

Acquired heart defects

Valve defects are a very common heart disease, which can take the form of **stenosis** (narrowing), **regurgitation** (insufficiency) or the two mechanisms can be combined. The most extensive problem with valve defects is the aortic and mitral valves. Right heart valves are affected less frequently, although their involvement may have a major impact on the patient's prognosis (eg, significant tricuspid regurgitation).

The pathophysiological mechanisms of valve defects are quite diverse. In general, due to either pressure or volume overload, hypertrophy, resp. dilatation of the ventricles or atria with appropriate hemodynamic effects. For example, aortic insufficiency leads to volume overload and dilatation of the left ventricle, which can result in left heart failure with secondary mitral regurgitation. The clinical picture is also varied. It is important to keep in mind that valve defects are very often asymptomatic unless they occur acutely, such as acute mitral regurgitation in papillary myocardial infarction.

Compared to the 20th century, the **etiology** of valve defects has changed significantly. With the onset of antibiotic treatment, valve disease has decreased significantly due to rheumatic fever, with the exception of developing countries. Thus, degenerative disorders, congenital disorders (eg aortic valve bicuspid predisposing to aortic stenosis) or secondary disorders, eg due to ventricular dilatation, currently predominate in the etiology of heart valve disease.

Transthoracic and esophageal **echocardiography** with Doppler examination now plays a crucial role in the diagnosis of valve defects. Thanks to this method, it is possible to assess not only anatomical abnormalities but also their functional effects, including pressure gradients.

In addition to drug treatment, treatment methods currently consist not only of **surgical solutions** but also of increasingly used interventional **catheterization techniques**. This is especially true for left heart valve involvement (TAVI, MitraClip, etc.).

Aortic regurgitation

Aortic regurgitation is caused by aortic valve insufficiency. Aortic valve insufficiency can be caused by **dilatation of the aortic root or damage to the valve itself**, both as a result of acquired and congenital defects. In the pathophysiology of aortic regurgitation, **volume overload of the left ventricle dominates**. Diagnosis of this defect is sometimes complicated by **many asymptomatic periods**. In addition to clinical examination, echocardiography is the basic examination method. Both cardiac surgery and catheter valve replacement can be used in treatment.

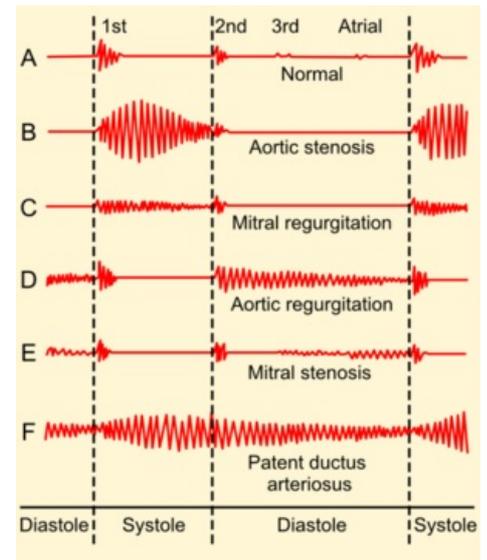
Aortic stenosis

Aortic stenosis is a valve defect characterized by a narrowing of the aortic orifice. According to the location and etiology, we distinguish between **valvular** (most common), **supravalvular** and **subvalvular stenosis**. The symptomatology of this defect is individual, for a long time it can be completely asymptomatic or manifest as angina pectoris. An echocardiographic examination is, as with other valve defects, a key step in the diagnosis. The basic treatment is surgical or catheter replacement of the aortic valve.

Mitral regurgitation

Mitral insufficiency is caused by mitral valve insufficiency. The valve and its suspension apparatus have **complex anatomy** that includes the ring, valve tips, ligaments and papillary muscles. The developmental and functional continuity of the mitral valve and left ventricle is also important. Mitral insufficiency can be divided into **primary** (valve involvement leads to regurgitation and subsequently alteration of left ventricular function) and **secondary** (disease, dilatation, left ventricular disease leads to regurgitation). In **acute mitral regurgitation**, the clinical picture is dominated by symptoms of cardiac pulmonary edema to cardiogenic shock. **Chronic regurgitation**, on the other hand, has been asymptomatic for decades. As with other valve defects, the echocardiographic examination is an essential element of diagnosis. Treatment of mitral insufficiency consists of both pharmacological treatment (prevention of infectious endocarditis, treatment of atrial fibrillation and heart failure) and invasive procedures. Conservative cardiac surgery is preferred. Other forms of intervention are also being developed, such as transcatheter valve replacement or **MitraClip**, which is already used in practice.

