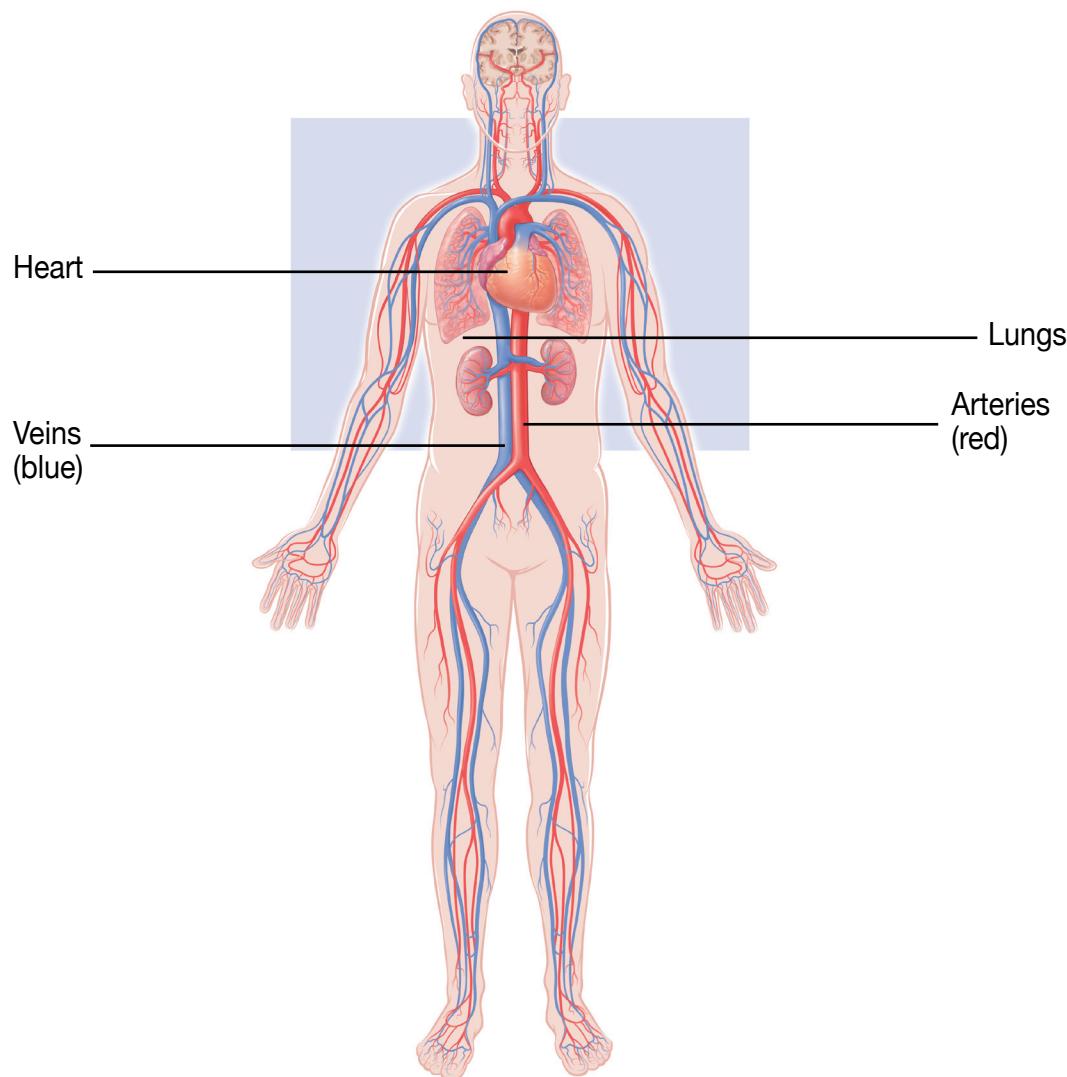


How Your Heart Works

Your heart is a muscular pump about the size of your fist, located slightly to the left and behind your breastbone. Its function is to pump blood throughout your body. As your heart beats, the walls of the heart squeeze, sending nearly 12 pints of blood throughout your body every minute. In a normal heart, it takes less than one minute for blood to travel from your heart to your big toe and back. In that minute, your heart will beat 60 to 80 times.

The illustration below shows the body's circulation. The heart pumps oxygen-rich blood throughout the body via arteries (shown in red); veins (shown in blue) bring blood back to the heart.

Circulation Throughout Your Body



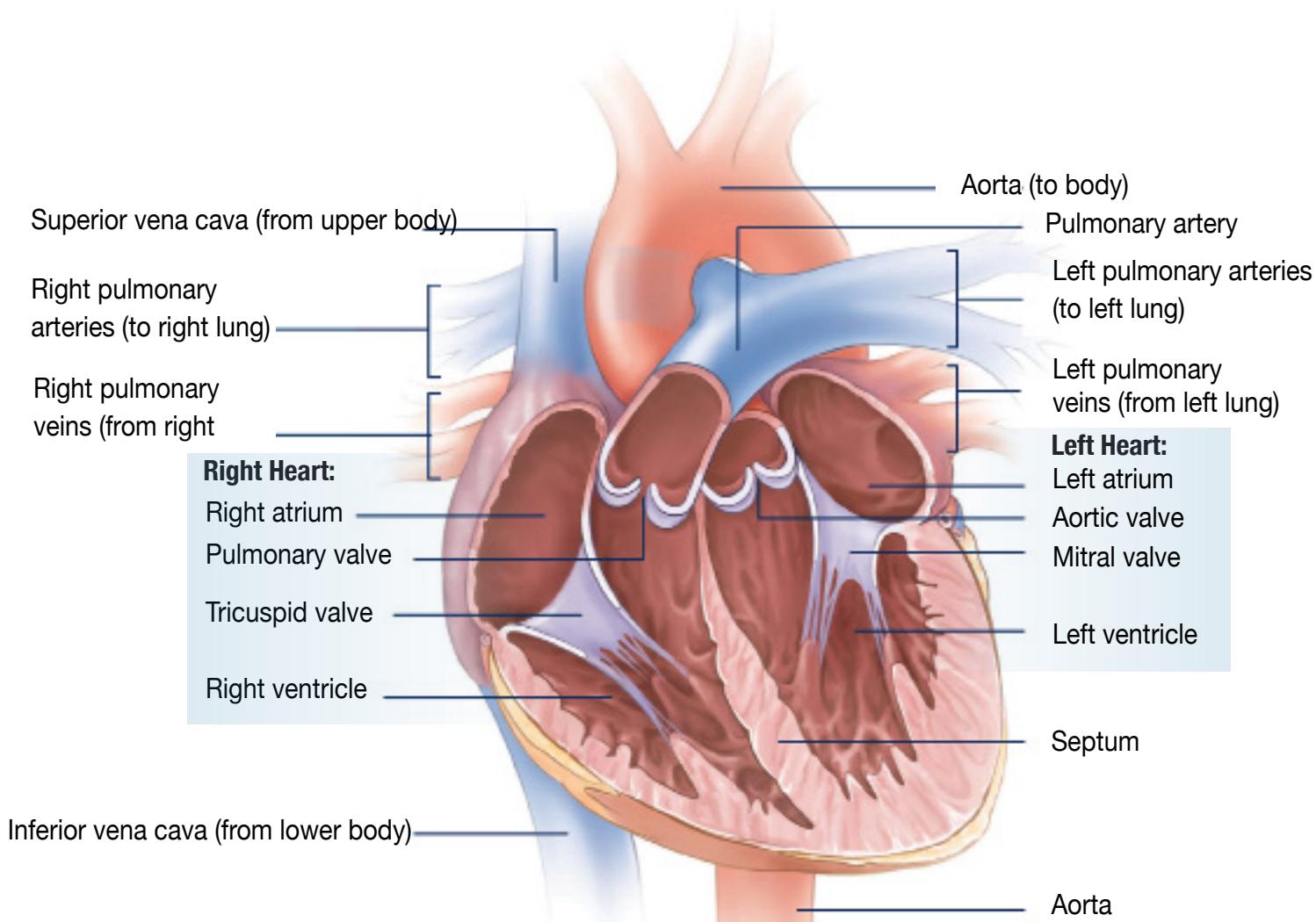
Heart Anatomy

The heart has two sides, separated by an inner wall called the **septum**. The right side of the heart pumps blood to the lungs to pick up oxygen. The left side of the heart receives the oxygen-rich blood from the lungs and pumps it to the body.

