

AORTIC STENOSIS



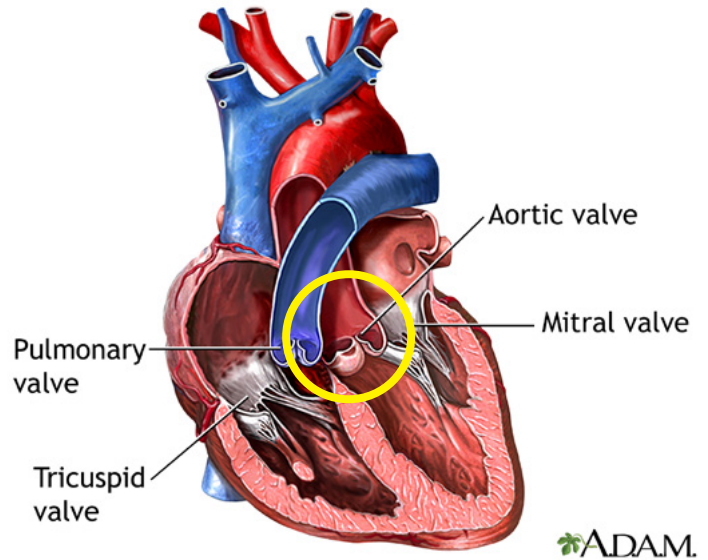
HENRY FORD HOSPITAL

CENTER FOR STRUCTURAL HEART DISEASE

WHAT IS AORTIC STENOSIS?

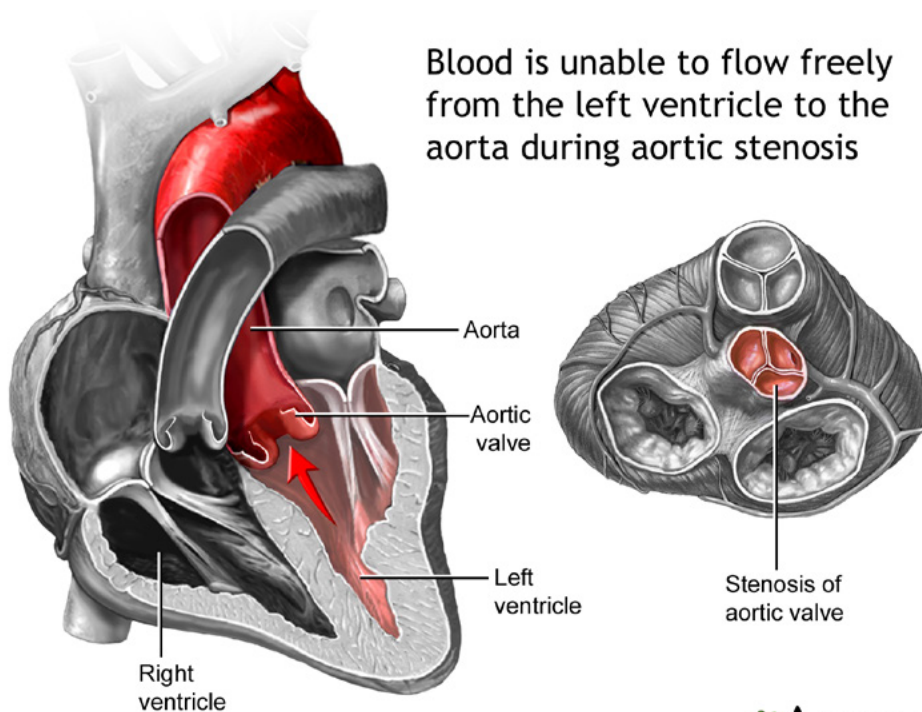
THE AORTIC VALVE

The aorta is the major vessel that carries oxygenated blood out of the left side of the heart to the rest of the body. When blood leaves the heart, it flows through the aortic valve, into the aorta. This one-way valve is made up of flaps called leaflets. In a normal aortic valve, there are three leaflets, all of which flip open to let the blood pass through into the aorta, and then flip closed, fitting together like pie pieces and creating a tight seal. In this way, the aortic valve allows blood to flow out of the heart, while preventing it from flowing back in.



