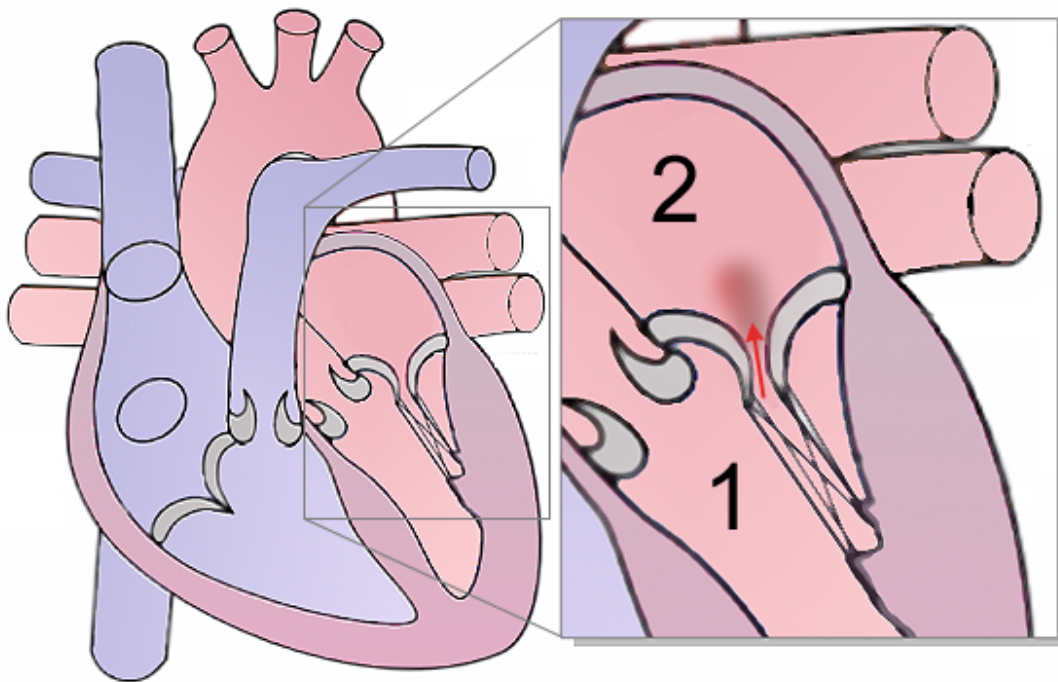


Mitral Insufficiency (Mitral Regurgitation) — Classification and Diagnosis

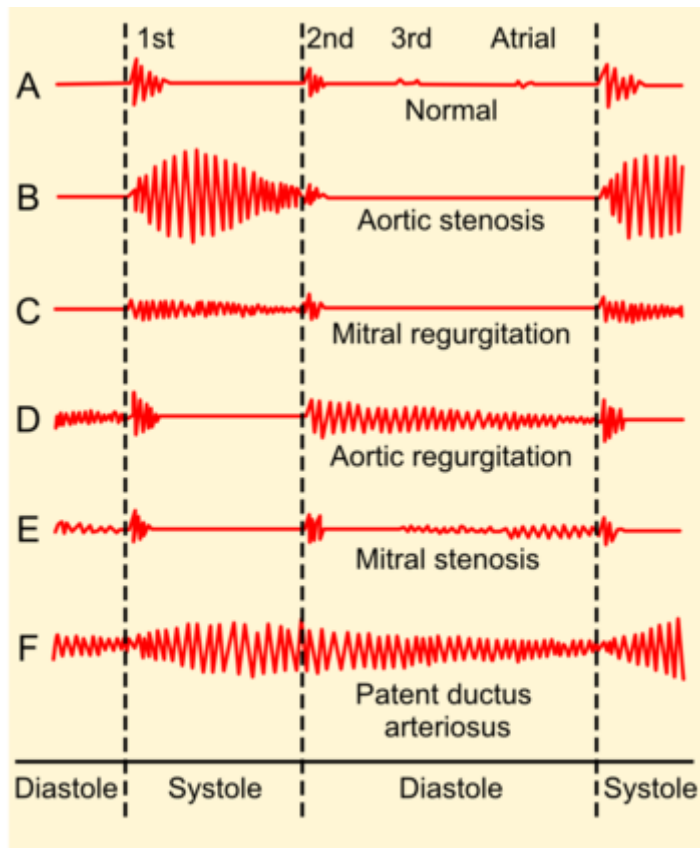
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Acquired valvular heart diseases may manifest as insufficiencies (i.e., the incomplete closure of the valve), as a stenosis (i.e., a narrowing of the valve), or as a combined valvular defect. In principle, all valves can be affected. The aortic valve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



Introduction

Mitral valve insufficiency is the second most common disease of the heart valves. It 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 maintenance of cardiac output.