The heart has four chambers and four valves and is connected to various blood vessels. **Veins** are blood vessels that carry blood from the body to the heart. **Arteries** are blood vessels that carry blood away from the heart to the body.

The illustration shows a cross-section of a healthy heart with its inside structures.

The explanations of these structures are listed on the next page.



Heart Chambers

The heart has four chambers.

The two upper chambers are called atria (**left atrium** and **right atrium**) and the two lower chambers are called ventricles (**left ventricle** and **right ventricle**).

Heart Valves

Four valves control the flow of blood from the atria to the ventricles and from the ventricles into the two large arteries connected to the heart. These one-way valves have either two or three tissue flaps called leaflets that act as doors that open and close to ensure that blood flows only in the proper direction.

Right Side The **tricuspid valve** allows blood to move from the right atrium into the right ventricle.

The **pulmonary valve** allows blood to move from the right ventricle to the lungs to get oxygen.

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

The **aortic valve** allows blood to move out of the left ventricle into the aorta and then to the rest of the body.

Veins

The veins are major blood vessels connected to your heart.

The **superior and inferior vena cavae** are large veins that carry oxygen-poor blood from the body back to the heart.

The **pulmonary veins** carry oxygen-rich blood from the lungs to the left side of the heart so it can be pumped to the body.

Arteries

The arteries are major blood vessels connected to your heart.

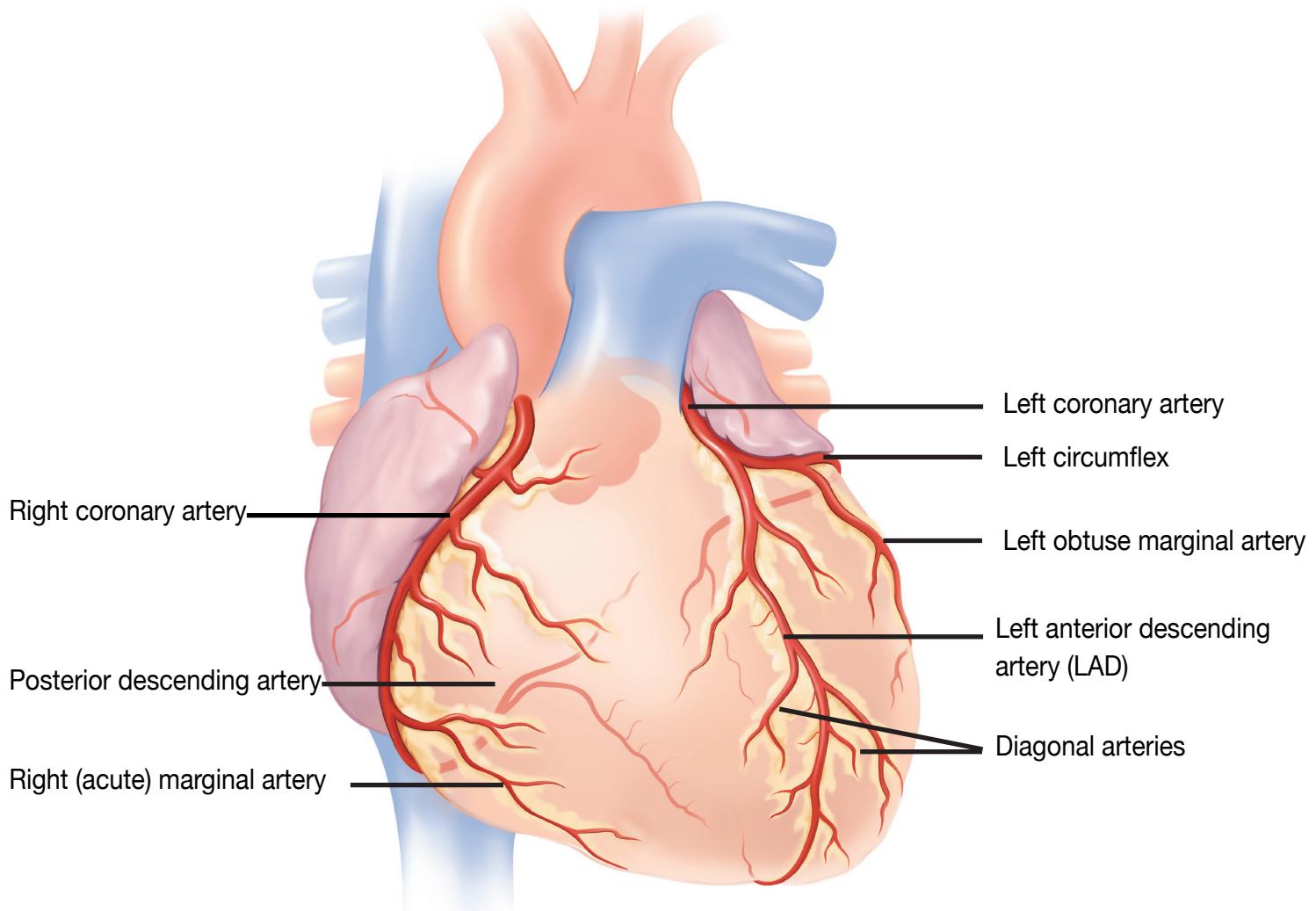
The **pulmonary artery** carries blood from the right side of the heart to the lungs to pick up a fresh supply of oxygen.

The **aorta** is the main artery that carries oxygen-rich blood from your heart to the rest of your body.

The **coronary arteries** are the other important arteries attached to the heart. They carry oxygen-rich blood from the aorta to the heart muscle, which must have its own blood supply to function.