STENOSIS

Aortic stenosis is a disease in which the leaflets of the valve become stiff, thick and narrow – preventing it from opening fully. The narrow valve prevents blood from flowing forward out of the heart causing blood to build up in the heart chambers, eventually backing up into the lungs. This extra fluid can cause shortness of breath. The narrowed valve also causes pressure to increase in the heart, making the heart work harder. The muscular walls of the heart become thicker with extra exertion, sometimes causing chest tightness or pain. Eventually, the heart weakens from the extra effort. The combination of the narrow valve and weak pump, means less blood moves forward into the body. This results in fatigue and weakness, and in severe cases, can cause lightheadedness and fainting from less blood flow to the brain.



Blood is unable to flow freely from the left ventricle to the aorta during aortic stenosis

Aortic stenosis is a continuous, progressive, lifelong disease. It is often first detected with a heart murmur heard during a physical exam. There may be no symptoms for many years. A long, slow, stable course is followed by a faster development later in life.

CAUSES

There are two main types of aortic stenosis:

- Acquired aortic stenosis (senile): Develops later in life from calcium buildup on the edges of the leaflets causing them to fuse together. This occurs slowly over time as part of aging or in people who have had rheumatic fever earlier in their lives.
- Congenital aortic stenosis: Occurs in people who were born with either an already narrow aortic valve or with a valve that has only two leaflets - known as a bicuspid valve (bi = two, cusp = flap). There may be no problems until adulthood, but people with this condition should be monitored regularly for signs of heart failure.

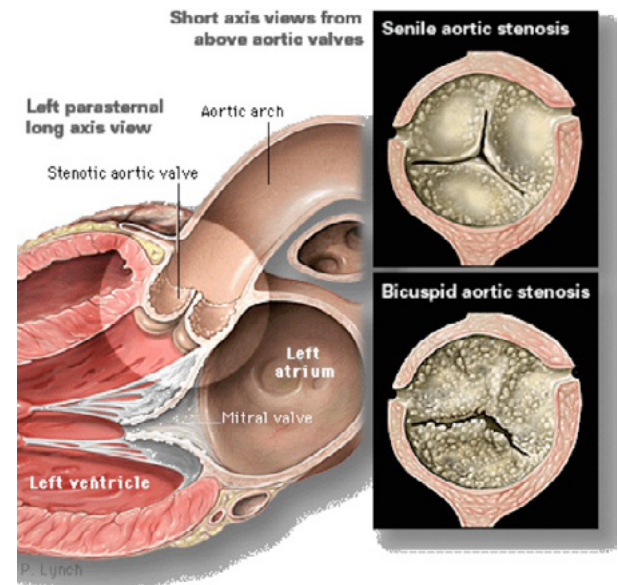


Illustration by Patrick Lynch, Yale University

HOW IS AORTIC STENOSIS DIAGNOSED?

SYMPTOMS

Aortic stenosis may be present for many years before symptoms such as the following occur:

- Shortness of breath with exertion
- Chest pain or tightness, also called angina
- Weakness and fatigue with activity
- Palpitations, racing or fluttering heart beats
- Lightheadedness, feeling faint or fainting



DIAGNOSIS

Aortic stenosis causes the heart to pump harder through the stiff, narrow valve, which creates turbulence. This results in two key findings on a physical exam: a special heart murmur and a forceful pulse. These signs will guide your health care provider to consider additional tests, including:

