Repair versus non repair of moderate functional tricuspid regurgitation in patients undergoing mitral valve replacement for rheumatic mitral disease

Thesis

Submitted in Partial Fulfillment of
The Master Degree (**M.Sc**) in
Cardiothoracic Surgery

By

Ayman Mohammed Abdel Wahab Kenawy
(M.B.; B.Ch., Cairo University.)

Under supervision of

PROF. DR. ASHRAF ESMAT
Professor of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

PROF. DR. SOLIMAN ABDELHAY
Assistant Professor of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

DR. AHMED ABDELRAHMAN
Lecturer of Cardiothoracic Surgery,
Faculty of Medicine, Cairo University

Faculty of Medicine,
Cairo University
2013

بسم الله الرحمن الرحيم

ACKNOWLEDGEMENT

I would like to start this humble work by expressing my deepest gratitude to all the team that helped me in achieving it.

I wish to thank our Professor Dr. ***Ashraf Esmat ,****Professor of Cardiothoracic Surgery, Faculty of Medicine, Cairo University; who honored me by carrying out the burden of meticulously revising my script and guiding my thoughts.*

I am also profoundly grateful to Prof. Dr. ***Soliman Abdelhay*** *Assistant Professor of Cardiothoracic Surgery, Faculty of Medicine, Cairo University, for his brotherly guidance and enormous support that was a great help to me.*

*I am deeply indebted to Dr****.Ahmed Abdelrahman,*** *Lecturer of Cardiothoracic Surgery, Faculty of Medicine, Cairo University, whose kindness was more than encouraging.*

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Group A	**Repair group**
Group B	**Non-repair group**
STR	**Secondary tricuspid regurgitation**
TR	**Tricuspid regurgitation**
RV	**Right ventricle**
MVR	**Mitral valve replacement**
TVA	**Tricuspid valve annuloplasty**
FTR	**Functional tricuspid regurgitation**
LHD	**Left heart disease**
MV	**Mitral valve**
TA	**Tricuspid annulus**
TV	**Tricuspid valve**
C.V.P	**Central venous pressure**
F.C.	**Functional class**

ABSTRACT

Functional or secondary tricuspid regurgitation (STR) is the most frequent etiology of tricuspid valve pathology in Egypt. Surgical tricuspid repair has been avoided for years, because of the misconception that tricuspid regurgitation should disappear once the primary left-sided problem is treated; this results in a large number of untreated patients with STR. Over the past few years, many investigators have reported evidence in favor of a more aggressive surgical approach to STR. Consequently, interest has been growing in the physiopathology and treatment of STR. The purpose of this review is to explore the anatomical basis, pathophysiology, therapeutic approach, and future perspectives with regard to the management of STR.

In this study I wanted to determine if there is near-term postoperative progression of non-corrected moderate functional TR in patients who underwent mitral valve replacement for rheumatic mitral disease and if RV size and function were affected.

Methods and Results. I compared two groups of patients prospectively. In the first group (group A, n 20), tricuspid valve annuloplasty (TVA) in the form of De vega repair had been performed in conjunction with mitral valve replacement (MVR). The second group (group B, n 20) underwent MVR without TVA.

Group A revealed a significant decrease in TR and right ventricle diameter. In group B, (6) patients (32%) showed a significant progression of the non-corrected TR together with dilatation and decreased ejection fraction of the right ventricle.

Conclusion. Tricuspid annuloplasty performed concurrently with MVR can prevent subsequent progression of tricuspid regurgitation along with right ventricular dilatation and systolic dysfunction in the near-term postoperative period.

KEYWORDS:

Tricuspid valve – Tricuspid valve regurgitation – Tricuspid valve surgery – Tricuspid valve repair – DeVega annuloplasty

INTRODUCTION

There are two types of tricuspid regurgitation. Primary TR, attributed to congenital anomalies or resulting from bacterial endocarditis, is much less common than secondary (functional) TR***(Porter A***.and ***Shapira Y.)***

Secondary TR is attributed to dilatation of the right ventricle and tricuspid annulus due to volume or pressure overloading of the right ventricle.

The most frequent causes of functional TR are ***(Rizzoli G . etal)***

(1)left heart disease (significant aortic or mitral valve disorder, or left ventricular dysfunction),

(2)chronic pulmonary disease, and

(3)primary pulmonary hypertension.

