Mechanical Versus Tissue Valves Replacement in cases of Rheumatic Mitral Valve Disease

Thesis

Submitted for partial fullfilment of M.D. Degree in Cardiothoracic Surgery

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List of Abbreviations

2D echo	Two-dimensional echocardiography
ACE	Angiotensin converting enzyme
AF	Atrial fibrillation
ASD	Atrial septal defect
BMW	Ballon mitral valvotomy
CAD	Coronary artery disease
COP	Cardiac output
COPD	Chronic obstructive pulmonary disease
CVP	Central venous pressure
ECG	Electrocardiogram
Echo	Echocardiography
EOA	Effective orifice area
ERA	Effective regurgitant area
ESRD	External sewing ring diameter
FTR	Functional tricuspid regurgitation
GOA	Geometric Orifice area
HF	Heart failure
HT	Hypertension
INR	International normalized ratio

IOD	Internal orifice diameter
LA	Left atrium
LV	Left ventricle
LVEDD	Left ventricular end diastolic diameter
LVEDP	Left ventricular end diastolic pressure
LVEF	Left ventricular ejection fraction
LVESD	Left ventricular end systolic diameter
LVOT	Left ventricular outflow tract
MR	Mitral regurgitation
MS	Mitral stenosis
MV	Mitral valve
MVA	Mitral valve area
MVR	Mitral valve replacement
NYHA	New York Heart Association
OS	Opening snap
PASP	Pulmonary artery systolic pressure
PMC	Percutaneous mitral commissurotomy
PVL	Paravalvular leak
RF	Rheumatic fever
RV	Right ventricle

RHD	Rheumatic heart disease
Rvol	Regurgitant volume
S1	First heart sound
S2	Second heart sound
SV	Stroke volume
SVD	Structural valve deterioration
TAD	Tissue annulus diameter
TEE	Transoseophageal echocardiography

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Mohamed Zahran
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Introduction

Rheumatic fever (RF) is the cause of rheumatic heart disease (RHD) in developing countries. It is estimated that 15.6 million people suffer from RHD worldwide, with nearly 233,000 related deaths each year ***(Carapetis J. et al., 2005).***

Mitral valve is the most commonly affected cardiac valve. Mitral valve affection results from an abnormal autoimmune response to group A streptococcal infection in a genetically susceptible host ***(Marijon E. et al., 2012)***.

In rheumatic mitral valve disease, the valve is exposed to one or both of two conditions (mitral Stenosis or mitral regurgitation). Patients with Mitral stenosis typically present more than 20 years after an episode of rheumatic fever. Single or recurrent bouts of rheumatic carditis cause progressive thickening, scarring, and calcification of the mitral leaflets and chordae.

Fusion of the commissures decreases the size of the mitral opening. This obstruction results in the development of a pressure gradient across the valve in diastole and causes an elevation in left atrial and pulmonary venous pressures. Elevated left atrial pressure leads to left atrial enlargement, predisposing the patient to atrial fibrillation and arterial thromboembolism. Elevated pulmonary venous pressure results in pulmonary congestion and pulmonary edema. In advanced mitral stenosis, patients develop pulmonary hypertension and right-sided heart failure ***(Ronan et al., 2010)***.

Rheumatic mitral regurgitation results from two possible etiologies. One is the acute rheumatic process resulting in annular dilation from myocarditis. This occurs from the actual rheumatic infection. However, the most common cause is from the chronic sequelae of rheumatic fever resulting in severe valve thickening, especially involving the posterior leaflet, as well as rolling of the leaflet edges. The chordae may be elongated but more typically are shortened, thickened and fused, and sometimes they are so short that the papillary muscles actually appear to be fused up to the valve leaflet ***(James* I. et al., 2008)**.

Rheumatic process is the first most common cause of mitral stenosis and the second most common of mitral regurgitation. If a patient has combined mitral stenosis and mitral regurgitation, the cause is nearly always rheumatic ***(Fritz J. ,2003)***.

If the condition is not prevented, nor properly medically treated (with antibiotics), progressive damage to the mitral valve can occur. Since rheumatic heart disease is usually progressive, the cardiac valve problems tend to worsen over time and valve replacement surgery is likely to be required. It should be noted that in developing countries rheumatic heart disease is the predominant indication for cardiac surgery ***(Geldenhuys A., et al .2012)***.

When describing rheumatic affection of mitral valve leaflets, 5 points are to be assessed: the **commissural fusion**, **leaflet thickening**, **leaflet calcification**, **leaflet fibrosis** and **chordal shortening**. Dysfunction of any one or more components of this valvular-ventricular complex can lead to mitral regurgitation or mitral stenosis ***(James I.* et al., 2008)**.

There are 2 main types of valves implanted in cases of mitral valve disease (mechanical prosthetic and tissue valves) **(*Tomas G., et al. 2008)***.

In general, mechanical valve is preferred than tissue due to freedom from valve reoperation but not from valve-related morbidities. A mechanical valve should be expected to last the lifetime of the patient. Tissue valves are made from porcine valve or bovine pericardial tissue. They deteriorate with time, either becoming calcified or stenotic ***(Jamieson W. et al., 2005).***

The main **advantage** of the mechanical valve is that it is permanent. The main **disadvantage** is that it requires anticoagulation (which is hazardous in young female patients during pregnancy) for the rest of a patient's life. Even with adequate anticoagulation, there remains a chance of thrombosis **(*Tomas G., et al. 2008)***.