Phonocardiograms from normal and abnormal heart sounds

Image: Phonocardiograms from normal and abnormal heart sounds. By Madhero88, License: [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)

Definition of Mitral Insufficiency

Mitral valve insufficiency involves **mitral valve changes** that do not allow the valve to **close properly**. These changes can affect the annulus, 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 annual incidence of 2%.

Etiology of Mitral Insufficiency

Causes of mitral insufficiency

A relative mitral valve insufficiency occurs when the reason for the inability of the mitral valve 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](#), [mitral valve prolapse](#), or **CHD**, the chordae tendineae and papillary muscles can be affected.

Calcification, as well as **rheumatic** and **bacterial endocarditis**, may result in mitral valve insufficiency. **Degenerative changes** can occur as part of conditions such 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 4 grades, just like [aortic valve insufficiency](#), depending on the **regurgitation fraction**:

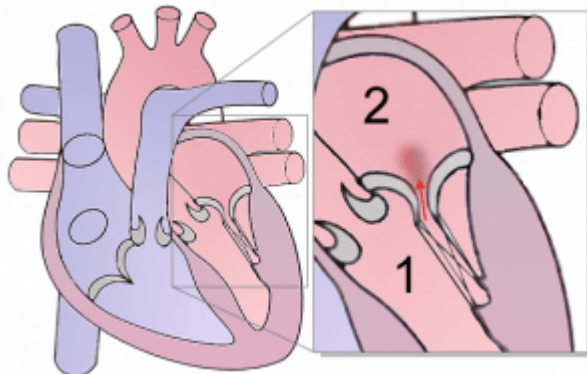


Image: Slight mitral insufficiency. The color cloud symbolizes the blood backflow. Left ventricle - 1, Left atrium - 2. By JHeuser, License: [CC BY 2.5](#)

Grade I: Regurgitation fraction <20%. A little contrast agent enters the left atrium but is completely excreted again during systole.

Grade II: Regurgitation fraction 20–39%. The left atrium is completely filled with contrast agent but is weak after several heartbeats.

Grade III: Regurgitation fraction 40–60%. The left atrium is completely filled 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 is completely filled with contrast again during the first or second heartbeat. The contrast medium density is higher in the left atrium than in the left ventricle. Reflux of the contrast agent into the pulmonary veins occurs.

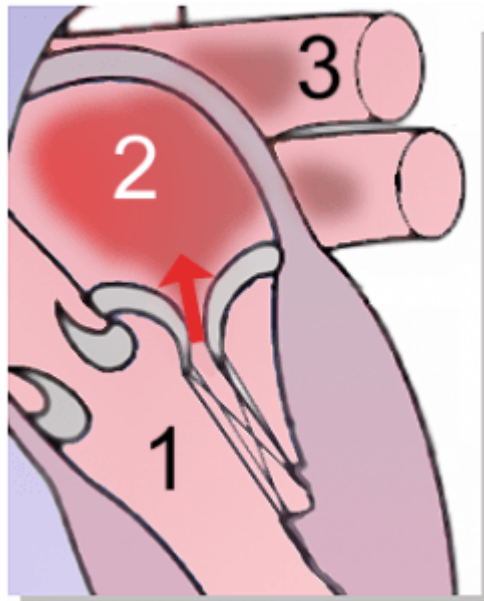


Image: Severe mitral regurgitation. The color cloud symbolizes the backflow of blood. 1 - Left ventricle, 2 - Left atrium, 3 - Pulmonary vein. By JHeuser, License: [CC BY 2.5](https://creativecommons.org/licenses/by/2.5/).

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, the blood is pumped back into the pulmonary circulation. This leads to an **accumulation of blood in the lungs** and thus to **pulmonary hypertension, right ventricular overload, 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 the cardiac output. This also causes **increased strain on the left ventricle** and leads to **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**, and 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.