- Chest X-ray: Shows calcium buildup on your aortic valve and the size of your heart.
- Echocardiogram (Echo) and Doppler Ultrasounds: Shows your valve, heart size and movement of the heart walls.
- Electrocardiogram (ECG): Shows how the electrical messages that tell your heart to beat travel through the heart. (These signals can be partially blocked by calcium buildup).
- Trans-Esophageal Echocardiogram (TEE): An internal ultrasound of your heart using a smaller “scope” that is swallowed, and gives close-up pictures of the heart valves opening and closing.
- Exercise testing: A variety of tests that measure how a narrowing valve could be affecting your activity level or blocking blood flow.
- Cardiac catheterization: This is a minimally invasive test that measures pressures in your heart and looks at the blood flow in the vessels that feed your heart. Thin tubes known as catheters are inserted through major vessels (in either your wrist or groin area), and then threaded up to your heart. This test tells exactly how the heart is working because of the stiff, narrow valve.
- Magnetic Resonance Imaging (MRI): A noninvasive test used to gain a detailed image of your heart’s structure.

HOW IS AORTIC STENOSIS TREATED?

TREATMENT OVERVIEW

Treatment is based on how you feel and size of the valve. During early stages with no symptoms, you may only need monitoring by a health care provider. You may be advised to limit strenuous activities, stop smoking, schedule regular visits with your heart team, undergo tests periodically to assess valve and heart function, or take medication. As the valve narrows and symptoms become severe, or if your heart shows signs of weakening, you may need to have your aortic valve replaced or repaired.

MEDICAL THERAPY

No medications will remove the stiffening or narrowing of the valve, but the following may be used early in the disease process to slow the buildup of calcium and help control symptoms:

- Cholesterol pills: If started early in the disease, keeping cholesterol levels low might help to slow the disease process.
- Aspirin: Most people with aortic stenosis also have an increased risk for coronary artery disease. Aspirin helps reduce the risk of heart attacks.
- Blood thinners: If an irregular heart rhythm called atrial fibrillation is present, blood thinners may be used to prevent clots from forming in the heart.
- Blood pressure pills: These are used if high blood pressure is present. Early in the disease process this can help slow thickening of the heart muscle.
- Stop smoking: Smoking has been shown to speed up the narrowing of the aortic valve.



REPLACEMENT THERAPIES

As the disease progresses and symptoms worsen, valve replacement becomes necessary to improve quality of life and longevity.

SURGICAL: AORTIC VALVE REPLACEMENT (AVR)

AVR is an open-heart procedure that involves removing the damaged valve and replacing it with either a biological or mechanical valve.

- Prior to the procedure, you and the surgeon will decide what type of valve will be used.
- Before the procedure begins, you are put completely to sleep by anesthesia.
- During the procedure, your heart is stopped and a heart-lung bypass machine is used to do all the work of your heart and lungs.
- Next, the replacement valve is sewn in place.
- After the valve is replaced, your heart is restarted and a breathing machine is used until all anesthesia has worn off.
- The surgery usually requires staying in the hospital for around five days, a period of recovery at home and exercise rehabilitation therapy.

