Mitral Insufficiency (Mitral Regurgitation) — Classification and Diagnosis

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Acquired valvular heart diseases may manifest as insufficiencies (i.e., the incomplete closure of the valve), as a stenosis (i.e., a narrowing of the valve), or as a combined valvular defect. In principle, all valves can be affected. The aortic valve stenosis and the mitral regurgitation are particularly frequent.

Introduction

As the second most common disease of the heart valves, the mitral valve insufficiency has various causes but is associated with a favorable prognosis, especially because it can remain asymptomatic for a long time. Good adaptation mechanisms allow the maintaining of the cardiac output.
Definition of Mitral Insufficiency

A mitral valve insufficiency involves changes of the mitral valve so that it is no longer able to close properly. These changes can affect both the annulus as well as cusp, chordae tendineae, and papillary muscles.

Epidemiology of Mitral Insufficiency

Distribution of mitral insufficiency

Next to valvular aortic stenosis, mitral valve insufficiency is the second most common disease of the heart valves, with an incidence rate of 2% per year.

Etiology of Mitral Insufficiency

Causes of mitral insufficiency

A relative mitral valve insufficiency occurs when the reason for the inability to close can be attributed to the dilation of the mitral valve annulus. This can occur as part of a dilated cardiomyopathy. In an acute myocardial infarction, or mitral valve prolapse, as well as a CHD, the chordae tendineae and papillary muscles can be affected.
Calcifications, as well as rheumatic and bacterial endocarditis, may result in a mitral valve insufficiency. Degenerative changes can occur as part of such conditions as Ehler-Danlos syndrome, Marfan syndrome or mitral valve prolapse syndrome.

Classification of Mitral Insufficiency

The 4 grades of severity of mitral insufficiency

Mitral valve insufficiency can be divided into four grades, just like the aortic valve insufficiency, depending on their regurgitation fractions:

- **Grade I**: Regurgitation fraction < 20%, little contrast agent enters the left atrium; it is completely excreted again in the systole.
- **Grade II**: Regurgitation fraction 20 – 39%, the left atrium fills up completely but is weak after several heartbeats with the contrast agent.
- **Grade III**: Regurgitation fraction 40 – 60%, the left atrium fills up completely with the contrast agent, the contrast medium density in the left atrium corresponds to the density in the left ventricle.
- **Grade IV**: Regurgitation fraction > 60%, the left atrium fills up completely with the contrast again during the first or second heartbeat, the contrast medium density is higher in the left atrium than it is in the left ventricle, a reflux of the contrast agent into the pulmonary veins occurs.

Image: “slight mitral insufficiency” by JHeuser. Licence: CC BY 2.5
The color cloud symbolizes the blood backflow, 1 Left ventricle – 2 Left atrium
Pathophysiology of Mitral Insufficiency

If the mitral valve does not close properly, the blood from the left ventricle is only partially directed into the systemic circulation. The other part is pumped into the left atrium again, and, since the pulmonary veins have no valves, pumped back into the pulmonary circulation. This leads to an accumulation of blood in the lungs and thus to pulmonary hypertension, right ventricular load and right heart failure.

Since the cardiac output would fall into the left atrium, due to the return flow, the left ventricle must intensify its work in order to maintain it. Thus, this also causes an increased strain on the left ventricle and left ventricular hypertrophy and dilation.

Symptoms and Clinical Presentation of Mitral Insufficiency

Acute mitral insufficiency

The acute form of mitral valve insufficiency quickly leads to symptoms of heart failure with pulmonary edema, even to cardiogenic shock, due to lack of time for decompensation.

Chronic mitral insufficiency

The chronic form may be asymptomatic for a long time and is associated with a good prognosis, since the adaptation mechanisms are very good. Patients may complain of fatigue and dyspnea on exertion. Mitral valve insufficiency is only more pronounced at a higher grade and decompensation: dyspnea at rest and palpitations, as well as nocturnal coughing fits, can occur.
Progression and Special Types of Mitral Insufficiency

A distinction is made between **acute** and **chronic mitral valve insufficiency**. The cause of the acute form is a bacterial endocarditis or an acute myocardial infarction. The rheumatic mitral valve insufficiency has a 5-year survival rate of 80%. Generally, the ejection fraction can be maintained for a long time. The progression of the disease should still be monitored every six to twelve months.

Diagnosis of Mitral Insufficiency

Auscultation of mitral insufficiency

![Echocardiogram of Severe Mitral Regurgitation](https://via.placeholder.com/150)

Image: “Echocardiogram of Severe Mitral Regurgitation” by JHeuser. Lizenz: CC BY 3.0

Left Atrial (LA) – 2 Mi – Jet, LV Left Ventricle – RV Right Ventricle – Right Atrium (RA)

Signs during an exam are rare or are based on an eccentric left ventricular hypertrophy. **Peripheral cyanoses** can be present, as well as a **widened and displaced apical impulse**. In auscultation, a **strip-shaped pansysolic systolic murmur which is heard best over the cardiac apex, whose sounds are propagated into the axilla**.

First heard sound is soft, with a wide splitting of the second heart sound.

Sustained hand grip **increases systematic vascular resistance and afterload**. It’s used to differentiate between aortic stenosis and mitral insufficiency: in MR: the murmur increases/in AS: the murmur decreases.

Radiological examination of mitral insufficiency

Signs on the **ECG** are dependent on the adaptation mechanisms of the heart. In pulmonary hypertension, a right axis deviation, in left ventricular hypertrophy more of a horizontal heart can be seen. The P wave may have two peaks.

On the **chest X-ray**, an enlarged heart can be seen. Pulmonary venous congestions may
also be identified. The valvular apparatus should be assessed using **echocardiography**. The degree of insufficiency can also be determined.

**Treatment of Mitral Insufficiency**

**Treatment options for mitral insufficiency**

Conservative treatment of mitral regurgitation includes **physical rest**, and, if the risk of atrial fibrillation exists, **prevention of thromboembolism** should be initiated with anticoagulants:

- Decrease afterload by using ACIs/ARBs, especially if mitral insufficiency is associated with systolic dysfunction.
- Decrease the pulmonary congestion with diuretics and digitalis.

**Regular follow-ups** ensure that the indication for surgery is not overlooked. Once the contractility of the ventricle is restricted, there is a danger that even a reconstruction will not be able to help produce ventricular function again. Ideally, a **mitral valve repair** should be carried out. This can be done in a minimally invasive or surgical way. A **mitral valve replacement** is possible, with a mechanical, as well as a biological, prosthesis.

**Complications of Mitral Insufficiency**

A complication of mitral valve insufficiency is **cardiac decompensation**, which may cause **pulmonary edema**. This can be triggered by **atrial fibrillation** as well.

**References**


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