Coronary Arteries of The Heart

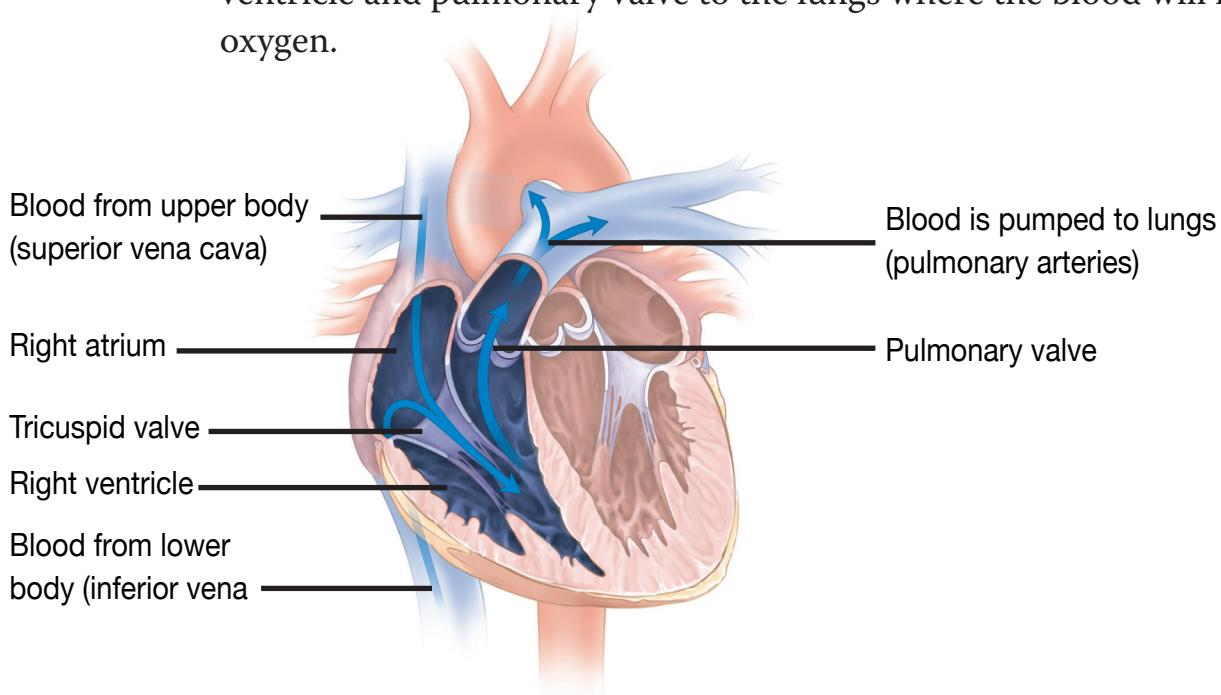
The illustration shows the largest of the coronary arteries.



Heart Function

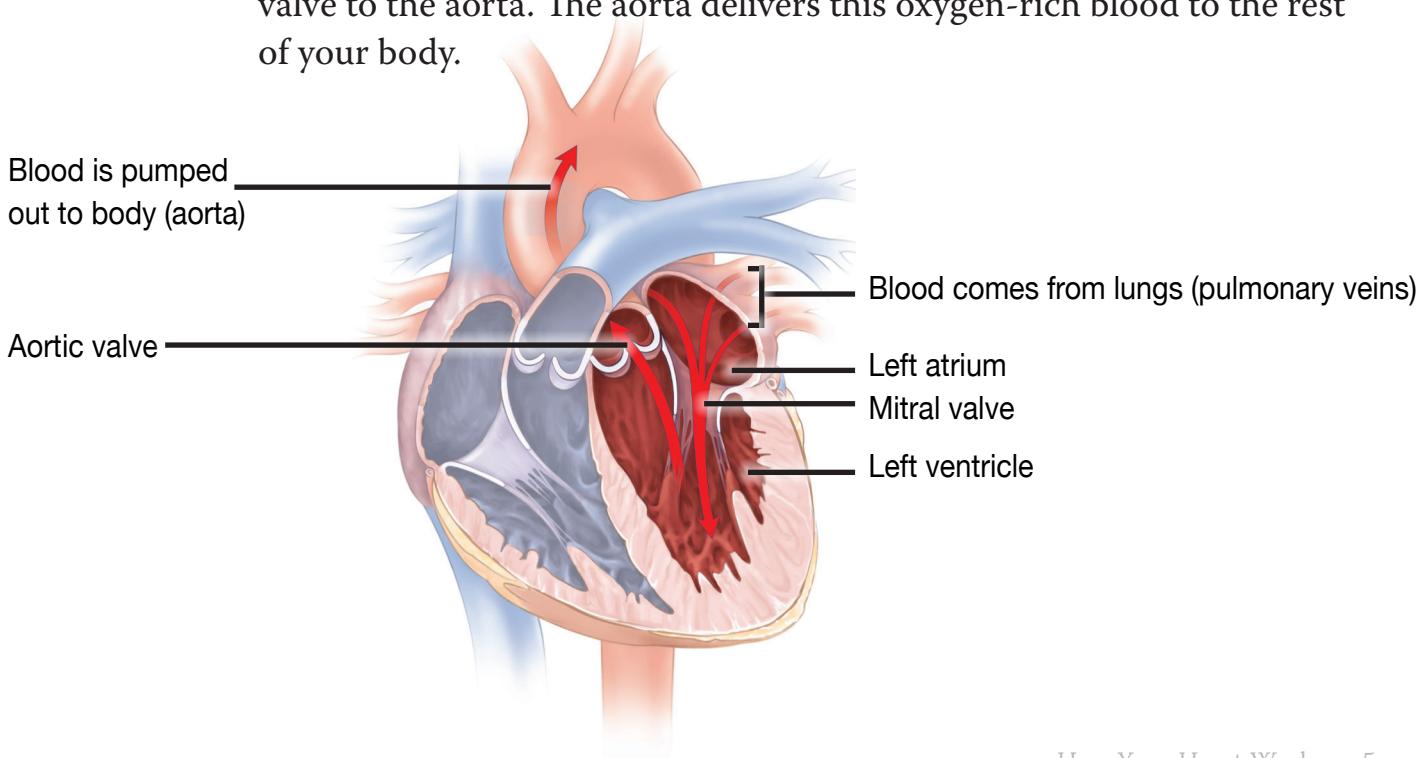
A. The Right Side of Your Heart

The right heart takes in **oxygen-poor blood (blue)** from the body and pumps it into the lungs to receive oxygen. Blue arrows show the path of the oxygen-poor blood through the right atrium, tricuspid valve, right ventricle and pulmonary valve to the lungs where the blood will receive oxygen.



B. The Left Side of Your Heart

The left heart takes in **oxygen-rich blood (red)** from the lungs and pumps it out to the body. Red arrows show the path of the oxygen-rich blood through the left atrium, mitral valve, left ventricle and aortic valve to the aorta. The aorta delivers this oxygen-rich blood to the rest of your body.



Types of Heart Problems and Surgical Procedures

The following descriptions are of some common heart problems and the surgical procedures used to correct them.