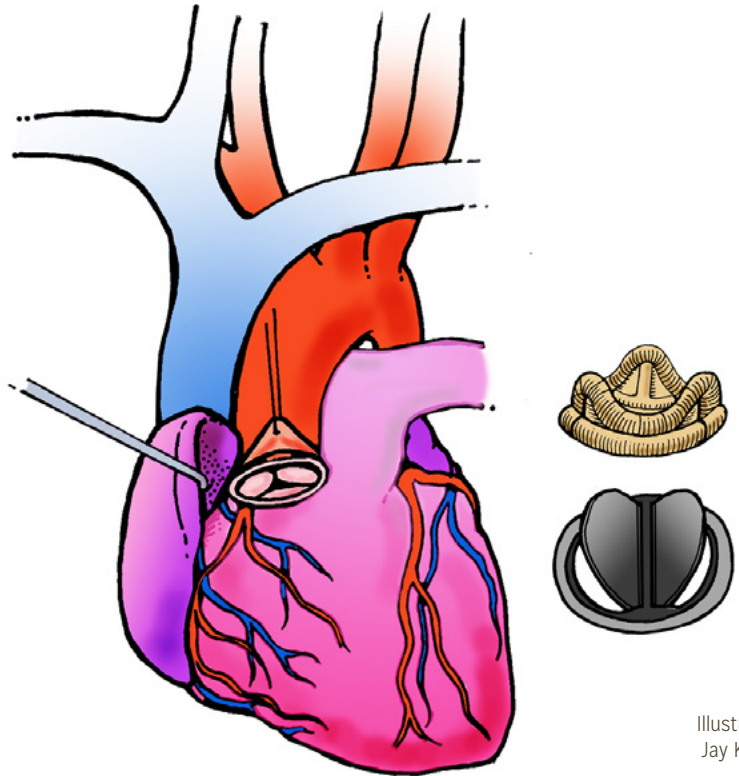


Illustration by Jay Knipstein

BIOLOGICAL VS. MECHANICAL VALVES

- **Biological valves:** These are made of cow, pig or human heart tissue that has been specially treated to reduce the chances of rejection or infection. Biological valves do not require any blood thinners to prevent clots from forming. They last approximately 10 years, but some of the newer valves may last 15 years or more.



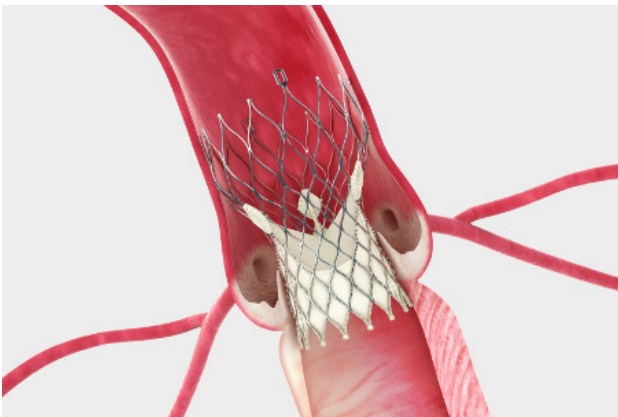
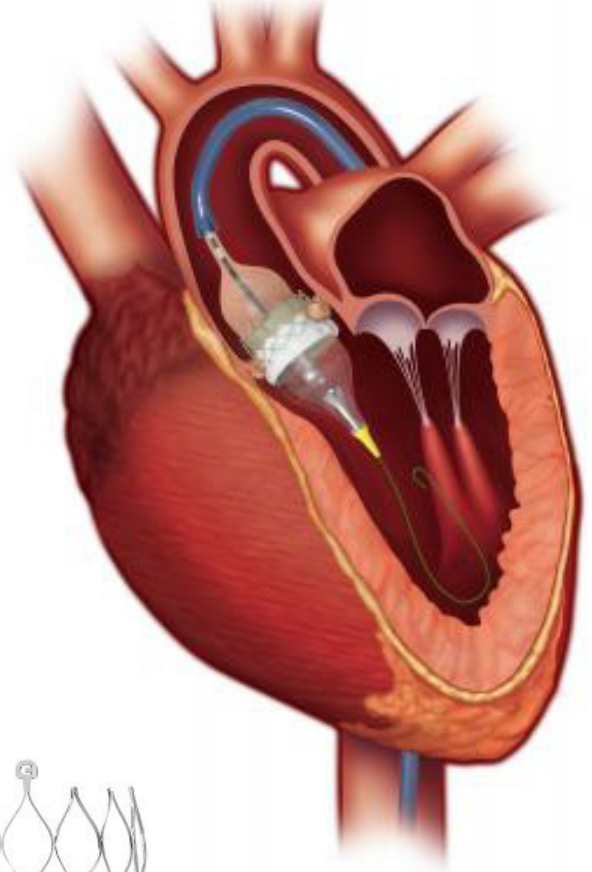
- **Mechanical or man-made valves:** These are made of metal or polymers. They last longer than biological valves and sometimes do not require replacement during your lifetime. However, they do require lifelong blood thinners to prevent blood clots from forming on the valve.

TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR):

TAVR is a minimally invasive procedure in which the aortic valve is replaced by using a “stent valve” mounted on thin tubes known as catheters, which are inserted through various different approaches, threaded through the aortic valve and then fixed in place.



