

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

Thesis

*Submitted for partial fulfillment of M.D. Degree in Cardiothoracic Surgery*

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توطئة للحصول على درجة الدكتوراه في جراحة القلب و الصدر

رسالة مقدمة من

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

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

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

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## **ACKNOWLEDGEMENTS**

In the name of ALLAH The Merciful The Compassionate

To the **Almighty Merciful Allah** whose celestial assistance has offered me the golden chance to be instructed by such most respectable scientists and most honourable professors. To him of most humbly I offer my thanks.

To **Prof. Mohsen Abd El-Karem Fadala, Professor of cardiothoracic surgery, Ain Shams University**, I give tribute of what can words convey of gratitude together with love and admiration, for without his enthusiastic help, care and encouragement, this work would not have come to light. Let me admit, that through his remarks, guidance and moralism, I have been able to get valuable experience, information and to avoid glaring errors.

To **Prof. Ahmed Abd ElAziz Ibrahim, Professor of cardiothoracic surgery, Ain Shams University**, who supported, encouraged and directed my efforts through this work. To him, in simple but expressive words, I voice a sincere but humble “thank you”.

My great appreciation to **Dr. Hossam Eldin Ashour, Assistant Professor of cardiothoracic surgery, Ain Shams University**, is due to his intellectual guidance, his valuable advices and his peerless efforts throughout the whole work. His generosity, kindness and humanity are unique and everlasting.

My great appreciation to **Dr. Shady Eid Moussa Elwany, Assistant Professor of cardiothoracic surgery, Minia University**, is due to his intellectual guidance, his valuable advices and his peerless efforts throughout the whole work. His generosity, kindness and humanity are unique and everlasting, and to **Dr. Sherif Abd El-Samie Ahmed, Lecturer of cardiothoracic surgery, Ain Shams University**, for his great guidance and support .

My sincere thanks to my colleagues in the departments of Cardiothoracic Surgery, Ain-Shams University and Minia university for their co-operation, understanding and constructive remarks.

Last but not least my thanks to the participants in this study for without their patience, interest in research this work would not have been done.

**Mohamed Zahran  
2016**

## 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 (*Geldenhuis 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*).