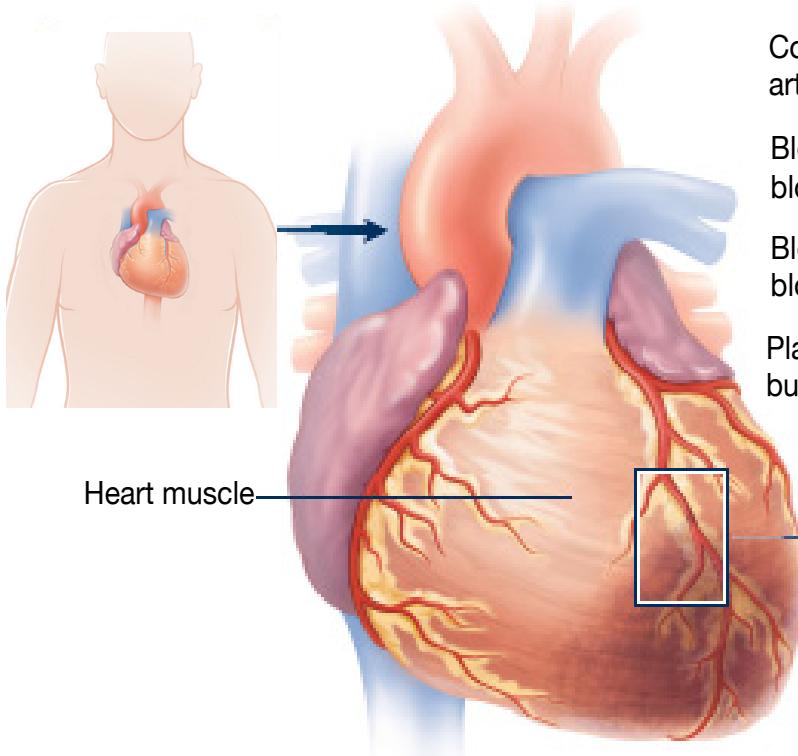
Atherosclerosis or Coronary Artery Disease

Coronary arteries are small vessels on the outside of the heart. These arteries supply blood to your heart muscle. If fatty deposits build up inside these arteries, they may narrow and lose their ability to deliver blood and oxygen to your heart. This condition is called atherosclerosis, hardening of the arteries, or coronary artery disease.

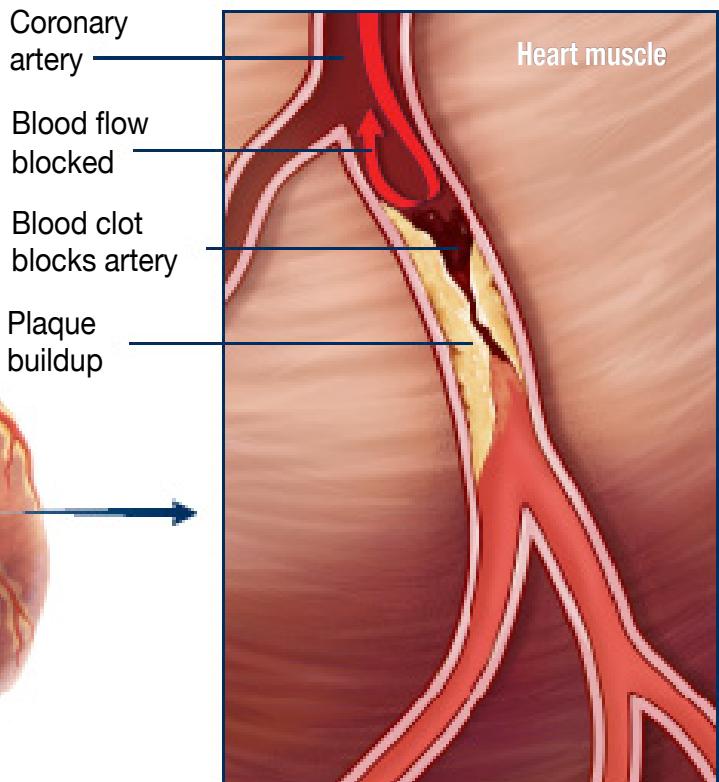
Your heart muscle needs blood to function. If the coronary arteries are blocked, the heart muscle beyond the blockage doesn't get oxygen. That part of the heart muscle dies. If the muscle dies, the result is what we commonly refer to as a heart attack. Chest pain, or angina, may also occur when the heart muscle does not receive enough blood.

Heart Damage from a Blocked Coronary Artery

A. Location of the heart in the body.



B. Shows a section of the coronary artery with plaque buildup and a blood clot.



Adapted from <http://www.nhlbi.nih.gov/health>

Coronary Artery Bypass Graft Surgery

Coronary artery bypass grafting (CABG) is done to bring new blood supply to the heart muscle. The bypasses go around the blocked artery (or arteries) to create new pathways for oxygen-rich blood to flow to the heart muscle.

To perform the operation, the heart may be stopped and you will be placed on circulatory support, called cardiopulmonary bypass or the heart-lung machine. This support works in place of your heart and lungs to circulate blood to your body and provide oxygen.

In some patients, coronary artery bypass grafting is performed on a beating heart. The heart is not stopped during the operation and the patient is not placed on cardiopulmonary bypass. This technique is not for all patients, so please discuss the options with your surgeon.

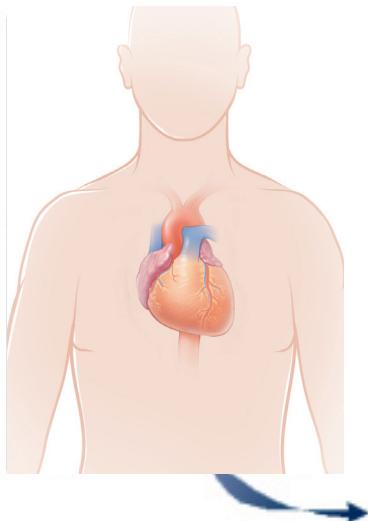
You may need one or more of your arteries to be bypassed. The grafts used to make a bypass usually come from the **internal mammary artery** (in the chest wall), the **greater saphenous vein** (in the legs), or the **radial artery** (in the arms). The location and size of your blockage and your other medical conditions determines which graft is most appropriate.

There are several systems of veins in your legs. If the greater saphenous vein is used, the other systems take over to provide adequate blood return from the legs. Blood flow into the leg is not changed by the removal of the vein. When used, one end of the removed vein is sewn onto the aorta and the other end is sewn or grafted onto the coronary artery below the blockage.

