

HEART VALVE DISEASE AND TREATMENT OPTIONS

The Heart Valves

Located at the exit of each of your heart chambers, the heart valves make sure blood flows in only one direction through the heart.

There are four valves in the heart. The mitral and tricuspid valves are located between the atria (upper chambers of the heart). The aortic valve and pulmonic valve are located between the ventricles (lower chambers of the heart) and the major blood vessels leaving the heart.

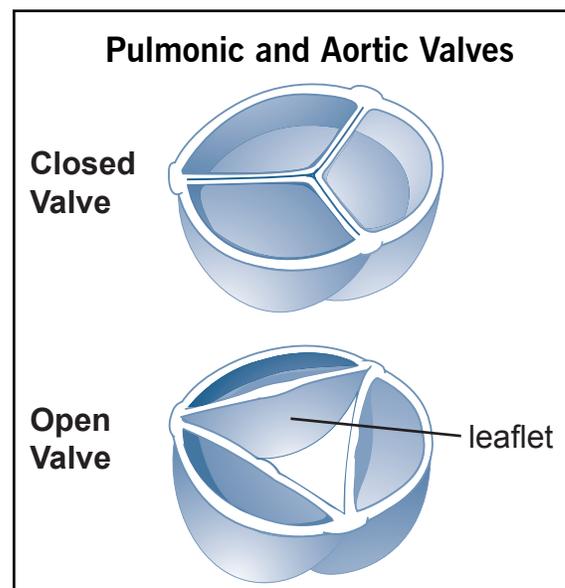
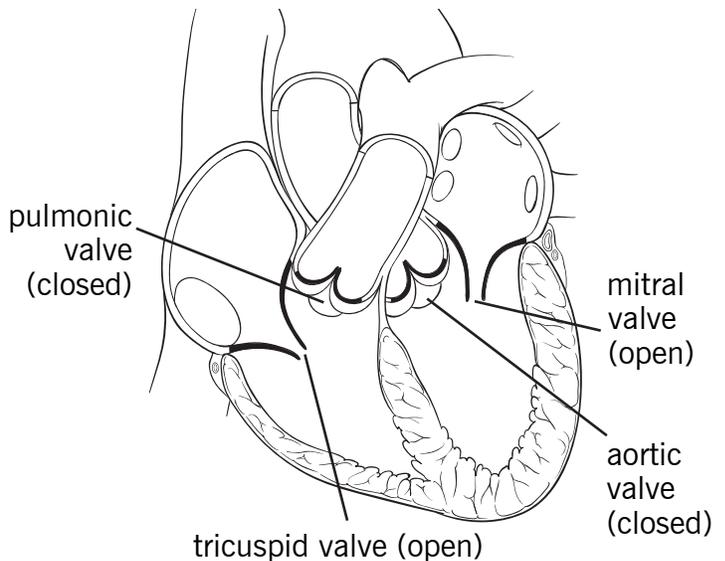
The **tricuspid valve** allows blood to move from the upper chamber of the heart, the right atrium, into the lower chamber, the right ventricle.

The **pulmonic valve** allows blood to move out of the right ventricle, which pumps blood to the lungs. After absorbing oxygen from the lungs, the blood flows back into the heart to the left atrium.

The **mitral valve** allows blood to move from the left atrium into the left ventricle.

The **aortic valve** allows the blood to move out of the left ventricle, which pumps the blood out of the heart, to the rest of the body.

The valves are made of strong, thin flaps of tissue, called leaflets. The leaflets open to allow blood to move forward through the heart during half of the heartbeat, and close to prevent blood from flowing backward during the other half of the heartbeat.

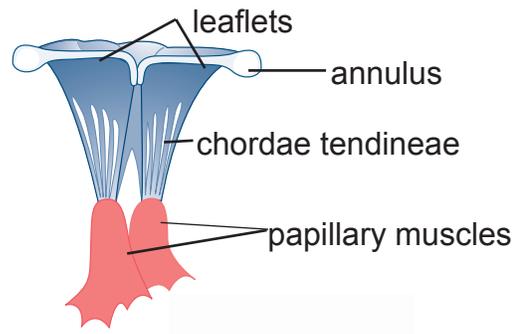


This information is not intended to replace the medical advice of your doctor or health care provider. Please consult your health care provider for advice about a specific medical condition.

Mitral and Tricuspid Valves

The leaflets in the mitral and tricuspid valves are also supported by:

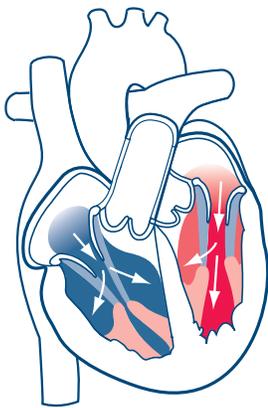
- **Annulus:** tough, fibrous ring attached to the leaflets that helps support and maintain the proper shape of the valve
- **Chordae tendineae:** tough, fibrous strings
- **Papillary muscles:** part of the inside walls of the ventricles



Closed Valve

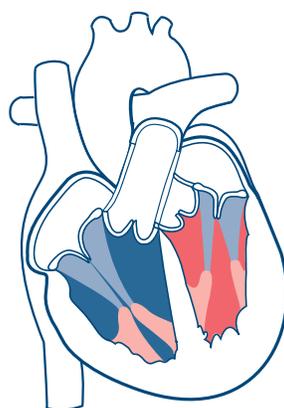
The chordae tendineae and papillary muscles keep the leaflets stable against any backward flow of blood.

How the Valves Work



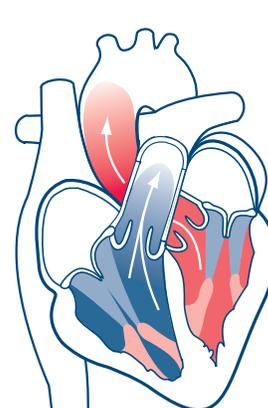
Open tricuspid and mitral valves

Blood flows from the right atrium into the right ventricle through the open **tricuspid** valve, and from the left atrium into the left ventricle through the open **mitral** valve.



