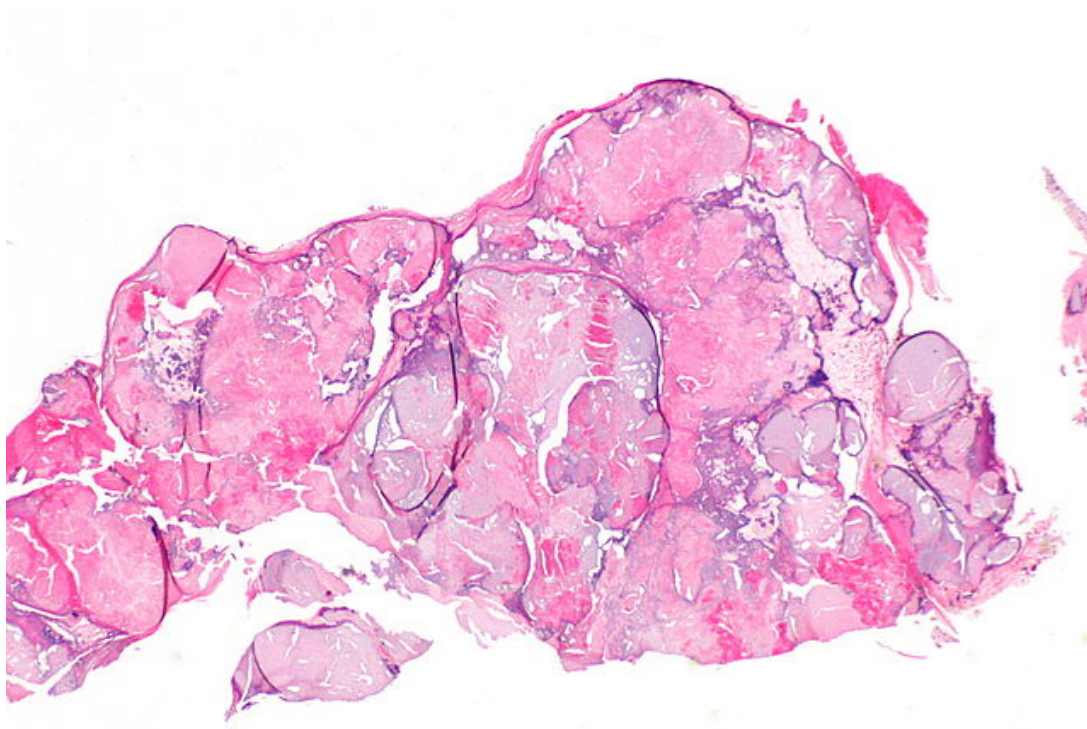


Aortic Stenosis (Aortic Valve Stenosis) — Diagnosis and Treatment

[See online here](#)

Acquired valvular heart disease may manifest as insufficiency (i.e. incomplete closure of the valve), as a stenosis (i.e. a narrowing of the valve), or as a combined valvular defect. All valves can be affected. Aortic valve stenosis and mitral regurgitation are particularly frequent.



Definition of Aortic Stenosis

As the most common valvular heart disease, valvular aortic stenosis is often a disease of old age and a result of atherosclerotic changes. Rheumatic forms have become rare in industrialized countries. In 50% of cases, it remains asymptomatic for many years and is associated with a good prognosis. If the disease becomes symptomatic, the prognosis worsens to a 2-year survival rate of less than 50%.

Prognosis - Rule of 5, 3, and 2:

- 50% of patients with angina will die in 5 years if the aortic valve is not replaced.
- 50% of patients with symptoms of syncope due to AS will die in 3 years if the aortic valve is not replaced.
- 50% of patients with symptoms of congestive heart failure (CHF) secondary to

AS will die in 2 years if the valve is not replaced.

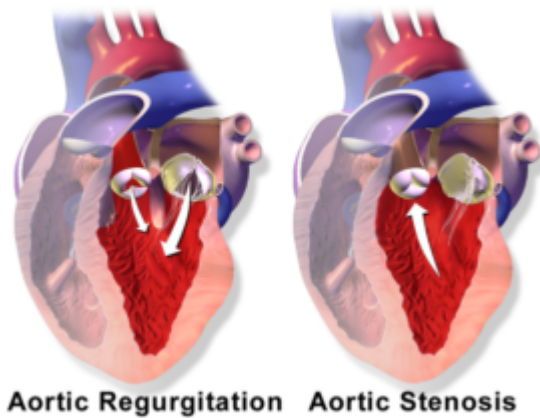


Image: "Aortic Valve Regurgitation vs. Aortic Valve Stenosis." by BruceBlaus - Own work. License: [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)