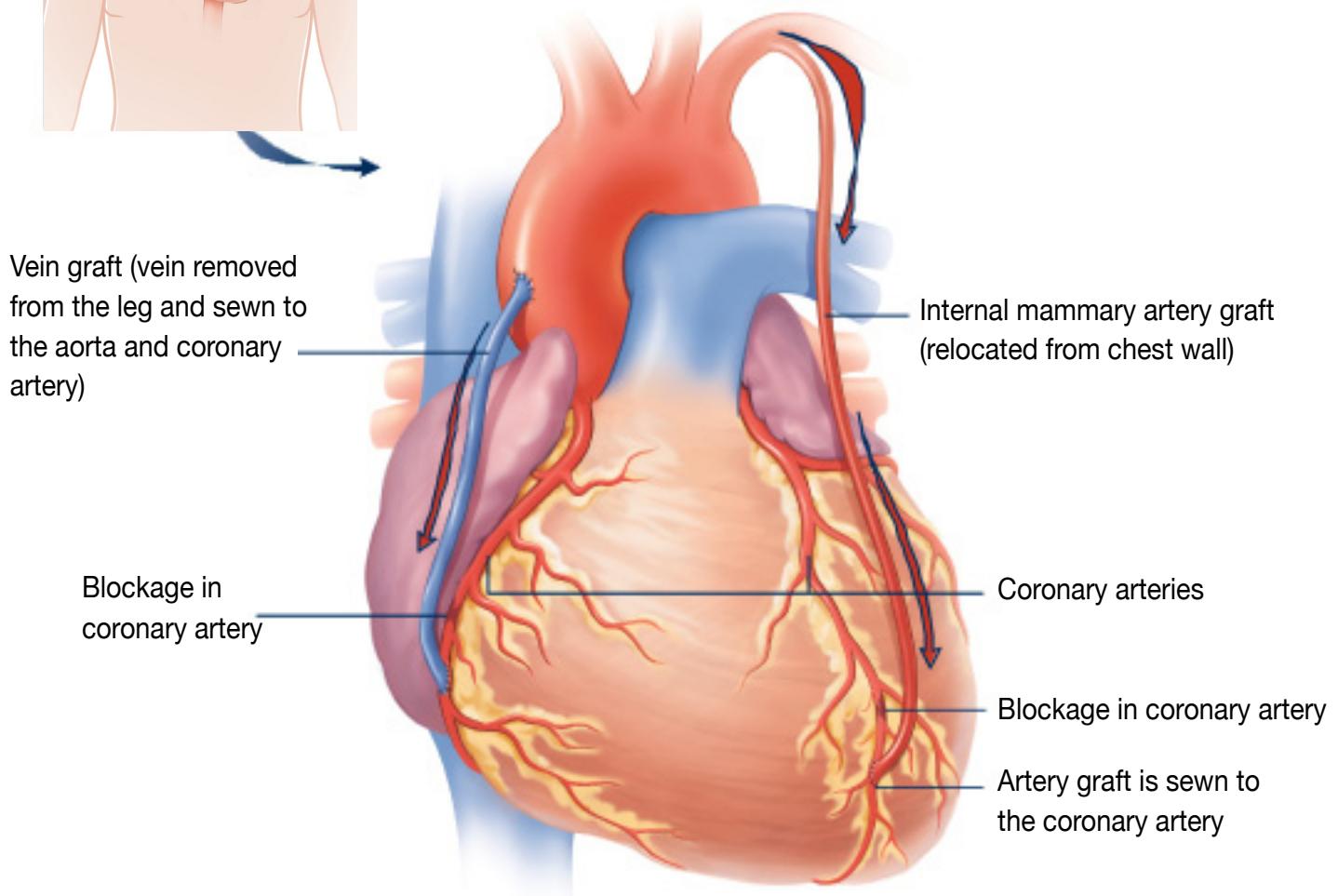
If the mammary artery is used, one end may remain attached at its origin and the other end is sewn onto the coronary artery below the blockage.

Coronary Artery Bypass Grafting

A. Location of the heart



B. Shows how vein and artery bypass grafts are attached to the heart.

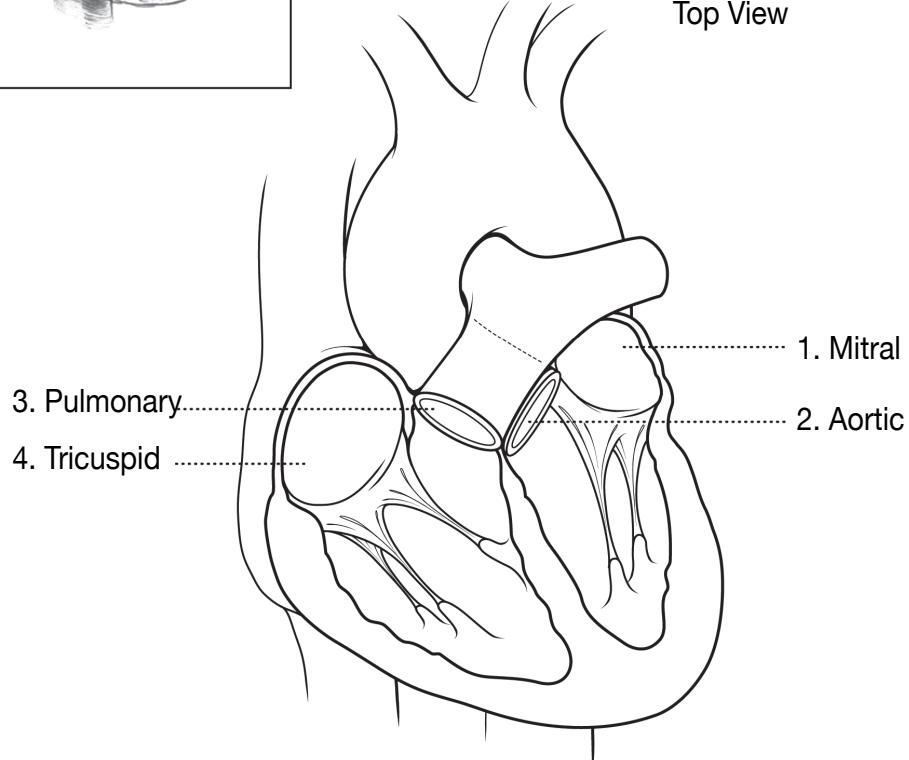
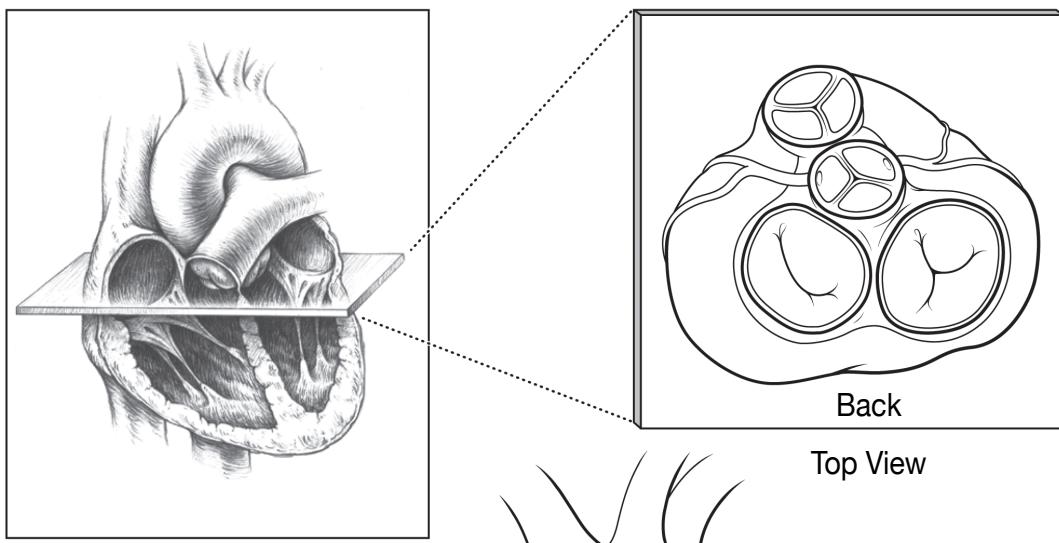


Heart Valve Disease

Heart valve disease occurs when one or more of your heart valves does not open or close properly. Valve problems that exist from birth are called congenital malformations. Other valve deformities may occur later in life when conditions, such as an infection, can damage the valve leaflets. The natural aging process may also weaken already damaged valve leaflets or harden normal valve tissue.

Valve problems produce many symptoms. Faulty heart valves can cause dizziness, shortness of breath, fatigue, irregular heartbeats, fluid buildup, strokes and heart attacks. Tests such as an echocardiogram or a cardiac catheterization can show if heart valves are not functioning properly.