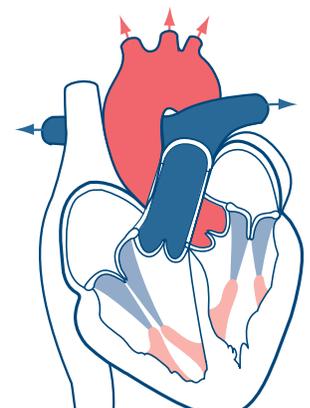
Closed tricuspid and mitral valves

When the right ventricle is full, the **tricuspid** valve shuts and prevents blood from flowing backward into the right atrium when the ventricle contracts (squeezes).
When the left ventricle is full, the **mitral** valve shuts and prevents blood from flowing backward into the left atrium when the ventricle contracts.



Open pulmonic and aortic valves

As the right ventricle begins to contract, the **pulmonic** valve is forced open. Blood is pumped out of the right ventricle through the pulmonic valve into the pulmonary artery to the lungs.
As the left ventricle begins to contract, the **aortic** valve is forced open. Blood is pumped out of the left ventricle through the aortic valve into aorta, which divides into many arteries and provides blood to the body.



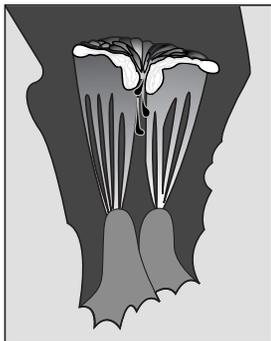
Closed pulmonic and aortic valves

When the right ventricle finishes contracting and begins to relax, the **pulmonic** valve snaps shut. This prevents blood from flowing back into the right ventricle.
When the left ventricle finishes contracting and begins to relax, the **aortic** valve snaps shut. This prevents blood from flowing back into the left ventricle.

This pattern is repeated over and over, causing blood to flow continuously to the heart, lungs and body. The four normally working heart valves make sure that blood always flows freely in one direction and that there is no backward leakage.

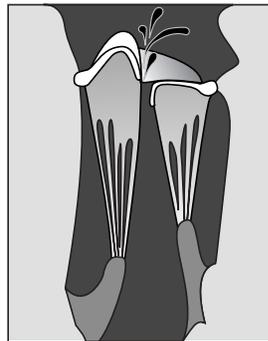
What is valve disease?

Heart valve disease occurs when one or more of the heart valves do not work correctly because of valvular stenosis or valvular insufficiency. These conditions cause the heart to pump harder to circulate the right amount of blood through the body.



Valvular stenosis:

The tissues forming the valve leaflets become stiff, narrowing the valve opening and limiting the amount of blood that can flow through it.



Valvular insufficiency

(also called regurgitation, incompetence or “leaky” valve): The valve leaflets do not close completely, allowing blood to flow backward through the valve.

Some patients may have both valvular stenosis and valvular insufficiency in one or more valves.

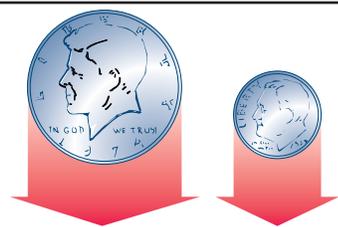
Left untreated, heart valve disease can reduce a person’s quality of life and become life-threatening. In many cases, valves can be surgically repaired or replaced, restoring normal function and allowing the person to return to normal activities.

What causes valve disease?

Valve disease occurs when the heart valves do not work correctly. Valve disease can be congenital (present at birth) or acquired later in life.

Common causes of acquired valve disease include infection (including rheumatic fever and infective endocarditis) and structural changes that occur over time.

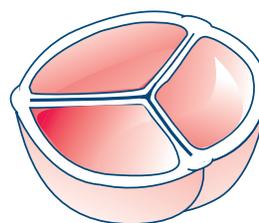
The normal valve opening is about the size of a 50-cent piece or larger. In contrast, stenosis may reduce the opening of the valve leaflets to the size of a dime or even smaller.



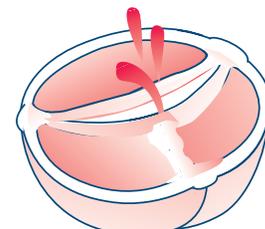
CONGENITAL VALVE DISEASE

Congenital valve disease is an abnormality that develops before birth. It may be related to improper valve size, malformed leaflets, or an irregularity in the way the leaflets are attached. Congenital valve diseases include bicuspid aortic valve disease and mitral valve prolapse.

Bicuspid aortic valve disease is a type of congenital valve disease that affects the aortic valve. It occurs more frequently in some family members. About one-fourth of patients may have some enlargement of the aorta above the valve. Bicuspid aortic valve disease affects about 2 percent of the population.



Normal aortic valve - three leaflets

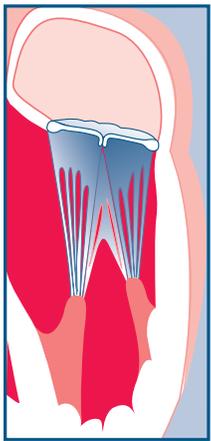


Bicuspid aortic valve - two leaflets

The valve may not open fully (stenosis) or may not close tightly (regurgitation).

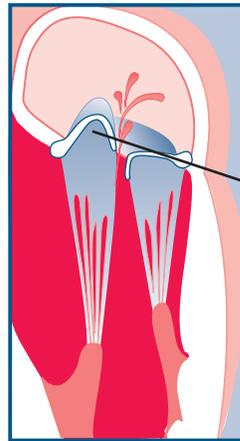
CONGENITAL VALVE DISEASE (CONTINUED)

Mitral valve prolapse (MVP) is a type of myxomatous valve disease, caused by an abnormal growth of connective tissue. MVP causes the leaflets of the mitral valve to flop back into the left atrium during the heart's contraction. MVP also causes the tissues of the valve to become abnormal and stretchy, causing the valve to leak.



