Acquired valvular heart diseases may manifest as insufficiencies (i.e. 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.

A frequent cause of aortic valve insufficiency is bacterial endocarditis, but even congenital diseases or congenital defects can cause this disorder, which can remain asymptomatic in its chronic course and have, in this case, a favorable prognosis.

Definition of Aortic Insufficiency

Acute and Chronic Aortic Insufficiency

The aortic valve insufficiency describes the incomplete closure of the aortic valve with pathological reflux into the diastole (regurgitation). It can be acute or chronic and have different causes.
Etiology of Aortic Insufficiency

Acute Aortic Insufficiency

The acute form of aortic valve insufficiency is frequently observed in conjunction with bacterial endocarditis that affects the aortic valve. An aortic dissection type A or trauma may also be responsible for the insufficiency.

Chronic Aortic Insufficiency

The chronic form may be due to a congenital defect, such as a bicuspid valve, or the consequence of dilation in the valvular region. Aortic valve insufficiency can also be observed as part of diseases such as Marfan syndrome, Ehlers-Danlos syndrome or syphilis.

Classification of Aortic Insufficiency

Severity of Aortic Insufficiency

The severity of the aortic insufficiency can be classified according to the degree of diastolic reflux (regurgitation fraction). This can be done as part of a cardiac
catheterization, with the introduction of a contrast medium into the ascending aorta.

- **Level I:** Regurgitation fraction < 20%, very little contrast medium enters the left ventricle; it is completely excreted during systole.
- **Level II:** Regurgitation fraction 20 - 39%, the left ventricle fills up completely, but is weak after several heartbeats with the contrast medium.
- **Level III:** Regurgitation fraction 40 – 60%, the left ventricle fills up completely with the contrast medium, the contrast medium density in the left ventricle corresponds to the density in the ascending aorta.
- **Level IV:** Regurgitation fraction > 60%, the left ventricle fills up completely with the contrast agent during the first heartbeat, the contrast agent density is higher in the left ventricle than in the ascending aorta.

### Pathophysiology of Aortic Insufficiency

#### Changes Due to Aortic Insufficiency

Due to the constant backflow of blood into the left ventricle, the volume load rises. Therefore, a chronic aortic valve insufficiency causes an **isolated left ventricular hypertrophy**. Initially, the cardiac output can be maintained and the patients remain asymptomatic. With persistent insufficiency, however, **the compliance of the ventricle decreases**, so that the normal stroke volume can no longer be maintained.

The perfusion of the left ventricle with oxygen cannot be sufficiently secured, peripheral resistance increases, and the duration of the diastole is extended. This change can increase the magnitude of the insufficiency.

### Symptoms and Clinical Presentation of Aortic Insufficiency

Acute aortic valve insufficiency leads to a rapid **left cardiac decompensation with pulmonary edema**. The chronic insufficiency can be tolerated for decades and remain
asymptomatic. First signs are palpitations. With progression of the disease, reduced performance and signs of left ventricular failure become apparent. Syncope, dyspnea, or arrhythmia, as well as angina pectoris and a sudden death, can be the symptoms, but compared to the aortic stenosis, this occurs only rarely.

Diagnosis of Aortic Insufficiency

Murmurs Due to Aortic Insufficiency

Diastolic, decrescendo murmur best heard at left third intercostal space (second aortic area).

Hand grip → increase after load → increase murmur.

Valsalva and standing → decrease preload → decrease murmur.

Diagnostics can be divided into physical and instrument-based diagnosis. In the physical examination, the Austin Flint murmur with punctum maximum above the Erb point can be auscultated. Additionally, a low diastolic blood pressure, with a high pulse amplitude and water hammer pulse (collapsing pulse), as well as the Musset sign and the Müller sign, can be found in cases of severe insufficiencies.

Rapid raising carotid pulse with sudden collapse can be seen.

Treatment of Aortic Insufficiency

Medical Treatment Involves:

1- vasodilators to decrease after load à ACEIs or ARBs / Nifedipine

2- decrease the pulmonary congestion with diuretics or digitalis.

Aortic valve insufficiency can be treated conservatively if patients are asymptomatic. Patients who have a hemodynamically significant insufficiency should exercise regularly, but avoid excessive efforts. Surgical intervention is indicated if patients are symptomatic or if asymptomatic patients show an ejection fraction less than 50% or an LV end-diastolic diameter of more than 70 mm, that is alternatively an end-systolic diameter of more than 50 mm.

References

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