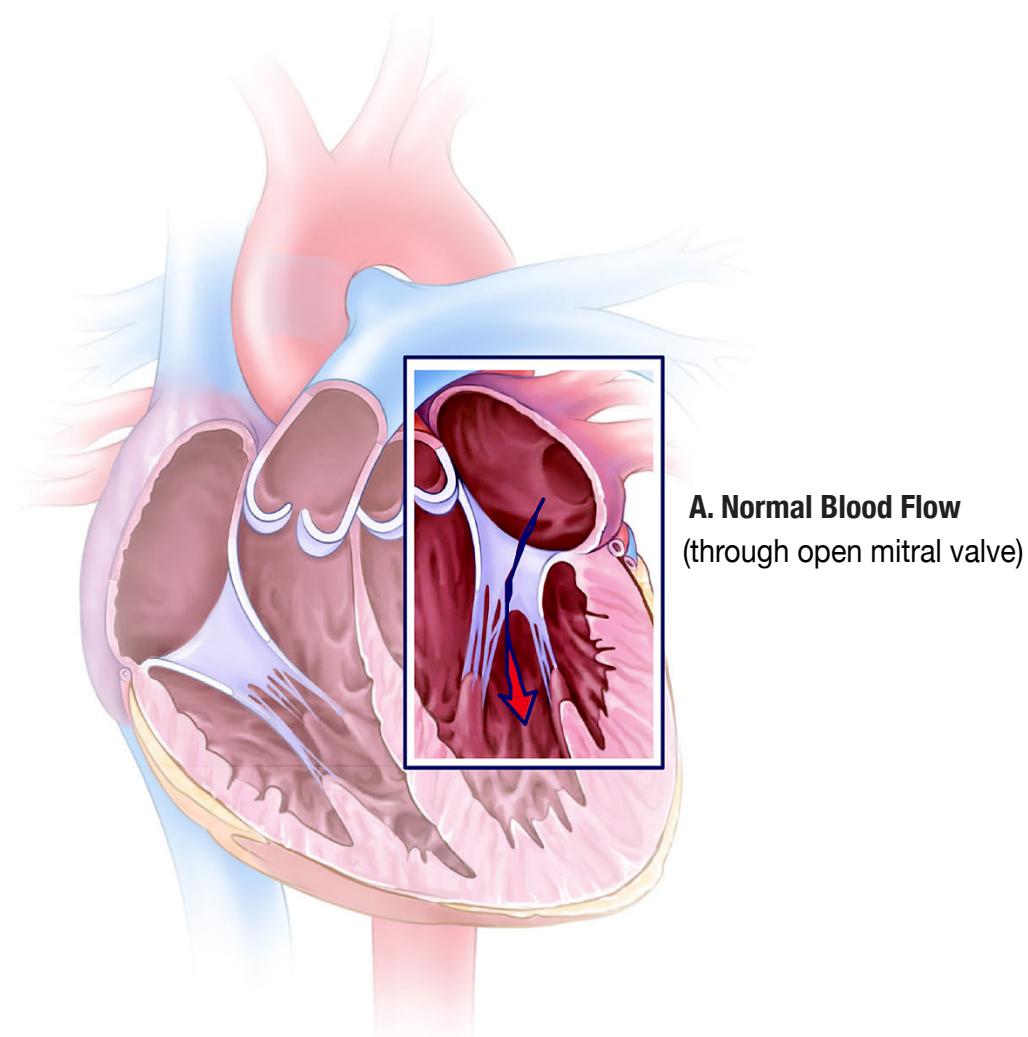
Heart Valves



Heart Valve Diseases and Operations

Mitral Valve Disease

The mitral valve is located between the left-sided filling chamber (atrium) and the pumping chamber (ventricle). This valve has two leaflets that allow blood to flow from the lungs to the heart. The most common problems affecting the mitral valve are the inability of the valve to completely open (**stenosis**) or close (**insufficiency**).

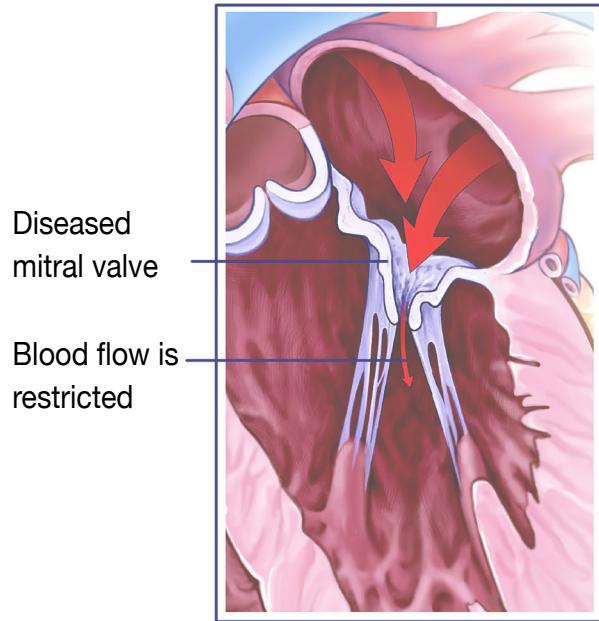


A. Normal Blood Flow
(through open mitral valve)

Injury to your mitral valve leaflets or chordae (small muscles that support the valve) can be caused by a heart attack, infection or illnesses such as rheumatic or scarlet fever. When blood flows backward through the mitral valve (**regurgitation**), it is pushed into the lungs, greatly increasing the workload of the heart often causing shortness of breath.

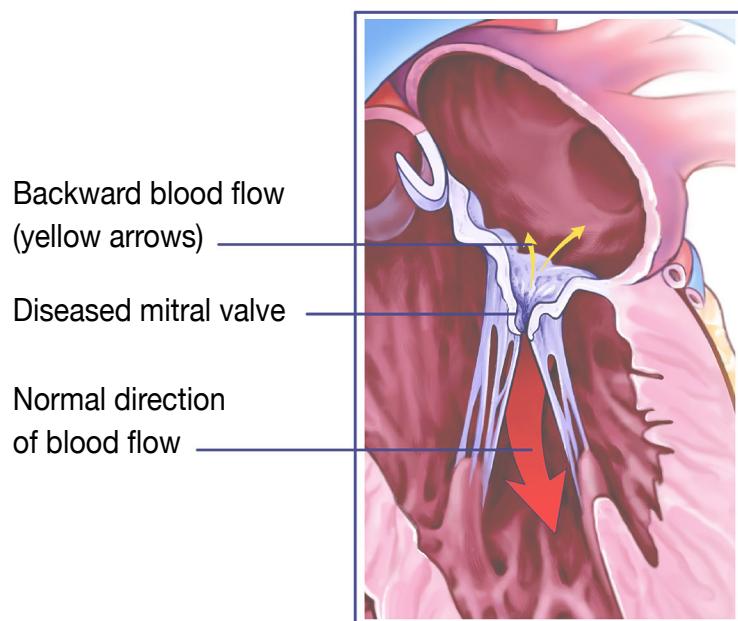
B. Mitral Valve Stenosis

When mitral valve leaflets do not open properly blood flow can be restricted.



C. Mitral Valve Insufficiency

When mitral valve leaflets do not close properly blood may flow backwards (regurgitate).



Mitral Valve Surgery

Your surgeon will decide whether your mitral valve should be repaired or replaced. A repair consists of reconstruction of the leaflets and/or the chordae. A reinforcing ring may be placed around the edge of the valve to help maintain proper size and shape while correcting the flow of blood. If the mitral valve cannot be repaired, the surgeon will replace your valve with an artificial one made from either synthetic mechanical or bioprosthetic tissue (see page 22).

Choosing between a mechanical or bioprosthetic (tissue) valve is a personal decision and should be given careful consideration. Conversation with your cardiologist and surgeon will be helpful in determining valve choice. Occasionally, medical or anatomic issues may not enable patient choice, and could require placement of a specific valve type.