Normal mitral valve

Leaflets close tightly to prevent backflow of blood when the ventricle contracts



Mitral valve prolapse

- Mitral valve leaflets are stretched
- The leaflets bow or flop back into the left atrium with each heartbeat
- The valve may leak

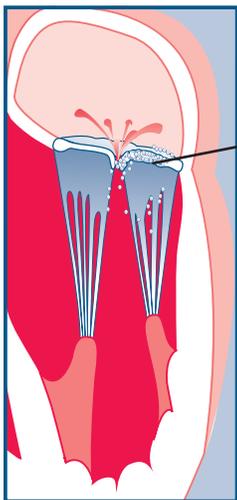
MVP occurs in about 1 to 2 percent of the population, and equally in men and women. Most often, it is not a cause for concern. Only 1 in 10 patients with MVP eventually require surgery. If the prolapse becomes severe or is associated with torn chordae or flail leaflets (floppy, lacking support), the leak may be greater, and surgery may be needed.

All patients with MVP should ask their doctor if they need to take precautions to prevent endocarditis.

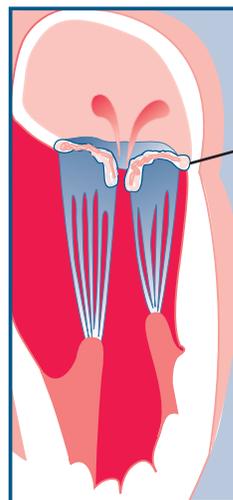
ACQUIRED VALVE DISEASES

Acquired valve diseases include problems that develop with valves that were once normal. Acquired valve diseases include infection, such as infective endocarditis and rheumatic fever, and structural valve changes, such as stretching or tearing of the chordae tendineae or papillary muscles, fibro-calcific degeneration or dilatation of the valve annulus. Sometimes the cause of acquired valve disease is unknown.

Infection



Infective endocarditis is a major infection and can be life-threatening. Germs attack the heart valve and may cause the valve to leak.



Rheumatic fever may cause the valve leaflets to become inflamed.

The leaflets may stick together and become scarred, rigid, thickened and shortened.

One or more of the valves (most commonly the mitral valve) may become stenotic (narrowed) or leaky.

How infective endocarditis develops

Infective endocarditis (also called bacterial endocarditis) is an infection of the heart valves or the heart's inner lining (endocardium).

It occurs when germs (especially bacteria, but occasionally fungi and other microbes) enter the blood stream and attack the lining of the heart or the heart valves.

Bacterial endocarditis causes growths or holes on the valves or scarring of the valve tissue, most often resulting in a leaky heart valve. Without treatment, bacterial endocarditis can be a fatal disease.

How rheumatic fever develops

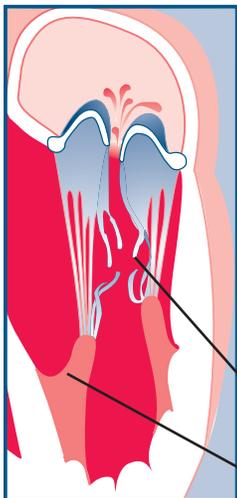
Rheumatic fever is usually the result of an untreated streptococcal infection, such as strep throat. The use of penicillin to treat strep throat can prevent this disease.

Rheumatic fever occurs most often in children aged 5 to 15, but symptoms of valve disease may not be seen for years.

The valve itself is not infected in rheumatic fever. Antibodies developed by the body to fight the infection react with the heart valves, causing inflammation and eventual scarring.

Structural Valve Disease

Structural valve diseases include stretching or tearing of the chordae tendineae or papillary muscles, fibro-calcific degeneration or dilatation of the valve annulus.

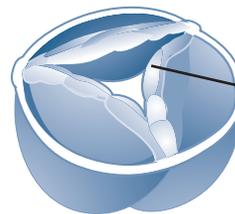


Stretching or tearing of chordae tendineae or papillary muscles: Valve leaflets may flop backward (flail leaflet) when the ventricles contract, causing a leaky valve. Most commonly affects the mitral valve and can be the result of a heart attack, heart valve infection or trauma.

torn chordae

stretched papillary muscles

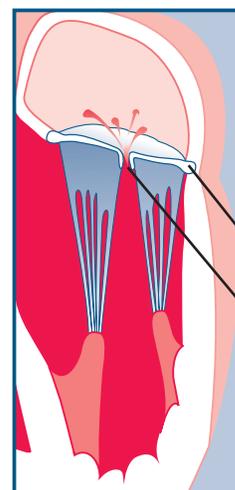
Fibro-calcific degeneration: The valve opening becomes narrowed. Fibro-calcific degeneration most commonly affects the aortic valve and often occurs in adults over age 65. Risk factors for this condition include increased age, low body weight and high blood pressure.



Valve leaflets become thick (fibrotic) and hard (calcific)

Dilatation: The widening or stretching of the valve annulus that causes the leaflets to lack support, not close tightly and leak.

Dilatation may occur when the heart muscle is damaged due to conditions such as heart attack (heart muscle injury), cardiomyopathy (weakened heart muscle), congestive heart failure, advanced stages of high blood pressure or syphilis. It can also occur as part of an inherited heart condition, such as Marfan syndrome.



Annulus widens

Leaflets lack support and do not close tightly

What are the symptoms of heart valve disease?

When the heart valves begin to fail, the heart beats harder to compensate for the reduced blood flow. As the heart beats harder, symptoms of valve disease may occur, including:

- Increased shortness of breath
- Heart palpitations (feeling of skipped heartbeats)
- Chest pain or discomfort
- Swelling of the ankles, feet or abdomen (edema)
- Rapid weight gain (3 pounds in one day is possible)

- Increasing fatigue
- Weakness or dizziness

Symptoms can occur quickly if the onset of valve disease is severe and sudden. For some people, symptoms may occur gradually and may not be noticeable.

Call your doctor if you have any of these symptoms so you can be evaluated. If you have already been diagnosed with valve disease, keep your regular follow-up appointments and call your doctor if you develop any new symptoms or if your symptoms become more frequent or severe. Don't wait for your next appointment to discuss changes in your symptoms.