- Before the procedure, the level of anesthesia is determined by the procedure type. Some procedures require complete anesthesia, others require lighter levels of sedation.
- A pacemaker wire is placed in the heart, very fast pacing is used briefly during the procedure when the valve is being placed to keep the heart still.
- The replacement valve mounted on the catheter is inserted through either a major vessel or through a small slit opening in the chest wall.
- When the valve catheter reaches the aortic valve, the heart is sped up by the pacemaker.
- The replacement valve is deployed into place, the calcium on the original valve provides some support for the new valve.
- The catheters are removed after the heart valve has been placed.
- The procedure generally involves a hospital stay of one to three days with a short period of recovery at home and with cardiac rehabilitation therapy.



REPAIR THERAPY

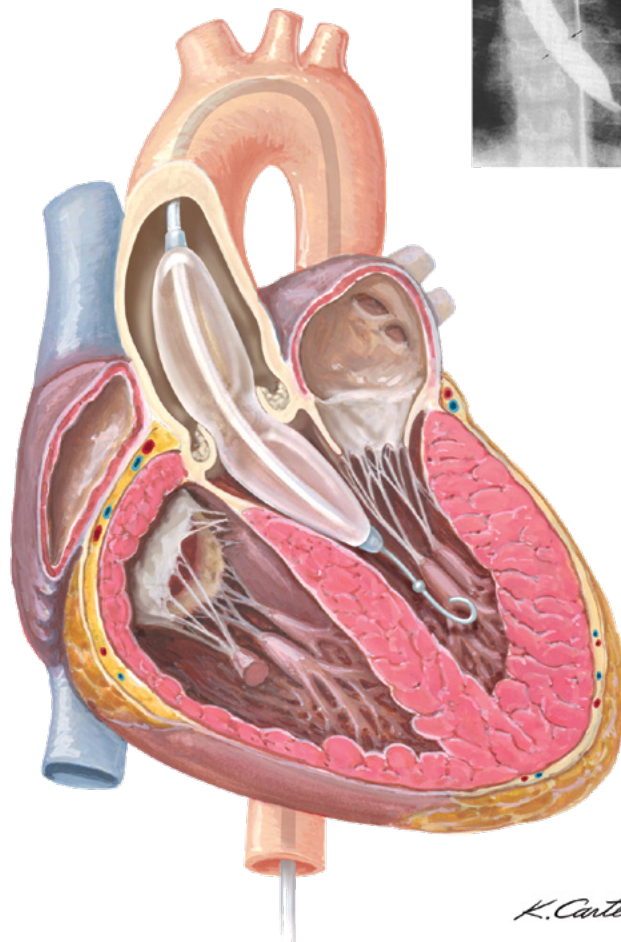
NONSURGICAL:

PERCUTANEOUS AORTIC BALLOON VALVULOPLASTY (PABV):

PABV is a minimally invasive procedure in which the aortic valve is repaired by using thin tubes known as catheters, which are inserted into the major vessels in the groin area and threaded up through the aorta to the aortic valve. This procedure provides short term improvement of symptoms, usually lasting six to 12 months or longer.

- During the procedure, you will receive medications for light levels of sleep and pain management.
- A pacemaker wire is placed in the heart, very fast pacing is used briefly during the balloon procedure to keep the heart still.
- When the balloon-tipped catheter reaches the faulty aortic valve, the heart is paced at very high rates and the balloon is inflated for a short period of time.
- This widens the opening of the aortic valve so that it opens and closes more freely and blood can flow through more easily.
- After the balloon is deflated the movement of the walls and the valve are assessed with an echocardiogram.
- You will stay overnight in the hospital and have another echocardiogram the day after the procedure.

Repairing the aortic valve may relieve symptoms, especially in children. However, in adults it is generally a temporary treatment with effects lasting usually 6 to 12 months. It is sometimes used in elderly patients as a “bridge to surgery” allowing time to improve health prior to open-heart valve replacement.



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