Your cardiac surgeon will discuss these options with you, and together you'll decide which procedure is best for you.

Pulmonary Valve Disease

The pulmonary valve is located between the heart's lower-right chamber (right ventricle) and the pulmonary artery. This valve opens to allow blood to be pumped from the heart to the lungs (through the pulmonary artery) where the blood will receive oxygen.

Disorders of the pulmonary valve are much less common than problems with the heart's other valves. The two most common forms of pulmonary valve disease are regurgitation (also known as insufficiency or incompetence) and stenosis.

Pulmonary valve regurgitation occurs when the valve is leaky and allows blood to flow backward into the right ventricle. Pulmonary regurgitation is most often caused by pulmonary hypertension (high blood pressure in the lungs) or a congenital heart defect. Other causes of pulmonary regurgitation are endocarditis (infection), pulmonary artery dilation (enlargement of the artery that runs from the heart to the lungs) and rheumatic fever (infection).

Pulmonary valve stenosis is a narrowing of the pulmonary valve opening. Pulmonary stenosis restricts blood flow from the heart's lower-right chamber into the lungs. It is most commonly the result of a congenital heart defect. Later in life, pulmonary stenosis can develop as a result of rheumatic fever (infection), endocarditis (infection) or carcinoid tumors.

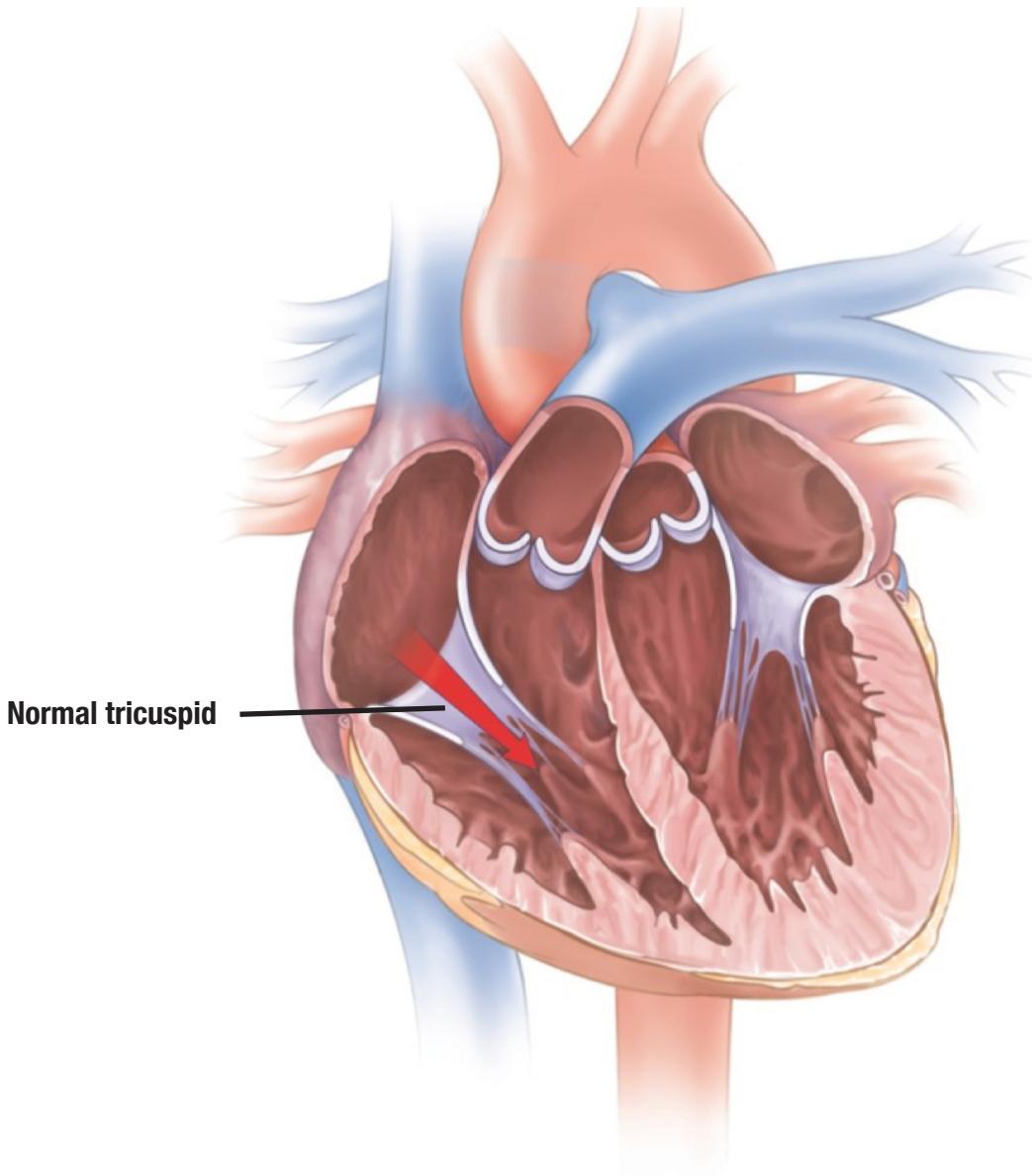
Pulmonary Valve Surgery

Surgical replacement of the pulmonary valve is the standard treatment for pulmonary valve disease. Your surgeon will replace the damaged valve with a tissue (bioprosthetic) or mechanical valve (see page 22).

Choosing between a mechanical or bioprosthetic (tissue) valve is a personal decision and requires careful consideration. We encourage you to speak with both your cardiologist and surgeon to help you decide which type of valve is right for you. Occasionally a patient's medical condition or anatomy may not allow for patient choice. In this situation, your surgeon will determine the valve type that is safest for you.

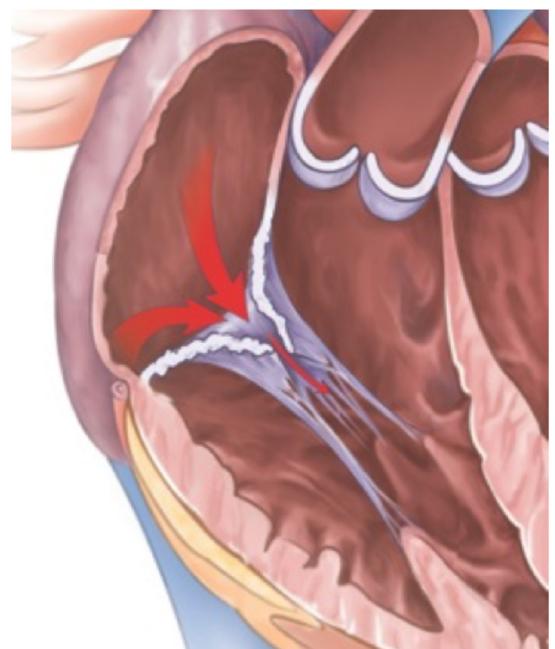
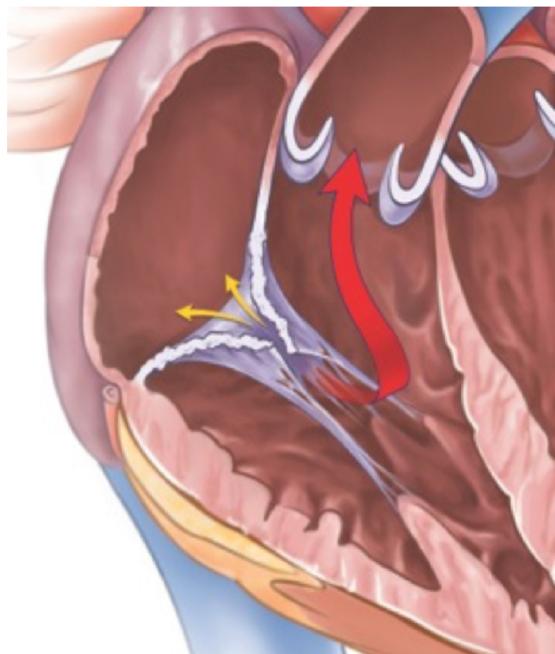
Tricuspid Valve Disease

The tricuspid valve is located on the right side of the heart, between the right side filling chamber (atrium) and the pumping chamber (ventricle). This valve has three leaflets and its function is to prevent blood from leaking back into the right atrium. The two most common forms of tricuspid valve disease are regurgitation (also known as insufficiency) and stenosis.