Valve disease and other heart conditions

Heart failure and atrial fibrillation often occur with valve disease.

Heart failure means your heart is working less efficiently and cannot pump a normal amount of blood. The symptoms of heart failure are similar to the symptoms of valve disease. If you have heart failure, you may be told to:

- Quit smoking
- Weigh yourself daily and report rapid weight gain
- Take medications to control fluid and help your heart pump better
- Decrease salt or sodium in your diet
- Maintain a desirable weight
- Participate in a regular exercise program planned by your doctor
- See your doctor for regular visits

Atrial fibrillation is an abnormal heart rhythm originating in the atria that can lead to a rapid and disorganized heartbeat.

Many options are available to treat atrial fibrillation. These include medications, lifestyle changes, procedures and surgery. The choice of treatment for you is based on your heart rhythm and symptoms.

How is valve disease diagnosed?

Valve disease is diagnosed after your doctor evaluates your symptoms and the results of your physical exam and diagnostic tests.

The physical exam may reveal fluid in the lungs, an enlarged heart or a heart murmur, the sound made by blood moving through a stenotic or a leaky valve.

Diagnostic tests help your doctor identify the location, type and extent of your valve disease and may include:

- **Echocardiogram (echo):** A graphic outline of the heart's movement. High frequency sound waves, transmitted through a transducer placed on the surface of the chest, produce pictures of the heart's valves, chambers and pumping action.

An echo can be performed during exercise (called an **exercise stress echocardiogram**) to evaluate the heart function during activity. To get a closer view of the heart, a **transesophageal echo (TEE)** may be performed in which the sound-wave transducer is placed on the end of a special tube (called an endoscope) and passed into the mouth and down the esophagus (food pipe). An echo may show evidence of a narrowed or insufficient valve.

- **Electrocardiogram (ECG or EKG):** A picture on graph paper of the electrical impulses traveling through the heart muscle. The picture is drawn by a computer from information supplied by electrodes attached to the body. An EKG may indicate evidence of abnormal electrical activity in the heart.

How valve disease is diagnosed (continued)

- **Cardiac catheterization (cardiac cath or coronary angiogram):** An invasive imaging procedure used to evaluate the function of the heart. During a cardiac catheterization, a long, narrow tube called a catheter is guided through a blood vessel in the arm or leg to the heart with the aid of a special x-ray machine. Contrast material is injected through the catheter and x-ray movies are created as the contrast material moves through the heart. A cardiac cath may show evidence of a narrowed or insufficient valve.
- **Radionuclide scans (MUGA and first pass scans):** A small amount of radionuclide isotope is injected into your bloodstream through an intravenous (IV) line. The isotope gives off energy detected by a camera to evaluate blood flow to the heart muscle, the size of the heart chambers, and how the heart contracts. “MUGA scans” and “first pass scans” are tests that detect the size and shape of the ventricles.
- **Magnetic resonance imaging (MRI):** A large magnet and radio waves are used to produce a picture of the heart’s valves and chambers. It can create moving images of the heart as it is pumping and can detect abnormal blood flow through the heart.

By repeating these tests over time, your doctor can evaluate the progress of your valve disease and help you make decisions about your treatment.

How is valve disease treated?

Valve disease can be treated by:

- Protecting your valve from further damage by taking precautions to reduce the risk of infective endocarditis (*see page 14 for more information about protecting your valves*)
- Taking medications as prescribed to treat symptoms and reduce the risk of further valve damage
- Having valve repair or replacement surgery, if necessary
- Having catheter-based procedures, if necessary, such as balloon mitral valvotomy
- Following up with your doctor for regular visits

The type of treatment that is recommended for you will depend on several factors, including the type of valve disease, the severity of the damage, your age and medical history. Your health care team will discuss the specific treatment options that are recommended for you.

Medical Treatment of Heart Valve Disease

Medications may be prescribed to increase the pumping action of the heart to compensate for a valve that isn’t working properly. However, heart valve disease is a mechanical problem, and surgery may eventually be needed.

Valve Surgery

Over the past several years, there have been great advances in the surgical treatment of diseased heart valves. Diagnostic tests have helped your heart doctor identify the location, type and extent of your valve disease. The results of these tests, the structure of your heart, your age, the presence of other medical conditions, and your lifestyle will help your cardiologist, surgeon and you determine what type of valve treatment is best.

At Cleveland Clinic, valve surgery may be combined with other heart surgeries, such as more than one valve procedure, bypass surgery, aortic aneurysm surgery or surgery to treat atrial fibrillation (an irregular heart beat that is common in patients with valve disease).

There are two types of valve surgery: valve repair surgery and valve replacement surgery.

VALVE REPAIR SURGERY

During valve repair surgery, the surgeon fixes the damaged or faulty valve, often without the use of artificial parts. The mitral valve is the most commonly repaired valve, but the aortic and tricuspid valves may also undergo some of these repair techniques.

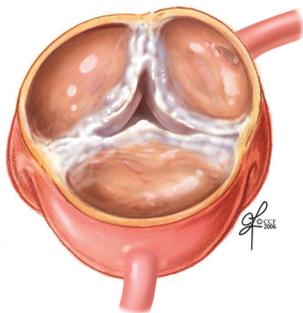
Types of Valve Repair Surgeries

The potential advantages of valve repair versus valve replacement are:

- Decreased risk of infection
- Decreased need for life-long anticoagulant (blood thinner) medication
- Preserved heart muscle strength

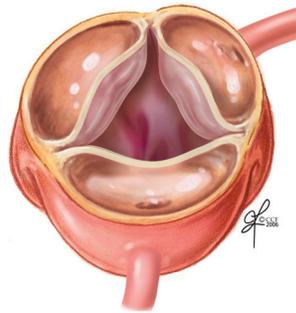
Types of valve repair techniques include commissurotomy, decalcification, quadrangular resection of leaflet, creation of new chords, annulus support, patched leaflets and bicuspid aortic valve repair.