Mitral stenosis



Phonocardiograms from normal and abnormal heart sounds

Mitral stenosis is a valve defect characterized by narrowing of the mitral orifice (physiologically, it has an area of 4-6 cm²). It is almost exclusively **post-rheumatic** (often associated with aortic stenosis). Rare causes are congenital mitral stenosis, mitral annular calcifications, systemic connective tissue diseases (scleroderma, etc.) or **myxoma** narrowing the valve mouth (must be considered in the differential diagnosis of stenosis). Mitral stenosis can be asymptomatic for a long time. The predominant symptoms are **dyspnoea and fatigue**, or signs of **thromboembolization** in atrial fibrillation and **right heart failure** in an advanced defect. The pillar of diagnosis, as with other valve defects, is echocardiographic examination. Drug treatment focuses on the prevention of infectious endocarditis, the treatment of atrial fibrillation and heart failure. Possible intervention techniques include **valvulotomy or valve replacement**.

Tricuspid regurgitation

Tricuspid regurgitation is caused by the insufficiency of the tricuspid valve between the right atrium and the right ventricle. Mild or trace tricuspid regurgitation is a common echocardiographic finding without hemodynamic effects. Significant insufficiency can be either primary or more often secondary to pulmonary hypertension or left heart disease. Diagnosis is based on echocardiographic examination. Cardiac surgery still dominates in the treatment of major insufficiency, although various catheterization approaches are already being tested.

Tricuspid stenosis

Tricuspid stenosis is a rare valve defect, and regurgitation of the valve is much more common. Tricuspid valve stenosis is most often the result of rheumatic damage, usually with concomitant left heart valve involvement. Symptoms of right heart failure predominate in the clinical picture. The basic diagnostic method is **echocardiography**. Both percutaneous valvuloplasty and surgical treatment are used in the treatment.

Pulmonary regurgitation

Pulmonary insufficiency is the insufficiency of the pulmonary valve tips between the right ventricle and the lungs. Mild pulmonary insufficiency is a relatively common finding in contrast to severe pulmonary insufficiency, which is most commonly present **in congenital heart defects and pulmonary hypertension**.

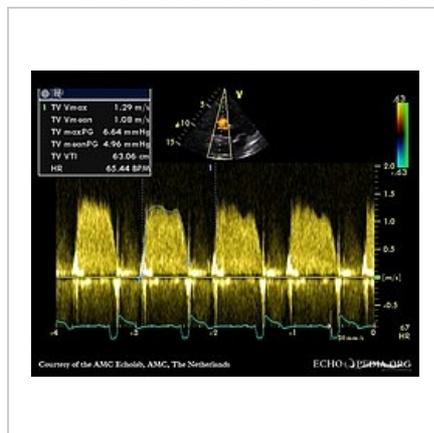
Pulmonary stenosis

Pulmonary stenosis is a rare valve defect in adult cardiology. It can occur alone or as part of more complex stenosis in the right ventricular outflow tract, mainly the pulmonary area. More generally, **pulmonary stenosis refers to both pulmonary valve stenosis and subvalvular or supra-valvular obstruction**. Diagnosis is based primarily on echocardiographic examination, or catheterization examination to assess pressures.

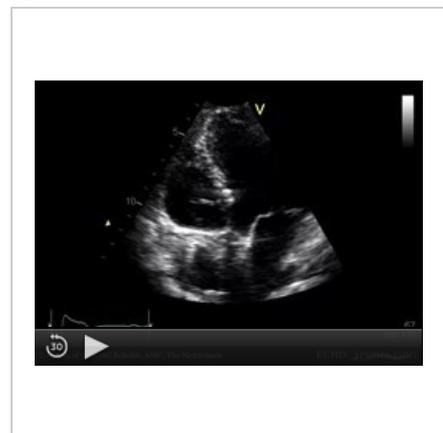
ECHO records of valve defects



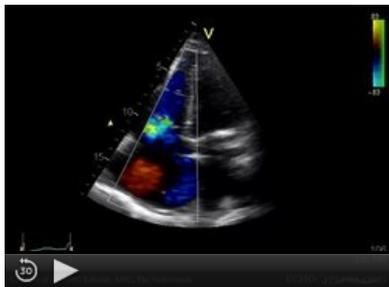
Doppler examination of pulmonary valve flow demonstrating severe pulmonary insufficiency (visible retrograde movement of blood through the valve)



Doppler measurement of pressure gradients on a tricuspid valve in stenosis



Four-cavity apical projection with an example of tricuspid stenosis



Echocardiographic evidence of severe tricuspid regurgitation (apical four-cavity projection)

References

External sources

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