



CHIRURGIE CARDIAQUE/CARDIAC SURGERY

MODIFIED DE VEGA ANNULOPLASTY FOR FUNCTIONAL TRICUSPID VALVE REGURGITATION

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ABSTRACT

Objectives: Tricuspid valve regurgitation is mostly functional and secondary to mitral valve and or without aortic valve diseases. Modified De Vega annuloplasty is one of the effective methods used in the surgical correction of functional tricuspid valve regurgitation. This study evaluates the long term results of modified De Vega annuloplasty for functional tricuspid valve regurgitation at the National Cardiothoracic Centre.

Patients and Methods: From March 1993 to July 2005, 64 consecutive patients who had modified De Vega annuloplasty for tricuspid valve regurgitation (TVR) were retrospectively selected for the study. The preoperative echocardiographic records of all patients with TVR were retrieved. The age, sex and the specific heart diseases were recorded. All the patients had follow up echocardiography at least once every two years and the tricuspid valve function reported from the latest post-operative echocardiographic reports were recorded.

Results: The average follow-up period after tricuspid valve repair was 61.3 months (5-133 months). Six (9.4%) had grade II post-operative tricuspid valve regurgitation and 17 (26.5%) had grade I post-operative tricuspid valve regurgitation. No post-operative regurgitation was seen in 41 (64.1%) of those who had modified De Vega annuloplasty. Mitral valve incompetence mostly secondary to rheumatic heart disease accounted for 81.3% (n= 52) of the causes of functional tricuspid valve regurgitation. Combined mitral and aortic valve regurgitation accounted for 9.4% (n = 6), mitral valve stenosis 7.8% (n = 5) and one (1.6%) case of functional tricuspid valve incompetence was associated with atrial septal defect. There was no post-operative heart block and no suture tear was observed in the 64 cases that had the modified De Vega annuloplasty. There were three deaths during the period of review. One died 9 years after surgery from arrhythmia and two died from post-operative dilated cardiomyopathy in their second year after the surgery.

Conclusion : Modified De Vega annuloplasty for tricuspid valve regurgitation is an effective, safe and a simple procedure to perform. In a developing country like Ghana, where most of our patients are poor and can not easily afford ring annuloplasty, De Vega annuloplasty remains the procedure of choice in the management of functional tricuspid valve incompetence.

RÉSUMÉ

Objectif : L'insuffisance tricuspide est le plus souvent fonctionnelle et secondaire à une valvulopathie mitrale avec ou sans une valvulopathie aortique associée. L'annuloplastie tricuspide de type De Vega modifiée est une des corrections efficaces de toute insuffisance tricuspide fonctionnelle.

Le but de cette étude est l'évaluation à long terme de l'intervention de De Vega modifiée en cas d'insuffisance tricuspide fonctionnelle au Centre National Cardio-thoracique d'Accra.

Patients et Méthodes : De Mars 1993 à Juillet 2005, 64 patients consécutifs ayant bénéficié d'une annuloplastie de De Vega modifiée ont été rétrospectivement étudiés. Les données pré-opératoires échocardiographiques ont été recensées. L'âge, le sexe, le type de valvulopathies ont été enregistrés. Tous les patients ont eu un suivi échocardiographique au moins 1 fois tous les 2 ans.

Résultats : Le suivi moyen de nos patients était de 61.3 mois (5 – 133 mois). Six patients (9.4%) avaient une régurgitation tricuspide post-opératoire grade II, 17 (26.5%) un grade I et 41 patients (64.1%) ne présentaient aucune régurgitation

tricuspidienne post-opératoire. L'insuffisance mitrale rhumatismale était la cause de l'insuffisance tricuspidienne fonctionnelle dans 81.3% des cas (n = 52), la sténose mitrale dans 7.8% des cas (n = 5) et dans un cas (1.6%) une communication inter-atriale était associée à l'insuffisance tricuspidienne fonctionnelle.

Aucun bloc auriculo-ventriculaire complet post-opératoire et aucun lâchage de l'annuloplastie tricuspidienne n'ont été observés chez nos 64 malades. Trois décès post-opératoires lointains ont été notés ; la cause de décès a été une arythmie, 9 ans après la chirurgie (1 cas) et une cardiomyopathie dilatée post-opératoire, 2 ans après la chirurgie (2 cas).