Commissurotomy



BEFORE:

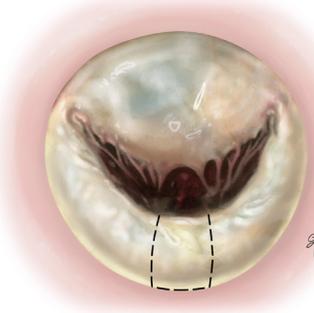
Valve leaflets are fused, causing narrowing.



AFTER:

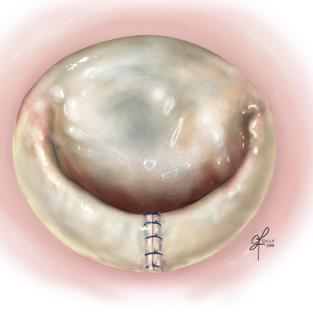
Valve leaflets are separated, widening the valve opening.

Quadrangle Resection of Leaflet



BEFORE:

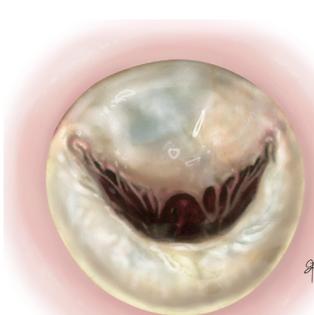
A portion of the mitral valve leaflet is flail (floppy) and bows back into the left atrium. A rectangular-shaped section is cut out.



AFTER:

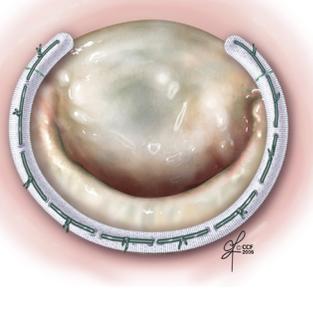
The leaflet is sewn back together; allowing the valve to close more tightly.

Annulus Support



BEFORE:

Valve annulus is too wide; the leaflets lack support and do not close tightly, causing the valve to leak.



AFTER:

The leaflet may be reshaped or tightened by sewing a ring around the annulus (annuloplasty). The ring may be made of tissue or synthetic material.

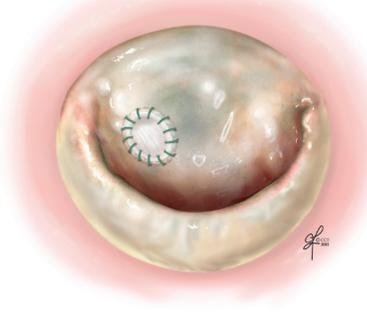
Types of Valve Repair Surgeries (continued)

Patched Leaflets



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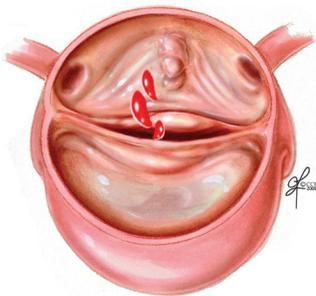
Valve leaflet has a hole or tear.



AFTER:

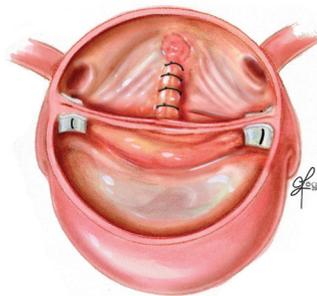
Tissue patches may be used to repair the hole or tear.

Bicuspid Aortic Valve Repair



BEFORE:

Bicuspid aortic valve has two leaflets instead of three. The valve may not open fully (stenosis) or may not close tightly (regurgitation).



AFTER:

The aortic valve leaflets may be surgically reshaped, allowing the valve to open and close more easily.

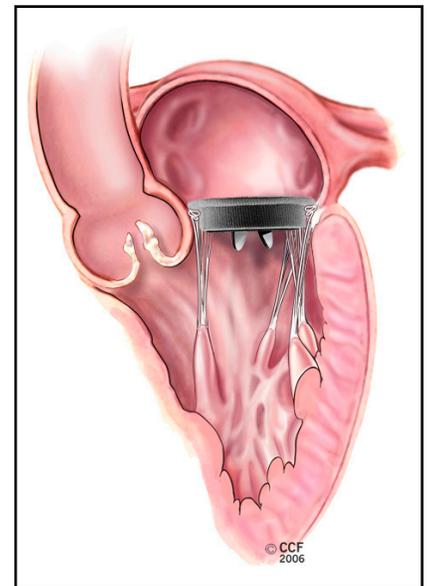
VALVE REPLACEMENT SURGERY

During valve replacement surgery, the surgeon removes the faulty valve (native valve) and replaces it by sewing a mechanical or biological valve to the annulus of the native valve. All valve replacements are “biocompatible” which means they will not be rejected by the patient’s immune system.

Valve replacement surgery is performed when valve repair surgery is not a treatment option. Valve replacement surgery is commonly performed for patients with aortic valve disease, although the aortic valve can be repaired in some cases. Your doctor will discuss the type of valve replacement that is recommended for you.

An important consideration of valve replacement surgery is that anticoagulant medications or “blood thinners,” such as warfarin (Coumadin) may need to be taken for the rest of the patient’s life, depending on the type of valve replacement that was used. Blood thinners are medications that delay the clotting action of blood. They help prevent blood clots from forming on the replaced valve to reduce the risk of a heart attack or stroke.

Patients who take Coumadin need to have regular blood tests (called Prothrombin time or PT for short) to calculate the International Normalized Ratio (INR), a measurement of how fast the blood is clotting. This test helps your doctor evaluate your response to the medication and helps determine if your dosage needs to be adjusted.



Types of Valve Replacement Surgeries

Biological Valves

Biological valves (also called tissue or bioprosthetic valves) can be made from cow tissue (bovine), pig tissue (porcine) and human tissue (allograft or homograft). Biological valves may have some artificial parts to give the valve support and to aid placement.