Reversible postcapillary or mixed pulmonary hypertension enabling surgery on an insufficient tricuspid valve usually accompanies significant chronic mitral regurgitation ***(Widimsky J.*** *and* ***Widimský p.)***

Functional TR may decrease or totally disappear after resolution of the left heart lesion responsible for the overloading of the right ventricle. However, TR progression occurs in as many as one half of patients***(G.D. Dreyfus G.D.).*** This untreated TR along with tricuspid annulus dilatation can lead to irreversible right ventricular dysfunction and failure ***(Scully H.E. and Armstrong C.S.).***

When a separate tricuspid valve repair, due to significant TR, follows mitral valve surgery, mortality rates up to 32% are seen and 5-year survivability is less than 50% ***(P. M. McCarthy 2004)***[6]**.** The reason is the poorer preoperative condition of the

patients due to increased age, complications related to the previous mitral valve operation, and the possibility that irreversible right

ventricular dysfunction had developed by the time of the second surgery.

Because of the high total mortality following tricuspid valve replacement ***(G. Rizzoli, I. Vendramin, G. Nesseris, and L. Schiavon,2004)***[2,7]**,** valve repair is preferable ***(A. Vahanian, and H. Baumgartner,2007)***[8]**,** and if tricuspid valve replacement is indicated, a bioprosthetic valve is preferable to a mechanical one. Regarding the surgery-sparing techniques (for secondary dilatation of the tricuspid valve annulus with subsequent non-coaptation of the leaflets), placement of sutures around the circumference of the annulus was initially used to narrow the annulus (most frequently the surgery technique according to De Vega), but currently not only the narrowing but also the remodeling of the tricuspid annulus using annuloplasty ring is preferred (see Figure 1). The advantage of this procedure is a better long-term outcome of the sparing surgery.

Figure 1: Tricuspid valve annuloplasty using semiflexible ring (provided Doc. Petr Němec, M.D., PhD., Center of Cardiovascular and Transplant Surgery, Brno, Czech Republic).

Pulmonary hypertension, higher RV diameter with tricuspid valve annulus dilatation, and decreased RV ejection fraction are considered risk factors for deterioration of untreated tricuspid regurgitation following mitral valve surgery ***(G. D. Dreyfus et al,2005, T. Colombo etal, 2001)***[4,9]**.** Therefore tricuspid valve repair in conjunction with mitral valve surgery is beneficial for severe TR and should be considered for less than severe TR when there is dilated annulus (40 mm) or pulmonary hypertension ***(G. D. Dreyfus et al,2005, A. Vahanian, and H. Baumgartner,2007, R. O. Bonow.et al 2006)***[4,8,10]

AIM OF WORK

To compare the development of significant functional TR after mitral valve replacement in the near-term postoperative period between a group of patients who had MVR only and a group of patients who had both MVR and TVA simultaneously,both groups being have moderate functional TR

CHAPTER ONE

ANATOMY OF THE TRICUSPID VALVE

The tricuspid (right atrioventricular) orifice is oriented with its plane in a semivertical axis and directs the right atrial blood anteriorly, inferiorly and to the left. The tricuspid valve lies vertically behind the left sternal border but at an angle of 45 degree to the median plane ***(Walmsley and Hamish, 1988)***[11]**.**

The normal area of the tricuspid valve is 7cm^2**(Rackley *et al., 2000)***[12]**.**

The main components of each valvular apparatus are the leaflets, three for the tricuspid valve. The leaflets are attached by their base to the annulus, which forms part of the skeleton of the heart, and by their free edge, through the chordae tendineae, to the papillary muscles, which form a part of the myocardial structure of the ventricles ***(Antunes, 2005)***[13]**.**

The three tricuspid leaflets are supported by a tensor apparatus composed of chordae tendinae and papillary muscles. There is no definite tricuspid annulus but the bases of the three leaflets are attached to heart at the atrioventricular junction. In normal situs and connection, this annulus is related to the base of the aortic valve, the membranous septum, central fibrous body, the right coronary artery, the lateral atrioventricular junction, the coronary sinus and the bundle of His. With its tensor apparatus, the tricuspid valve in part defines the morphologic right ventricle ***(Karp, 2000)***[14]**.**