Conclusion : *L'annuloplastie tricuspidienne de De Vega modifiée est efficace, simple à réaliser et sans danger. Elle s'avère utile dans les pays en voie de développement comme le Ghana où les patients sont économiquement faibles ; elle reste, chez nous, la procédure de choix dans le traitement de toute insuffisance tricuspidienne fonctionnelle.*

Introduction

Isolated tricuspid valve regurgitation is rare ¹. This is mostly organic tricuspid valve regurgitation and is usually due to trauma, endocarditis, carcinoid heart disease or rheumatic heart disease. However, 80% of patients with TVR are functional and mostly secondary to mitral and/or without aortic valve diseases². Functional TVR is a progressive disease³ and mainly due to dilatation of the annulus and always reflect some degree of right ventricular failure with elevated pulmonary vascular resistance. Functional TVR with left side valve disease mostly signals also, a right ventricular dilatation which is a marker for late neglected valvular disease⁴. This is not an uncommon situation in a developing nation like Ghana where sourcing for funding for open heart surgery delays early surgical intervention. Other causes of functional tricuspid valve regurgitation include cor pulmonale, myocardial infarction, dilated cardiomyopathy, endomyocardial fibrosis and pulmonary hypertension.

Surgical management of functional TVR remains an important procedure as part of the management of some cases of mitral and aortic valve disease.

There are many techniques described in the management of functional TVR. These include annular plication, suture annuloplasty, ring annuloplasty and rarely tricuspid valve replacement. Annuloplasty is feasible in most patients with functional TVR. Annular plication is used in patients who have functional tricuspid valve with organic change in the posterior valve leaflet. Valve replacement is considered only for those patients whose tricuspid valve has severe organic change.

Several tricuspid annuloplasty suture techniques have been developed with variable outcomes. The aim of this study is to review our experience with modified De Vega annuloplasty and the follow up results after 12 years.

Patients and Methods

During a twelve year period from 1993 to 2005 at the National Cardiothoracic Centre, 64 patients had

modified De Vega annuloplasty done for functional TVR. A retrospective review of patient records, echocardiographic reports and clinical outcome was carried out to ascertain the efficacy of the procedure.

Preoperative echocardiographic records of all the patients with TVR were retrieved. The age, sex and the specific heart diseases were recorded. The post-operative echocardiographic reports for the same patients and the tricuspid valve function after modified De Vega annuloplasty were reviewed. All the patients had follow-up echocardiography at least once every two years and the tricuspid valve function reported from the latest post-operative echocardiographic reports were recorded.

Procedure

A cardiopulmonary bypass was established. A right atriotomy was done and procedure was performed using 3-0 or 4-0 pledgeted prolene sutures with double needle. The initial suturing was from the antero-septal commissure to the postero-septal commissure and was similar to the original De Vega procedure. From the antero-septal commissure the second suturing was carried out in the same direction but in a spiral fashion around the annulus and the first suture. The two ends of the suture through a pledget were adjusted and the valve tested by injecting saline into the right ventricle. The suture was tied when leakage from the tricuspid valve is negligible.

Results

Sixty four patients were included in the study. Thirty five (55%) were females and twenty nine (45%) males. The age distribution is shown in table 1.

Table 1 : Age Distribution

Age (years)	No of patients
0-10	7
11-20	30
21-30	7
31-40	10
41-50	5
51-60	4
61-70	1
TOTAL	64

Within the period of review, 589 cases of valve surgery were carried out. Of these, 64 were associated with functional TVR. The average follow-up period after the tricuspid valve repair was 61.3 months (5-133 months). Forty one patients (64.1%) had no TVR, seventeen patients (26.5%) had grade I post-operative TVR and six patients (9.4%) had grade II TVR. Mitral valve regurgitation secondary to rheumatic heart disease accounted for 81.3% (n = 52) of the cases of functional tricuspid valve regurgitation. Combined mitral valve and aortic valve incompetence and isolated mitral valve stenosis accounted for 9.4% (n = 6) and 7.8% (n = 5) respectively. There was one case of functional TVR associated with atrial septal defect. Three deaths occurred during this period. One died 9 years after surgery from arrhythmia and two died from post-operative dilated cardiomyopathy in their second year after the surgery.

Discussion

Functional TVR is a progressive disease and the incidence is not well known. Some researchers have questioned the functional nature of TVR accompanying left side valve disease^{3,5}. It is now becoming clear that even moderate degrees of TVR are unlikely to regress spontaneously after correcting a left heart valvular lesion^{2,5}. As suggested by some studies, it is possible that the annular dilatation is at least partially organic^{2,5}.

Tricuspid valve regurgitation remains a challenge in terms of its precise diagnosis, indications and

appropriate surgical treatment². It has been found that preoperative echocardiography based on tricuspid valve grading test does not compare well with tricuspid dilatation found at surgery⁶. Under general anaesthesia intra-operative echocardiography is not very useful to quantify the tricuspid valve regurgitation in order to indicate valve repair or to assume valve competence after correction⁶. In this study, the indication of tricuspid valve repair was based on clinical, echocardiographic and surgical findings. Intra-operative filling of the right ventricle with cold Ringer's lactate was used to test the severity of TVR. Intra-operatively, some authors⁶ recommended surgical treatment of annulus > 70mm between the antero-septal and postero-septal commissures or surgically treated the TVR when indexed annulus dimension is more than 21mm/m². These have been effective in terms of clinical improvement and late functional results⁶. Patients with moderate and severe TVR should have repair since it is widely demonstrated that in these patients, tricuspid annuloplasty provides better symptomatic results and may improve survival⁶. Despite correction of a left sided pathologic condition, TVR may persist or recur and produce persistent continuous morbidity⁴.

