction

Tricuspid regurgitation (TR) is a common valvular heart disease, often secondary to left-sided heart conditions, pulmonary hypertension, or right ventricular dilation. (1) Moderate secondary TR presents a unique challenge due to its progressive nature and the resultant right heart failure if left untreated. (2) DeVega's tricuspid annuloplasty, a technique introduced by Marcos DeVega in the 1970s, has been widely adopted as a surgical intervention to address this condition.(3) This method involves the placement of a semicircular suture to reduce the annular diameter, thus enhancing leaflet coaptation without the need for prosthetic material.

Despite its longstanding use, the efficacy of DeVega's annuloplasty in the context of moderate secondary TR remains a subject of ongoing debate. Some studies advocate for its effectiveness in improving hemodynamics and patient outcomes, while others suggest a propensity for recurrent TR, particularly in the long term. This comparative study aims to evaluate the outcomes of DeVega's tricuspid annuloplasty, assessing its impact on TR severity, right ventricular function, and overall patient prognosis. By analyzing clinical data and postoperative

follow-up, this study seeks to provide a comprehensive understanding of the benefits and limitations of this technique in the management of moderate secondary TR.(4,5,6)

Methodology

This study was conducted over a one-year period from January 2023 to December 2023, focusing on patients diagnosed with moderate secondary tricuspid regurgitation. A total of 20 patients who met the inclusion criteria were selected for the study. The inclusion criteria encompassed patients with moderate secondary TR, confirmed through echocardiography, who were deemed suitable candidates for surgical intervention. Patients with primary TR or those with contraindications to surgery were excluded from the study.

Preoperative assessments included detailed clinical evaluations, echocardiographic measurements, and right heart catheterization to establish the severity of TR and assess right ventricular function. Baseline data, including demographic details, comorbid conditions, and preoperative echocardiographic parameters, were meticulously recorded. All patients provided informed consent before being enrolled in the study.

The surgical procedure involved DeVega's tricuspid annuloplasty, performed under general anesthesia. This technique included placing a semicircular suture along the tricuspid annulus to reduce its diameter and improve leaflet coaptation. Intraoperative transesophageal echocardiography was utilized to confirm the adequacy of the repair and ensure no significant residual TR was present. Postoperatively, patients were monitored in the intensive care unit for immediate complications and then transferred to the ward for further recovery.

Follow-up evaluations were conducted at one month, six months, and one year post-surgery. These assessments included clinical evaluations, echocardiographic studies, and right heart catheterization to monitor TR severity, right ventricular function, and any recurrence of regurgitation. Data collected were analyzed to compare preoperative and postoperative parameters, and the outcomes were statistically evaluated to determine the efficacy of DeVega's tricuspid annuloplasty in managing moderate secondary TR.

Results

Table 1: Demographic and Baseline Characteristics

Variable	Value
Number of patients	20
Age (years, mean ± SD)	56.2 ± 10.3
Gender (Male/Female)	12/8
Left Ventricular Ejection Fraction (%)	45.3 ± 7.8
Comorbidities (Hypertension/Diabetes/Other)	10/6/4

Table 2: Preoperative and Postoperative Echocardiographic Parameters

Parameter	Preoperative (Mean ± SD)	Postoperative 1 month (Mean ± SD)	Postoperative 6 months (Mean ± SD)	Postoperative 1 year (Mean ± SD)
Tricuspid Regurgitation Grade (0-4)	2.8 ± 0.4	1.2 ± 0.5	1.3 ± 0.6	1.4 ± 0.7

Right Ventricular End-Diastolic Diameter (mm)	45.6 ± 8.2	39.3 ± 7.4	39.7 ± 7.8	40.2 ± 7.6
Right Atrial Pressure (mmHg)	12.5 ± 3.2	8.7 ± 2.4	8.9 ± 2.6	9.1 ± 2.8
Pulmonary Artery Systolic Pressure (mmHg)	48.2 ± 10.1	35.4 ± 8.9	36.0 ± 9.2	36.8 ± 9.4

Table 3: Postoperative Complications

Complication	Number of Patients (%)
Arrhythmias	3 (15%)
Wound Infection	1 (5%)
Residual Tricuspid Regurgitation	2 (10%)
Reoperation	0 (0%)
Mortality	0 (0%)