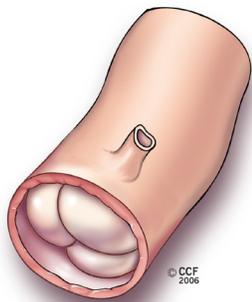
Most patients who receive a biological valve replacement do not need life-long anticoagulant therapy after surgery.



Biological valves

Traditionally, biologic valves were not considered as durable as mechanical valves. However, recent studies show these valves may last at least 17 years without a decline in function.

A **homograft valve** is a human heart valve that is obtained from a donor after death, frozen and then transplanted in the recipient. A homograft may be used to replace a diseased aortic valve, or it may be used to replace the pulmonic valve during the Ross procedure (*see page 5*). Homograft valves are well tolerated by the body because they are most like your own native valves. Most patients who receive a homograft valve replacement do not need to take anticoagulant medications for the rest of their lives.



Homograft

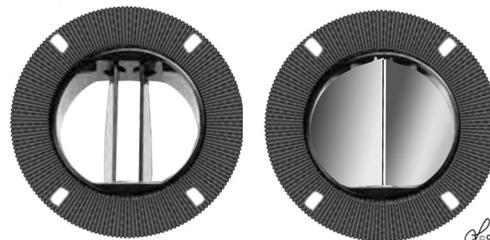
Mechanical Valves

A mechanical valve is made totally of mechanical parts that are tolerated well by the body. Mechanical valves are made of metal or carbon and are designed to perform the functions of the patient's native valve. A mechanical valve is very durable and is designed to last a lifetime.

The bileaflet valve is the most common type of mechanical valve and consists of two carbon leaflets in a ring covered with polyester knit fabric.

Most patients who receive a mechanical valve replacement need to take anticoagulant medications for the rest of their lives.

Some patients who have a mechanical valve replacement report a valve clicking noise at times. This is the sound of the valve leaflets opening and closing.



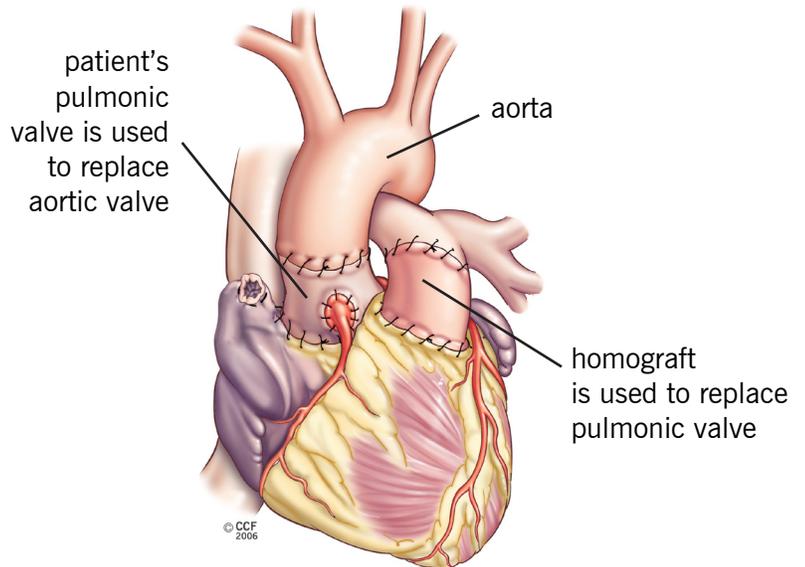
Mechanical valves

Switch Operation (Ross Procedure)

The Ross procedure is used to treat aortic valve disease. During this procedure, the patient's own pulmonic valve is removed and used to replace a diseased aortic valve. The pulmonic valve is then replaced by a homograft valve.

Most patients who undergo the Ross procedure do not need to take anticoagulant medications for the rest of their lives.

This procedure is mainly used in children or young adults with aortic valve disease.



Minimally Invasive Valve Surgery

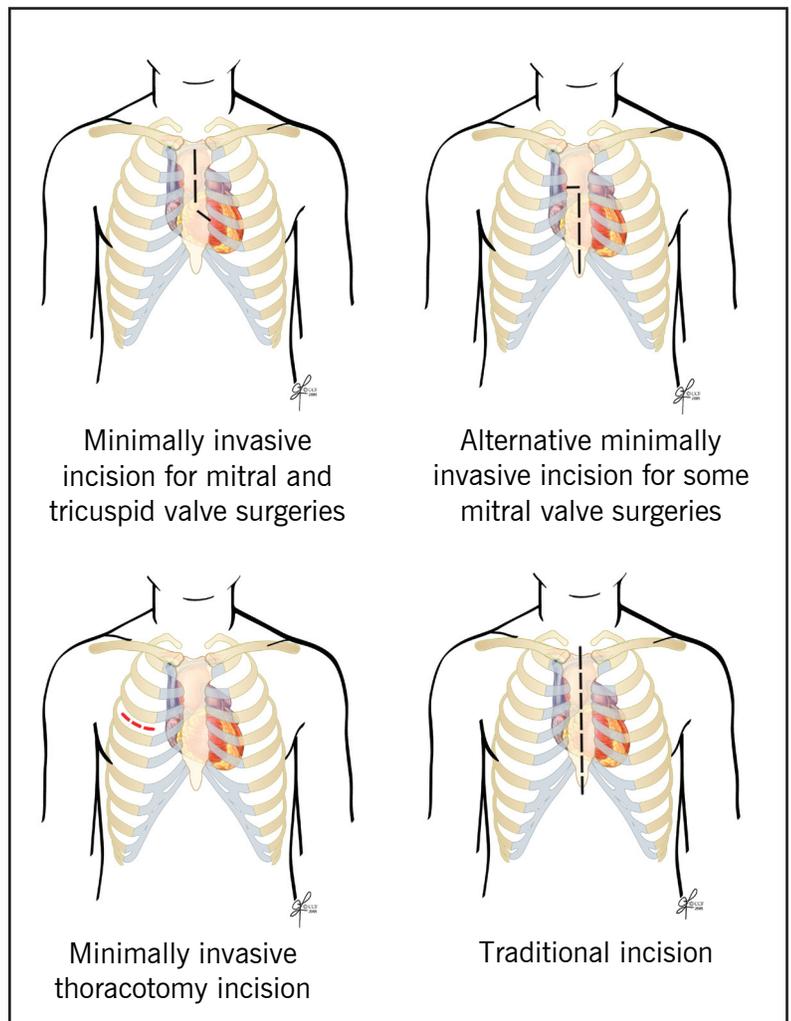
Minimally invasive heart valve surgery is a type of surgery performed through smaller incisions than traditional heart valve surgery.