There are three general techniques for tricuspid annuloplasty proposed to correct functional TVR^{7,8}. These are annular plication, annular ring insertion and semi-circular annuloplasty by Kay and Reed¹. Others techniques are the use of plantaris tendon graft for atrio-ventricular valve repair¹⁴ and fixed pericardial C- shaped strip for tricuspid valve repair⁴.

Disappointed with the results of annular plication and basing their technique on the pathologic anatomic studies, semi-rigid and flexible Carpentier-Edwards annuloplasty rings or flexible Cosgrove-Edwards annuloplasty rings or modified semi-circular annuloplasty were developed^{1,9,10,11,12,13}. Goksin I and al¹³ has noted that the results of ring annuloplasty are superior to annular plication and semi-circular and ring annuloplasty¹³.

The De Vega technique was first introduced by De Vega in 1972 in Madrid¹³. It reduces the amount of intra-cardiac prosthetic material, maintain annular flexibility and reduce potential for conduction system injury^{1,13}. It is one of the most effective methods used in surgical correction of functional TVR and has since been modified by others. Revuelta and Garcia –Rinaldi technique⁶ was described in 1989, and consisted of the use of interrupted sutures bolstered in Teflon pledgets and placed around the posterior and anterior segments of the tricuspid annulus. Modified De Vega annuloplasty (Sagban's Annuloplasty¹³)

uses spiral sutures after the first suture around the posterior and the anterior segments of the tricuspid annulus. The aim of this annuloplasty was to prevent recurrent tricuspid valve regurgitation secondary to bowstring (guitar string) phenomenon seen in the original De Vega annuloplasty¹³. The modified De Vega annuloplasty carried out in this study is similar to the Sagban's annuloplasty¹³.

The results of modified De Vega annuloplasty varies in different hospitals. In this study, 90.6% of patients who underwent modified De Vega annuloplasty for TVR had grade I or no regurgitation at all after surgery. None of our patients needed reoperation or replacement of the tricuspid valve. With the average follow-up period of 17.8 months, a study done elsewhere showed that after modified De Vega annuloplasty, 66.7% had no regurgitation after the procedure^{7,13}. This is comparable to our results where 64.1% of our patients had no TVR after repair. In another study after 20 months follow-up, none of the 63 patients who underwent De Vega annuloplasty had moderate or severe TVR¹⁵. Using the modified De Vega annuloplasty in 399 patients with functional TVR associated with left heart valve disease, only three (0.75%) had severe recurrent TVR which necessitated tricuspid valve replacement². Our results compare favourably with these findings. In a 25 year clinical experience with repair of tricuspid insufficiency, Carrier et al¹⁰ showed that De Vega annuloplasty, Bex linear reducer and Carpentier-Edwards prosthetic ring annuloplasty resulted in low rate failure and in good patient survival at long term follow-up.

However, in an article by McCarthy et al⁹, looking at the durability and risk factors for failure in tricuspid valve repair, it was found out that risk factors for worsening regurgitation included repair type other than ring annuloplasty. This study included 790 patients over 9 year period who underwent tricuspid valve annuloplasty for functional regurgitation using four techniques: Carpentier-Edwards semi-rigid ring, Cosgrove-Edwards flexible band, De Vega procedure and customized semi-circular Peri-Guard annuloplasty. Gilbert et al¹⁶ also made a similar observation where annuloplasty ring in patients undergoing tricuspid valve repair is associated with improved survival as compared to semicircular annuloplasty.

The tricuspid valve reoperation-free survival rate varies from different hospitals. In a study

mentioned by Mac Cathy⁹, the survival rate at 5 years was 90±2% and 84±2% at 8 years⁹. The 15-year freedom from reoperation rate was 91.6% in a study looking at the long term results of De Vega annuloplasty¹⁷. Tricuspid valve reoperation rate of < 1% and 3% were recorded at some centers^{3,9}. In this study there was no reoperation. None of our patients developed severe regurgitation to necessitate a reoperation. The hospital mortality for modified De Vega annuloplasty in some centers varies from 1.6 to 8.9%^{2,3,13,17}. In our study there was no hospital mortality. The death of three patients that occurred after they were discharged from hospital was unrelated to the procedure.

Conclusion

Modified De Vega annuloplasty is a simple, cost effective and reliable procedure in the management of tricuspid valve regurgitation. In our environment where most of our patients cannot afford ring annuloplasty, modified De Vega annuloplasty could be the procedure of choice.

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