The leaflets are separated by the commissures. Usually these deep indentations do not reach the annulus and a narrow band of leaflet tissue completes the veil around the valve orifice. Each leaflet of either atrioventricular valve has a different shape and size. In each case, the ventricular surface of the larger leaflet (anterior) is related to the outflow tract of the corresponding ventricle, hence separating the respective inflow and outflow chambers ***(Antunes, 2005)***[13]**.**

- **Cardiac Skeleton**

The central fibrous body "Right fibrous trigone" [Trigonum fibrosum dextrum], fuses at the center of the heart with the medial aspect of the mitral and tricuspid valves and the aortic root. The left fibrous trigone [Trigonum fibrosum sinistrusm], is formed by compact bundles of connective tissue that course from the central fibrous body to the left, posteroinferiorly and then anteriorly ***(Schlant et al., 2000)***[15]**.**

Continuations of fibroelastic tissue from the central fibrous body and the left fibrous trigone partially encircle the mitral and tricuspid valves. These rings of tissue are the mitral and tricuspid annuli. In general, the fibrous skeleton is less well developed around the tricuspid valve. The bundle of His penetrates the central fibrous body and travels along the inferior margin of the membranous portion of the ventricular septum ***(Schlant et al., 2000)***[15]**.**

This cardiac skeleton gives attachment to both myocardial musculature and valvular tissue, however, it is neither rigid nor static ***(Walmsley and Hamish, 1988)***[11]**.**

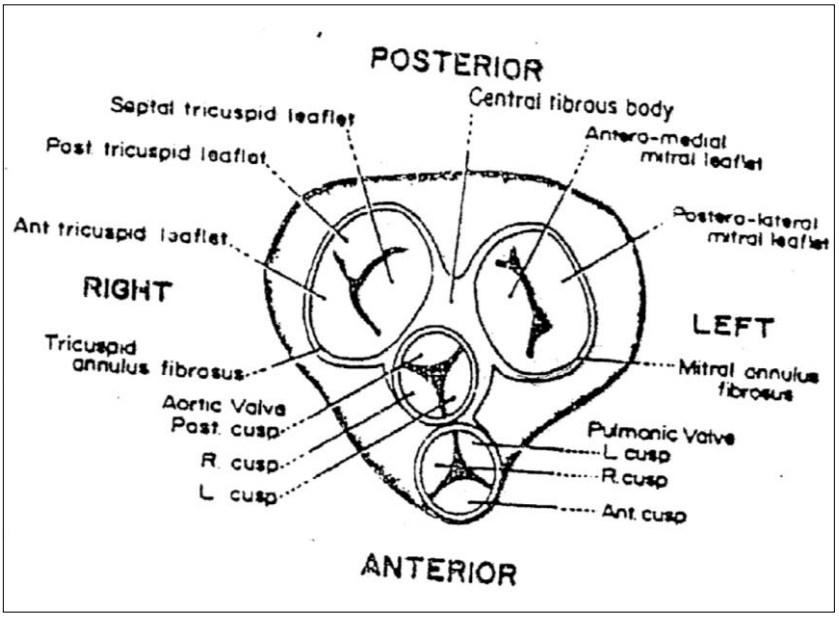

Fig (2): Schematic anterosuperior view of the heart with the atria removed. The components of the fibrous skeleton and the orientation of the leaflets of each valve are shown ***(Schlant et al., 2000)***[15]**.**

1. Annulus Fibrosus

The tricuspid annulus is located at the junction between the right atrium and right ventricle. The tricuspid annulus is attached only to the right fibrous trigone where the septal leaflet and the anteroseptal commissure insert. Elsewhere, the connective tissue in the leaflets joins the subendocardial tissue and the anterior and posterior leaflets insert directly into the myocardium ***(Tei et al., 1982)***[16]**.** It is at this specific site that dialation of the annulus occurs in functional tricuspid insufficiency ***(Carpentier et al., 1991 and Deloche et al., 1993)***[17]**.**

The attachments of the valve leaflets to the tricuspid annulus are at different levels ***(Silver et al., 1981)***[18]**.** Progressing from left to right, the basal attachment of both posterior leaflet and postero-septal half of the septal leaflet are roughly horizontal and about 15 mm lower than the highest point of valve attachment. From about midpoint of the septal leaflet, the basal attachment angles upwards at 30 degree from