Other minimally invasive valve surgery techniques include endoscopic or keyhole approaches (also called port access, thoracoscopic or video-assisted surgery) and robotic-assisted surgery.

The benefits of minimally invasive surgery include a smaller incision (3 to 4 inches -- or even smaller with robotic surgery -- instead of the 6- to 8-inch incision with traditional surgery) and smaller scars. Other possible benefits may include a reduced risk of infection, less bleeding, less pain and trauma, decreased length of stay in the hospital (3 to 5 days) and decreased recovery time.

Valve surgeries, including valve repairs and valve replacements, are the most common minimally invasive procedures.

The surgical team will carefully compare the advantages and disadvantages of minimally invasive valve surgery versus traditional valve surgery. Your surgeon will review the results of your diagnostic tests before your surgery to determine if you are a candidate for any of these minimally invasive techniques.



What happens before surgery?

When valve surgery is determined to be an appropriate treatment option for you, a presurgical appointment will be scheduled. At this appointment, you will receive instructions about when and where to report for surgery, what to expect before and after surgery, and whether you need further testing before surgery. If you need to see another health care provider or need testing during this preoperative appointment, you may be at the Cleveland Clinic all day or you may need to return another day.

During this appointment, you will have the opportunity to talk with a nurse or patient educator about the procedure and the Cleveland Clinic surgical experience. You may also meet with your surgeon and anesthesiologist to discuss your upcoming surgery.

Is the heart-lung machine used during surgery?

Yes. During surgery, the heart-lung bypass machine (called “on-pump” surgery) is used to take over for the heart and lungs, allowing the circulation of blood throughout the rest of the body. The heart’s beating is stopped so the surgeon can perform the valve procedure on a “still” heart.

How long does the procedure last?

The valve surgery procedure itself lasts from 3 to 6 hours.

What happens after surgery?

After the valve has been repaired or replaced, the heart-lung machine is turned off, the heart starts beating on its own, and the flow of blood returns to normal.

Temporary pacing wires and a chest tube to drain fluid may be placed before the sternum is closed with special sternal wires (in traditional valve surgery). Then the chest is closed with internal stitches or traditional external stitches. Sometimes a temporary pacemaker is attached to the pacing wires to regulate the heart rhythm until your condition improves.

The patient is transferred to an intensive care unit for close monitoring for about one to two days after the surgery. The monitoring during recovery includes continuous heart, blood pressure and oxygen monitoring and frequent checks of vital signs and other parameters, such as heart sounds.

Once the patient is transferred to the step-down nursing unit, the hospital stay is about 3 to 5 more days.

Recovery

Full recovery from valve surgery takes about two to three months. Most patients are able to drive in about three to eight weeks after surgery. Your doctor will provide specific guidelines for your recovery and return to work, including specific instructions on activity and how to care for your incision and general health after the surgery.

To maintain your cardiovascular health after surgery, making lifestyle changes and taking medications as prescribed are strongly recommended.

Lifestyle changes include:

- Quitting smoking
- Treating high cholesterol
- Managing high blood pressure and diabetes
- Exercising regularly
- Maintaining a healthy weight
- Eating a heart-healthy diet
- Participating in a cardiac rehabilitation program, as recommended
- Following up with your doctor for regular visits

Follow Up Care

During the first few months after surgery, you will probably need to visit a few times with the doctor who referred you for surgery. You will need to schedule regular appointments with your cardiologist (even if you have no symptoms).

Follow Up Care (continued)

Your follow-up appointments may be scheduled every year, or more often, as recommended by your doctor. Your appointments should include a medical exam. Diagnostic studies (such as an echocardiogram) may be repeated at regular intervals.

You should call your doctor if your symptoms become more severe or frequent. Don't wait until your next appointment to discuss changes in your symptoms.

Medications, surgery and other treatments will not fully cure your heart valve disease. You will always need to see your doctor for lifelong follow-up to make sure your heart valves work as they should.

FREQUENTLY ASKED QUESTIONS

Q: How does my doctor determine what treatment is right for me?

The type of valve disease treatment that is recommended will depend on several factors, including the type of valve disease, the severity of the damage, your age and medical history. Your health care team will discuss specific treatment options with you.

Q: Will surgery be better for me than medication alone?

A: Medications often help in the initial stages of valve disease but are less effective as the disease progresses. The decision to undergo surgery is a major one that depends on several factors that differ among patients. Surgery does not need to be delayed until your symptoms become unbearable. For some valve conditions, surgery is most effective when performed before symptoms begin. The decision to undergo surgery is a joint one between you, your cardiologist and your heart surgeon.

Q: How will I feel after surgery?

A: For a while after the surgery, you may feel worse than you did before surgery. This is normal and is usually related to the trauma of surgery, not necessarily to the functioning of your heart valves. It may take you from 4 to 10 weeks to fully recover from surgery.

How you feel after surgery depends on your overall health, how the surgery went, and how well you take care of yourself after surgery. After recovering from surgery, most patients do feel better. To some extent, how you feel will depend on how you felt before surgery. Patients with more severe symptoms before surgery may experience a greater sense of relief after surgery. Call your doctor if you are concerned about your symptoms or rate of recovery.

Q: How long will my valve last?