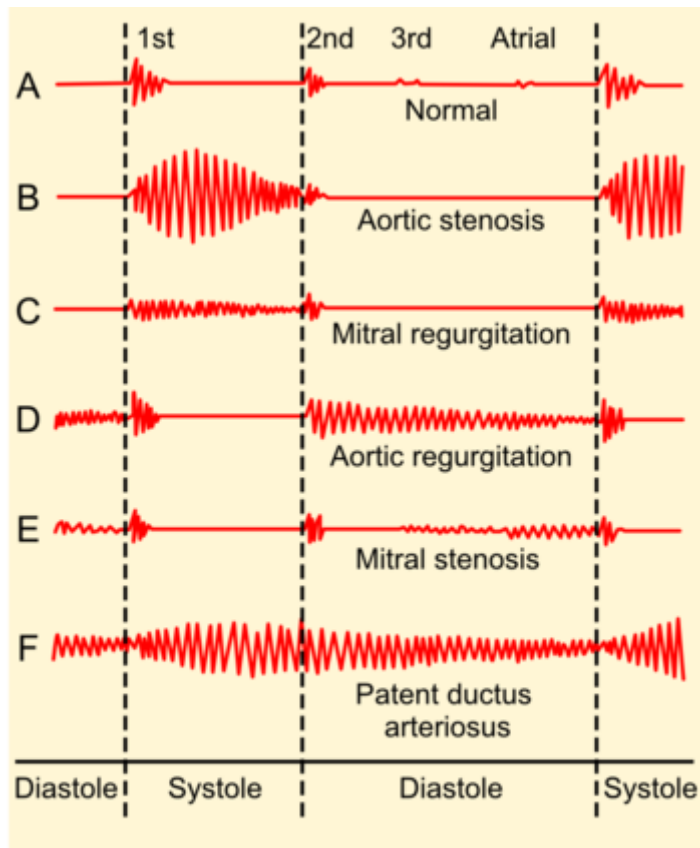
The term valvular aortic stenosis refers to a narrowing of the orifice that connects the heart and aorta. Often, the term aortic stenosis is used synonymously, although it refers more specifically to a narrowing of the valve.

Epidemiology of Aortic Stenosis

Prevalence of valvular aortic stenosis

Valvular aortic stenosis is the most common valvular heart disease, with 43% (in Europe and North America). In patients over 65 years of age, valvular aortic stenosis has a prevalence of more than 3%.

Etiology of Aortic Stenosis



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/)

Causes of valvular aortic stenosis

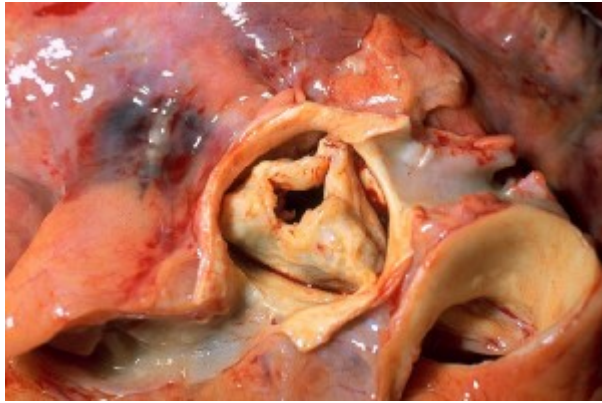
Calcifying processes that are common, especially among patients over 65 (bicuspid valves are affected earlier by the atherosclerotic processes), can cause valvular aortic stenosis. Rheumatic valvular aortic stenosis has become rare in industrialized countries because the responsible streptococcal infections are treated with antibiotics early on. Congenital forms of aortic stenosis also occur.

Classification of Aortic Stenosis

Different types of valvular aortic stenosis

Types of valvular aortic stenosis are determined by their location and are divided into valvular, supra-valvular, and subvalvular.

Pathophysiology of Aortic Stenosis



[Image](#): "Gross pathology of rheumatic heart disease: aortic stenosis" by CDC. License: Public Domain

In valvular aortic stenosis, the left ventricle has to use more strength to maintain the cardiac output against the pathologically increased pressure gradient of the valve. This results in concentric hypertrophy of the left ventricle. Long term, this creates a diastolic dysfunction, resulting in pulmonary congestion and signs of heart failure.

Symptoms and Clinical Presentation of Aortic Stenosis

Note: Patients who suffer from a mild valvular aortic stenosis can remain asymptomatic for a long time.

After strenuous exercise, syncope and dizziness are often present because the head, as well as the peripherals, are receiving poor circulation. With hypertrophy of the heart, coronary perfusion decreases, and this may lead to angina pectoris. Cardiac output decreases during the progression of the disease. Signs of heart failure are clinically apparent. In asymptomatic patients, valvular aortic stenosis can lead to sudden cardiac death.