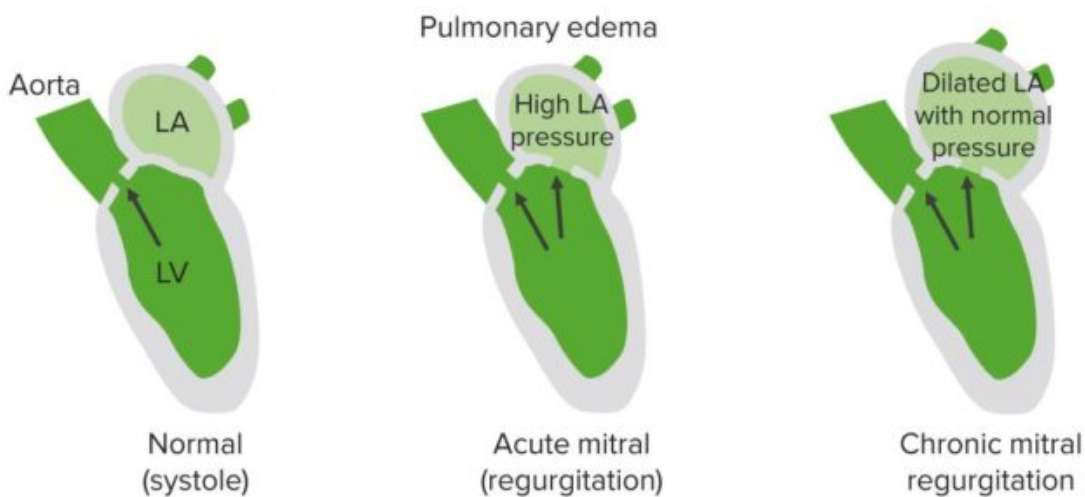


Image: The left ventricle dilates resulting in mitral annular dilation and worsening of mitral regurgitation. By Lecturio

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 bacterial endocarditis or acute myocardial infarction. 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 6–12 months.

Diagnosis of Mitral Insufficiency

Auscultation of mitral insufficiency

Signs during an examination 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 pansystolic murmur is noted, which is heard best over the cardiac apex. The sounds of this murmur are propagated into the axilla.**

The first heart sound is soft, with a wide splitting of the second heart sound.

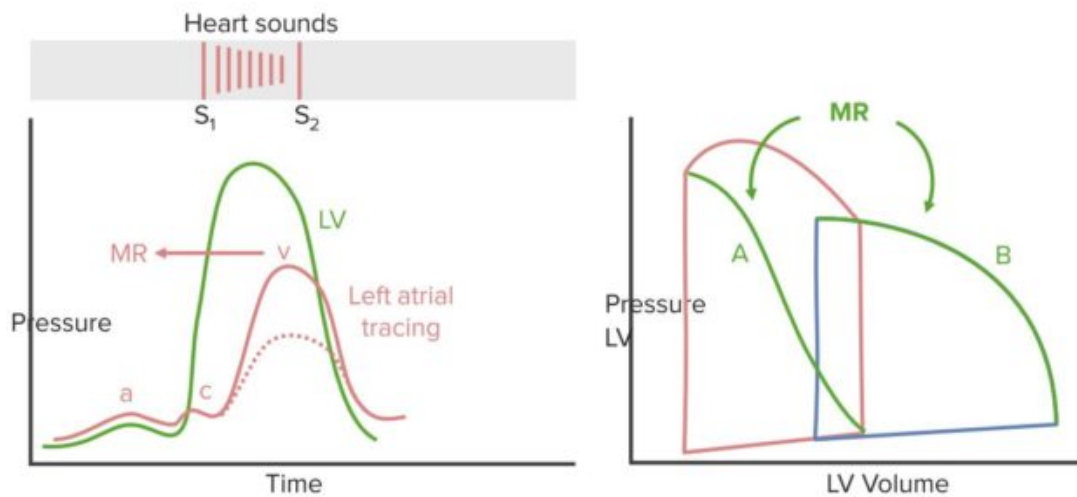


Image: Mitral regurgitation. By Lecturio

Sustained handgrip **increases systematic vascular resistance and afterload**. It is used to differentiate between aortic stenosis and mitral insufficiency. In mitral regurgitation, the murmur increases. In aortic stenosis, the murmur decreases.

Radiological examination of mitral insufficiency

ECG signs are dependent on the adaptation mechanisms of the heart. In pulmonary hypertension, a right axis deviation is noted, while in left ventricular hypertrophy, more of a horizontal heart can be seen. The P wave may have 2 peaks.

On **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 with ACIs/ARBs, especially if mitral insufficiency is associated with systolic dysfunction
- Decrease pulmonary congestion with diuretics and digitalis

Regular follow-ups ensure that indications for surgery are not overlooked. Once the contractility of the ventricle is restricted, there is a danger that even a reconstruction will not be able to help recover LV ventricular function. Ideally, a **mitral valve repair** should be performed. This can be achieved via minimally invasive or more invasive methods. A **mitral valve replacement** is possible, with a mechanical, as well as biological, prosthesis.

Complications of Mitral Insufficiency

One complication of mitral valve insufficiency is **cardiac decompensation**, which may cause **pulmonary edema**. Cardiac decompensation can also be triggered by [atrial](#)

[fibrillation](#).

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Notes