



Cardiac Problems and Outcomes of Mitral Valve Regurgitation

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Received Date: April 06, 2023; Accepted Date: May 26, 2023; Published Date: June 29, 2023

Citation: Bonow D, Harris H, Comin Y*, Badhwar D, Sampaio F. Cardiac Problems and Outcomes of Mitral Valve Regurgitation, J Clinical Cardiology Research and Reports. V2(I)

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Abstract

Mitral regurgitation is the second most common valvular disorder requiring surgical intervention worldwide. This review summarizes the current understanding of primary, degenerative mitral regurgitation with respect to etiology, comprehensive assessment, natural history and management.

Keywords: Early surgical intervention; aortic stenosis; primary mitral regurgitation; left ventricular dysfunction

Introduction

Mitral regurgitation (MR) is caused by the retrograde flow of blood from the left ventricle (LV) into the left atrium (LA) through the mitral valve (MV), causing a systolic murmur heard best at the apex of the heart with radiation to the left axilla. MR is the most common valvular abnormality worldwide, affecting over 2% of the total population and has a prevalence that increases with age.

Anatomy of Mitral Valve

The mitral valve consists of two leaflets (anterior and posterior) sitting within the annulus. The posterior mitral leaflet originates from the left atrial (LA) endocardium. A subvalvular apparatus, comprising of 2 papillary muscles (anterolateral and posteromedial), arise from the LV myocardium and the chordae tendineae, supporting the leaflets.

Types of MR

Mitral regurgitation can subdivide into primary and secondary causes.

Primary Mitral Regurgitation

- Also called degenerative or organic
- Any MR resulting from structural deformity of or damage to the leaflets, chordae, and/or papillary muscles causing leaflets to close insufficiently during systole.

Secondary Mitral Regurgitation

- Also called functional or ischemic
- Due to a left ventricular wall motion abnormalities (i.e., ischemic cardiomyopathy) or left ventricular remodeling (i.e., dilated cardiomyopathy)

Etiology

Degenerative:

The underlying pathophysiologic basis for degenerative mitral regurgitation is most commonly related to myxomatous degeneration of the mitral valve,

resulting in mitral valve prolapse (MVP). MVP can occur either as a primary, non-syndromic process or a secondary, syndromic process. In primary MVP, advancing age is the driving factor responsible for disease progression.

Congenital:

Conditions like isolated cleft of the mitral valve, double orifice mitral valve, and parachute mitral valve (PMV), which is a congenital valvular anomaly where the chordae tendineae are attached to a single papillary muscle, have been linked to causing MR.

Infectious/Rheumatic:

With an estimation of over 15 million cases worldwide, rheumatic heart disease (RHD) is extremely common in developing countries due to a lack of medical resources and vaccinations.

Hypertrophic Cardiomyopathy:

Hypertrophic cardiomyopathy (HCM) can also lead to MR. HCM is defined by severe left ventricular hypertrophy, which causes increased papillary muscle mass, bringing them closer together.

Pathophysiology

Mitral regurgitation results in left ventricular volume overload, due to an increase in the total stroke volume, as blood is ejected both forward into the aorta and backward into the left atrium. The compensatory response is hypertrophy of the myocardium, progressive dilation and increase in the left ventricular end-diastolic volume, with initial normalization of the wall stress. Long-standing mitral regurgitation causes progressive left ventricular dilation and decline in the left ventricular contractility and ejection fraction.

Diagnosis and Evaluation

Echocardiography plays a pivotal role in the diagnosis of mitral valve regurgitation, the determination mechanism/ cause, the quantification of its severity, and its effect/ consequences on the left ventricle. Once defined, further imaging data is used to determine prognosis, timing of surgical intervention and feasibility of successful surgical repair.



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Doppler echocardiography provides significant information on the severity of the mitral regurgitation. Qualitative assessment of the regurgitant jet area using color flow Doppler is influenced by the cause of the regurgitation and the jet eccentricity and it should not be used alone for the grading of the lesion severity.

Cardiac MRI is the most accurate non-invasive technique for measurement of end-diastolic and end-systolic volumes and left ventricular mass. Although visualization of mitral valve structure is more reliable by echocardiography, CMR may provide a more accurate assessment of the severity of regurgitation.

Conclusion

Mitral regurgitation is the most common valvular disorder in the USA and the second most common in Europe. Myxomatous degeneration of the valve is responsible for two thirds of primary mitral regurgitation, which is an intrinsic valve problem in contrast to the secondary regurgitation, which is a disease of the ventricle. Mitral regurgitation is a pure volume overload to the left ventricle, to which the ventricle responds with progressive dilation and eventually with decreased ejection fraction and symptoms of heart failure. Quantitative echocardiography is the main way to evaluate the severity of mitral regurgitation. Cardiac MRI and left/right heart catheterization have an adjunctive role when there is discrepancy between clinical findings and echocardiographic data. Clinical (age, symptoms, poor exercise capacity, atrial

fibrillation) and echocardiographic (left ventricular dysfunction, EROA, high SPAP and left atrial volume and abnormal LV strain) parameters predict worse outcomes in mitral regurgitation.

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