Physical examination will reveal

Systolic crescendo-decrescendo murmur:

- Heard loudest at the aortic area (RUSB)
- Radiated toward the carotids
- Paradoxical splitting of the 2nd heart sound

Hyperdynamic left ventricle:

- LV is enlarged due to hypertrophy

Pulsus Parvus et tardus:

- 'Slow and late' carotid pulse due to the delay in blood flow across the narrowed aortic valve

Diagnosis of Aortic Stenosis

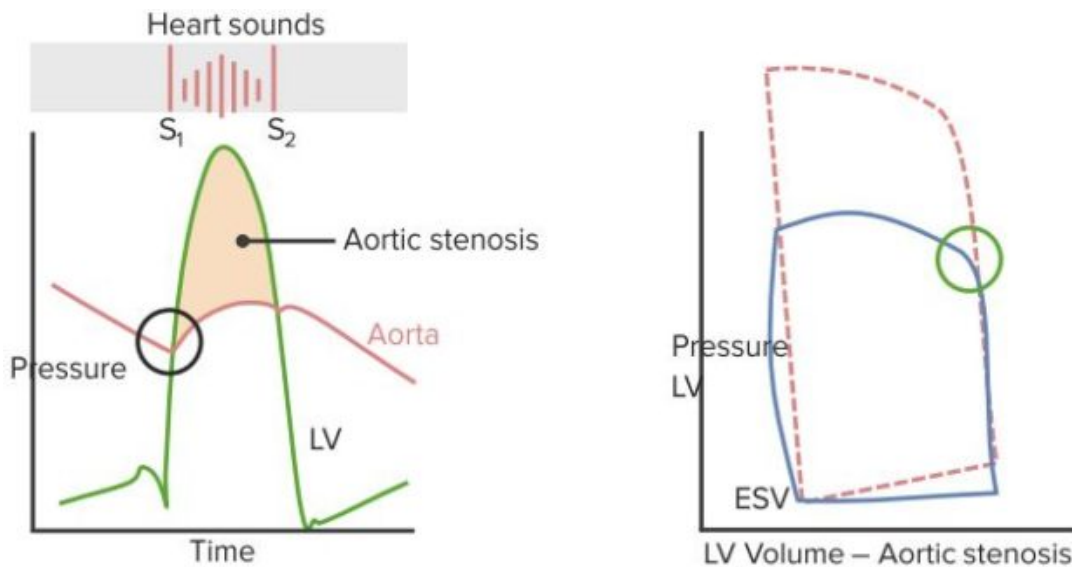
Exam and palpation of valvular aortic stenosis

Upon exam and palpation, the left ventricular hypertrophy manifests as a visible and palpable heaving and widened apical impulse. A buzzing can be heard above the aorta and the carotids. In auscultation, the systolic crescendo-decrescendo murmur (diamond shape) is best heard at the right 2nd intercostal space (first aortic area) and radiates to the carotid artery. The carotid pulse is slowly rising.

Valsalva and standing → decrease the venous return → decrease the ejection fraction → decrease the murmur.

Heart sounds of the valvular aortic stenosis

The second heart sound can be breath-dependent, and it may be cleaved paradoxically, especially with higher-grade stenosis. Electrocardiogram (ECG) changes, such as T-negativity in V4-6, are attributed to left ventricular hypertrophy but can also be completely absent.



"Heart Sounds Aortic Stenosis" Image created by Lecturio

Different levels of severity of valvular aortic stenosis

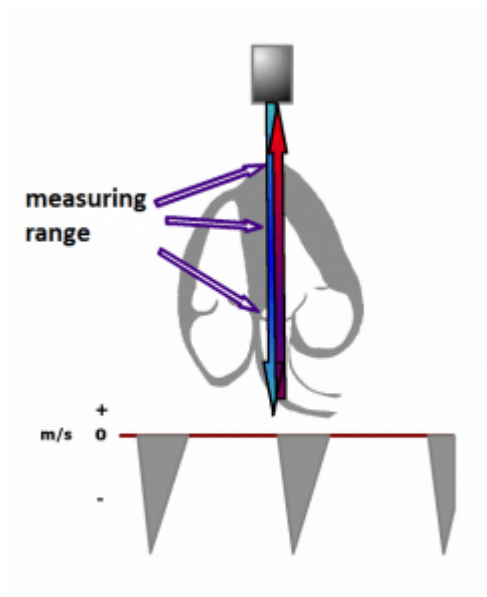


Image: "CW Doppler, measurement of the aorta schematically" by Kalumet. License: [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)

Using echocardiography, the stenosis can be classified into a mild stenosis (valve area $> 2 \text{ cm}^2$), moderate stenosis (valve area 1.1 to 2 cm^2) and severe stenosis (valve area $< 0.75 \text{ cm}^2$). Doppler sonography can be used for determining the flow velocity at the stenosis.

Cardiac catheterization can provide information on the pressure gradient but is usually only used when other tests are insufficient.

Treatment of Aortic Stenosis

Treatment options for valvular aortic stenosis

For the treatment of valvular aortic stenosis, a surgical aortic valve replacement, as well as a catheter intervention, can be used. A surgical valve replacement is associated with a surgical mortality rate of 3%. The Transcatheter Aortic Valve Implantation (TAVI) introduces a biological valve sewn into a stent through the femoral artery or transapically. Currently, this process is only used in patients with a high surgical risk.

Note: A treatment with only medication does not exist. Endocarditis prophylaxis is no longer indicated. Aortic valvular replacement is the only effective method for treating aortic stenosis.

Complications of Aortic Stenosis

Complications of aortic stenosis are arrhythmias and sudden cardiac death, as well as left ventricular failure.

Prevention of Aortic Stenosis

As an existing congestive heart failure (CHF) is a risk factor for the development of aortic stenosis, it is important to avoid this.

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Notes