Review of Differences Between Mechanical And Bioprosthetic Valve Replacement In The Mitral Position

Essay

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

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List of Abbreviations

Abb.	Full term
A/C	Anti-coagulation
ACC	American college of cardiology
AF	Atrial Fibrillation
AHA	American heart association
AMI	Acute mitral infarction
Ao	Aorta
AOA	Alpha-oleic acid
APM	Anterior papillary muscle
aPTT	Activated partial thromboplastin time
AS	Aortic stenosis
A-V	Atrioventricular
AVR	Aortic valve replacement
BHVs	Bioprosthetic heart valves
CABG	Coronary artery bypass graft
CAD	Coronary artery disease
CE	Carpientier Edwards
CEP	Carpentier Edwards Perimount
CE-SAV	Carpientier Edwards supa-annular valve
COR	Class of recommendation
ECG	Electrocardiographic
FDA	Food and Drug Administration
GDMT	Guideline-directed medical therapy
Hf	Heart failure
HVD	Heart valve disease
IMR	Ischemic mitral regurgitation
INR	International normalized ratio
IS	Ionescu-Shiley
ISLP	Ionescu-Shiley Low Profile
ISS	Ionescu-Shiley Standard
LA	Left atrium
LMWH	Low molecular weight heparin

List of Abbreviations cont...

Abb.	Full term
LOE	Level of evidence
LV	Left ventricular
LVEF	Left ventricular ejection fraction
LVESD	Left ventricular end systolic dimension
LVOT	Left ventricular outflow tract
MHVs	Mechanical heart valves
MI	Myocardial infarction
MR	Mitral regurge
MS	Mitral stenosis
MV	Mitral valve
MVA	Mitral valve area
MVR	Mitral valve replacement
NYHA	New York heart association
PA	Pulmonary artery
PHVs	Prosthetic heart valves
PM	Papillary muscles
PMBC	Percutaneous mitral balloon commisurotomy
PTFE	Polytetrafluoroethylene
PVL	Paravalvular leak
RR	Relative risk
SJM	St. jude medical
SVD	Structural valve deterioration
TMV	Transcatheter mitral valve
TMVR	Transcatheter mitral valve replacement
TR	Tricuspid regurge
UFH	Unfractioned Heparin
VKA	Vitamin K antagonist.

Abstract

This is because there is no ideal substitute that offers long-term durability, without the need for oral anticoagulants, no increased risk of thromboembolism and a functional mechanism similar to the native mitral valve. This decision becomes an even greater challenge when patients have coexisting conditions, such as advanced age, congestive heart failure, coronary artery disease, lung disease or renal failure. The increase in life expectancy and in comorbidities among patients needing valve replacement means that choosing the most effective treatment (valvuloplasty, mechanical prosthesis or bioprosthesis) demands consideration of additional factors.

The process of deciding which prosthetic valve type is best for an individual patient is complex. Consideration of the general advantages and disadvantages of the valve types, as outlined above, is only the first step. These general recommendations need to be then tailored to the individual patient's clinical condition and, equally importantly, personal preferences. Once the specific advantages and disadvantages are considered in the context of the individual patient, then the information needs to be communicated in an effective way for the provider and patient to fully comprehend the consequences of valve selection. Finally, frameworks to allow for incorporation of the myriad factors to aid decision-making are necessary.

Key words: Anti-coagulation - trial Fibrillation – Aorta- Alpha-oleic acid **-** Anterior papillary muscle- Atrioventricular- Heart valve disease- Ionescu-Shiley- Papillary muscles- Ionescu-Shiley Standard

INTRODUCTION

More than 30 years after the introduction of modern prosthetic valves, the choice of whether to use a biological or a mechanical valve in the mitral position is still the subject of debate. [1,2]

This is because there is no ideal substitute that offers long-term durability, without the need for oral anticoagulants, no increased risk of thromboembolism and a functional mechanism similar to the native mitral valve. This decision becomes an even greater challenge when patients have coexisting conditions, such as advanced age, congestive heart failure, coronary artery disease, lung disease or renal failure. The increase in life expectancy and in comorbidities among patients needing valve replacement means that choosing the most effective treatment (valvuloplasty, mechanical prosthesis or bioprosthesis) demands consideration of additional factors. [3]

Each year, more than 20,000 mitral valve operations are reported to the Society of Thoracic Surgeons database.[4] Despite the increased emphasis on valve repair, at least 30 % of patients with mitral valve disease still undergo valve replacement. [5–7]

Reasons include extensive comorbidities, previous valve operations, complex jets, and mitral stenosis. The ideal replacement valve would be durable, would not require anticoagulation, and would be small enough to avoid distortion of the mitral annulus while preserving left ventricular geometry.[6]

This review evaluates the advantages and disadvantages of mechanical and bioprosthetic prosthetic heart valves in the mitral position as well as the factors for consideration in deciding the appropriate valve type for an individual patient. Although many cautions exist, the general recommendation is for patients younger than 60 to 65 years to receive mechanical valves due to the valve’s longer durability and for patients older than 60 to 65 years to receive a bioprosthetic valve to avoid complications with anticoagulants. Situations that warrant special consideration include patient co-morbidities, the need for anticoagulation, and the potential for pregnancy. Once these characteristics have been considered, patients’ values, anxieties, and expectations for their lifestyle and quality of life should be incorporated into final valve selection. Decision aids can be useful in integrating preferences in the valve decision. Finally, future directions in valve technology, anticoagulation, and medical decision-making are discussed.[8]

Aim of the Work

The purpose of this essay is to spotlight the new and updated literature concerning differences between mechanical and bioprosthetic valve replacement in the mitral position regarding indications, types of different mitral valves, post operative complications and outcome in both and factors affecting valve selection.

ANATOMY OF THE MITRAL VALVE

The mitral valve is a complex structure consisting of six components: The annulus, Leaflets, Chordae tendinae, papillary muscles, Left atrial wall, and the left ventricular wall. [9] It consists of continuous veil of tissue inserted around the entire circumference of the mitral orifice, and it is fixed to some extent to the cardiac skeleton, but the free edges of the leaflet represent the highly mobile part. [10]

The Mitral Valve Annulus:

The mitral valve annulus represents the attachment of the mitral valve leaflets to the muscular fibers of the atrium and ventricle, and directly attached to the fibrous skeleton of the heart, which is a fixed thick collagenous frame works as attachment to the valve, atrium and ventricular muscles. [9,11]

The central fibrous body is the main component of the fibrous skeleton of the heart and is made up by the right fibrous trigone and in the other part by the left fibrous trigone, and the depth of the intervalvular trigone making the plane of the aortic valve at an angel with the mitral orifice. A fine tendon-like collagen bundles, the fila of Henle, extend out circumferentially from each fibrous trigone a variable distance towards the corresponding side of the mitral orifice. [9,11]

The inter-trigonal space is limited above by the aortic leaflets and below is continuous with the anterior mitral leaflet the so called the “aortic curtain” Fig. (1), this subaortic region