Table 4: Clinical Outcomes at One Year

Outcome	Number of Patients (%)
Improved Functional Status (NYHA Class I/II)	18 (90%)
Unchanged Functional Status (NYHA Class III)	2 (10%)
Hospital Readmissions	2 (10%)
Improved Right Ventricular Function	17 (85%)
Quality of Life Improvement (SF-36 Score)	19 (95%)

Discussion

The results of our study provide valuable insights into the efficacy and outcomes of DeVega's tricuspid annuloplasty for patients with moderate secondary tricuspid regurgitation (TR). The demographic and baseline characteristics of the patients, as detailed in Table 1, indicate a middle-aged population predominantly male, with significant comorbidities such as hypertension and diabetes. These baseline factors are essential as they reflect the typical clinical scenario where secondary TR is encountered, often in the context of left-sided heart disease or pulmonary hypertension.(7,8)

The echocardiographic parameters before and after the surgery, summarized in Table 2, reveal significant improvements postoperatively. The average grade of TR reduced from 2.8 ± 0.4 preoperatively to 1.2 ± 0.5 at one month, 1.3 ± 0.6 at six months, and 1.4 ± 0.7 at one year. This substantial reduction in TR grade demonstrates the immediate and sustained efficacy of DeVega's annuloplasty in reducing regurgitation. The right ventricular end-diastolic diameter also showed a notable decrease from 45.6 ± 8.2 mm preoperatively to around 40 mm postoperatively at all follow-up points, indicating a reduction in right ventricular dilation and improvement in right heart function. (9)

Another critical parameter, the right atrial pressure, showed a significant decrease from 12.5 ± 3.2 mmHg preoperatively to 8.7 ± 2.4 mmHg at one month, with slight increases at six months and one year but still remaining significantly lower than baseline. Pulmonary artery systolic pressure also decreased markedly from 48.2 ± 10.1 mmHg preoperatively to 35.4 ± 8.9 mmHg at one month, with marginal increases at subsequent follow-ups. These reductions in pressures indicate a beneficial hemodynamic impact of the surgery, alleviating the burden on the right side of the heart.

The postoperative complications, as outlined in Table 3, were relatively low. Arrhythmias were the most common complication, occurring in 15% of patients, but there were no reoperations or mortalities, and wound infection occurred in only one patient (5%). Residual TR was noted in 10% of patients, a finding consistent with other studies that highlight the risk of recurrence with annuloplasty techniques. Despite these complications, the overall safety profile of DeVega's annuloplasty in this patient cohort appears favorable.

The clinical outcomes at one year, shown in Table 4, are encouraging. A significant majority of patients (90%) experienced an improvement in functional status, moving to NYHA Class I or II, reflecting better symptomatic control and quality of life. Only 10% of patients remained in NYHA Class III, indicating a relatively low rate of unchanged or worsened functional status. The hospital readmission rate was also low at 10%, suggesting good overall clinical stability post-surgery.(10,11)

The improvement in right ventricular function was observed in 85% of patients, which is a crucial indicator of the procedure's success, as right ventricular dysfunction is a common and severe consequence of untreated TR. Additionally, the quality of life, assessed using the SF-36 score, showed improvement in 95% of patients, underscoring the positive impact of the surgery on patients' daily lives and overall well-being.

These results align with previous studies that have reported the benefits of DeVega's annuloplasty in managing secondary TR. However, the recurrence of TR in 10% of patients and the occurrence of arrhythmias in 15% are consistent with the known limitations of this technique. Studies have suggested that while DeVega's annuloplasty is effective in the short to medium term, its efficacy may diminish over time, leading to the recurrence of TR. This is attributed to the dynamic nature of the tricuspid annulus and the challenges in achieving a durable repair without prosthetic materials.

Comparing these findings with other surgical techniques, such as ring annuloplasty or more recent interventions like transcatheter tricuspid valve repair, DeVega's method remains a viable option, particularly in settings where resource constraints limit the availability of more advanced techniques. However, the potential for TR recurrence and the need for long-term follow-up should be considered when selecting the appropriate surgical approach.

Conclusion:

In conclusion, our study demonstrates that DeVega's tricuspid annuloplasty is an effective surgical option for patients with moderate secondary TR, offering significant improvements in TR grade, right ventricular function, and overall quality of life with a relatively low complication rate. The results highlight the importance of patient selection, thorough preoperative assessment, and vigilant postoperative follow-up to maximize the benefits of this procedure. Future research should focus on long-term outcomes and comparisons with other surgical and transcatheter techniques to refine treatment strategies for secondary TR.

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