A: The longevity of your valve repair or replacement will depend on several factors: your health at the time of surgery, the type of surgical treatment you undergo, and how well you take care of yourself after the surgery. In a few patients, valve repair does not stop the progression of valve disease and further surgery may be necessary. Mechanical valves rarely wear out, but occasionally they may need to be replaced if a blood clot, infection or a growth of tissue interferes with their function. Biological and homograft valves may need to be replaced, particularly when they are implanted in younger patients.

Q: Are there any risks of major complications from the surgery?

A: As with any surgery, there are risks involved. Your surgical risks are related to your age, the presence of other medical conditions and the number of procedures you undergo during a single operation. Your cardiologist will discuss these risks with you before surgery; please ask questions to make sure you understand why the procedure is recommended and what all of the potential risks are.

Q: Will I need to take blood thinners (anticoagulants) after surgery?

A: The need for anticoagulant medications after surgery varies from patient to patient. Patients receiving a mechanical heart valve must take anticoagulants for the rest of their lives. Patients receiving biological valves may only need to take anticoagulants for several weeks after surgery, or they may not need to take them at all. Patients receiving homograft valves do not require anticoagulants. However, other conditions associated with valve disease are also sometimes treated with anticoagulants. These conditions include an enlarged heart, irregular heartbeats, a weakened heart and a history of blood clots.

Because anticoagulant medications delay clotting time, patients with bleeding problems, such as ulcers, may need to be especially careful when taking these medications. Moderate to heavy bleeding from any cause also needs to be taken seriously and treated promptly. Also, alcohol consumption and dietary factors can affect how well the medication works.

Anticoagulant therapy requires taking a pill once a day without fail—and periodically having a blood test, usually at least once a month. These medications have few, if any, side-effects, protect against heart attack and stroke, and generally do not disrupt the lives of the patients who take them.

Q: What if I don't choose surgery?

A: Some types of valve disease can be treated with medicine, at least in the early stages of the disease. Some patients may also be eligible for nonsurgical valve treatment (see below). However, the natural course of valve disease is to worsen, as indicated by an increase in the number or severity of symptoms and a decrease in overall health. These changes are often gradual, but they can occur quickly. Thus, we recommend that patients who choose not have surgery remain in close contact with their physicians. Surgery usually remains a treatment option, even in advanced disease -- and it may be the only effective treatment.

**Nonsurgical Valve Treatment:
Balloon Mitral Valvotomy**

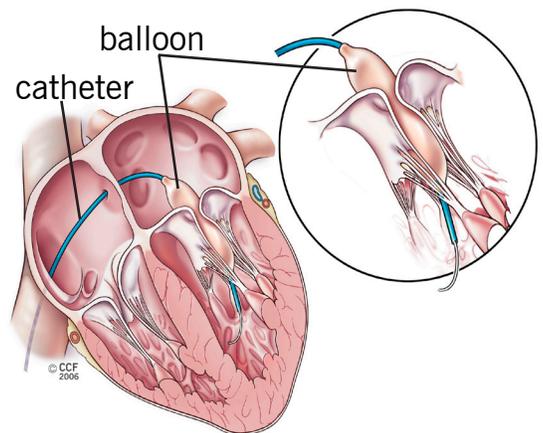
Balloon mitral valvotomy is used to increase the opening of a narrowed (stenotic) valve. This treatment is an option for:

- Certain patients who have mitral valve stenosis (narrowing) with symptoms of valve disease
- Select older patients who have aortic valve stenosis but are not able to undergo surgery
- Some patients with pulmonic valve stenosis

This procedure can be performed on the mitral, tricuspid, aortic or pulmonary valves. The procedure is performed in the cardiac catheterization lab by a cardiologist and a team of nurses and technicians.

During the procedure, a specially designed balloon catheter is inserted in the groin and guided to the heart. The balloon tip is directed inside the narrowed valve and is inflated and deflated several times to widen the valve opening. The balloon is removed after the valve opening has been widened enough.

The procedure takes about two hours, but preparation and recovery add more time. Patients usually stay overnight and go home the next day. New research-based percutaneous, non-surgical procedures to treat mitral and aortic valve regurgitation (leaky valve) are being tested.



Protecting Your Heart Valves

Bacterial or infective endocarditis is an infection of the heart valves or the heart's inner lining (endocardium). It occurs when germs (especially bacteria, but occasionally fungi and other microbes) enter the blood stream and attack the lining of the heart or the heart valves. Bacterial endocarditis causes growths or holes on the valves or scarring of the valve tissue, most often resulting in a leaky heart valve. Without treatment, bacterial endocarditis can be a fatal disease.

To reduce your risk of bacterial endocarditis:

- Practice good oral hygiene habits every day. Take good care of your teeth and gums by seeking professional dental care every six months, regularly brushing and flossing your teeth, and making sure dentures fit properly.
- Call your doctor if you have symptoms of an infection, including a fever over 100 degrees F; sweats or chills; skin rash; pain, tenderness, redness or swelling; wound or cut that won't heal; red, warm or draining wound; sore throat, scratchy throat or pain when swallowing; sinus drainage, nasal congestion, headaches or tenderness along upper cheekbones; persistent dry or moist cough that lasts more than two days; white patches in your mouth or on your tongue; nausea, vomiting or diarrhea.
- Don't wait to seek treatment. Colds and the flu do not cause endocarditis, but infections, which may have the same symptoms, do cause endocarditis. To be safe, call your doctor.

Who's at risk?

Most patients can reduce their risk of developing bacterial endocarditis by simply following the steps listed above.

Patients who have the highest risk of developing bacterial endocarditis include those who have:

- An artificial (prosthetic) heart valve, including bioprosthetic and homograft valves
- Previous bacterial endocarditis
- Certain congenital heart diseases
- Heart valve disease that develops after heart transplantation

These patients may reasonably benefit from taking preventive antibiotics before certain medical and dental procedures, in addition to following the steps above. If you have any of the conditions listed above, please talk to your doctor about the type and amount of antibiotics you should take, and for what procedures you should take them. A bacterial endocarditis identification card is available from the American Heart Association and should be carried with you. Ask your doctor for a card or go to www.americanheart.org and search for "bacterial endocarditis wallet card."