Tricuspid regurgitation – the valve is leaking because the leaflets do not close properly. Instead of blood being pushed to the lungs, some blood leaks backward into the major veins of the body. The most common cause of tricuspid regurgitation is enlargement of the right ventricle due to high pressures in the lungs (pulmonary hypertension) or due to problems with the valves on the left side of the heart (mitral and/or aortic valves). As the right ventricle enlarges, the leaflets of the tricuspid valve are pulled apart and some blood leaks back into the right atrium. Other causes of tricuspid regurgitation are endocarditis (infection), congenital defects such as Ebstein's anomaly, and carcinoid tumors.

Tricuspid stenosis – the valve is unable to open properly because the leaflets are stiff and do not open wide enough. Over time the right atrium becomes enlarged from trying to push the blood through an opening that is too small. Rheumatic fever is the most common cause of tricuspid stenosis.



Tricuspid Valve Surgery

Your surgeon will discuss with you whether your tricuspid valve should be repaired or replaced. Tricuspid valve repair consists of repairing the leaflets so that the valve opens and closes correctly and putting a reinforcing ring around the edge of the valve to help it maintain the proper size and shape. Tricuspid valve repair is often done in combination with other valve surgery (mitral and/or aortic). If the tricuspid valve cannot be repaired, your surgeon will replace the valve with an artificial tissue valve or, less often, a mechanical valve (see page 22).

Choosing between a mechanical or bioprosthetic (tissue) valve is a personal decision and requires careful consideration. We encourage you to speak with both your cardiologist and surgeon to help you decide which type of valve is right for you. Occasionally a patient's medical condition or anatomy may not allow for patient choice. In this situation, your surgeon will determine the valve type that is safest for you.

The decision as to whether your tricuspid valve will be repaired or replaced is dependent on many factors. Your cardiac surgeon will discuss these options with you, and together you'll decide which procedure is best for you.

Aortic Valve Disease

The aortic valve is one of the main valves on the left side of your heart. The aortic valve is located between the left ventricle and the aorta. Normally, the aortic valve has three leaflets that regulate blood flow by opening widely and closing securely, allowing blood to flow from the heart to the body and preventing blood from flowing backwards into the heart.

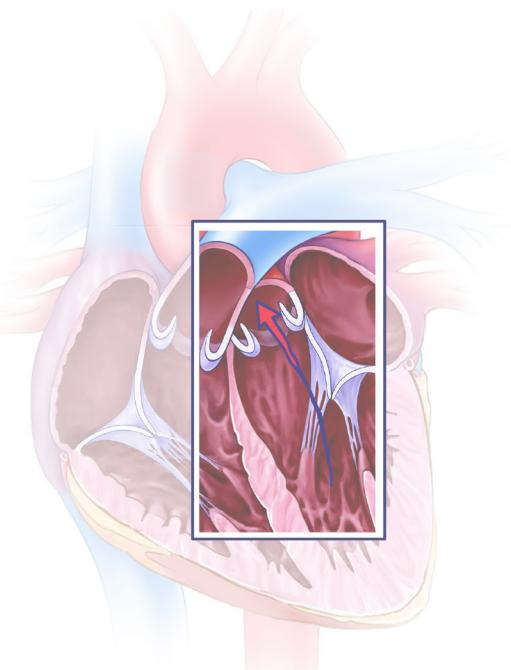
In bicuspid aortic valve disease, the aortic valve has only two leaflets. The actual cause of bicuspid aortic valve disease is unclear. We do know the two-leaflet valve develops during the early weeks of pregnancy, and the defect is present at birth (congenital). About 2% of the population has bicuspid aortic valve disease, and it is twice as common in males as in females.

Aortic valve disease occurs when the aortic valve doesn't work properly. There are two main types of aortic valve disease:

Aortic Valve Stenosis occurs when the aortic valve opening is narrowed. This narrowing prevents the valve from opening fully, which obstructs blood flow from your heart into your aorta and the rest of your body.

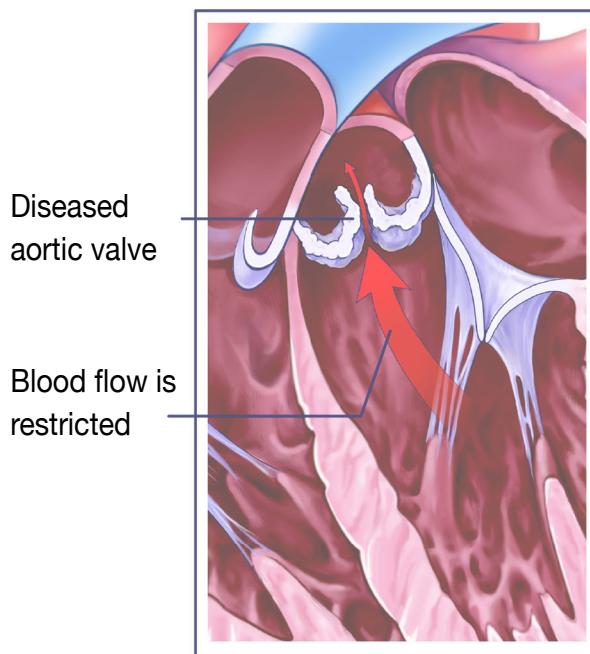
Aortic Valve Insufficiency occurs when the aortic valve does not completely close, causing blood to flow backward from the aorta into the heart (also known as "regurgitation").

A. Normal Blood Flow
(through open aortic valve)



B. Aortic Valve Stenosis

The restricted opening of the aortic valve makes it hard to pump blood from the heart



C. Aortic Valve Insufficiency

When the aortic valve does not close properly, blood may flow backwards (regurgitate) into the left ventricle.

Normal direction of blood flow
Diseased aortic valve
Backward blood flow (yellow arrows)
Left ventricle



Aortic Valve Surgery

Depending on the nature of your aortic valve disease, your surgeon will consider whether your valve can be repaired or must be replaced. While the aortic valve is usually replaced, repair may be an option in certain cases. Sometimes, aortic valves that are leaking (regurgitant) can be repaired. Your cardiac surgeon will discuss these options with you, and together you'll decide which procedure is best for you.

If your valve requires replacement, the two most common replacement valves are bioprosthetic (tissue) and mechanical valves (see page 22).

Types of Valve Replacements

Bioprosthetic (tissue) valves are sterilized for human use and do not require long term blood thinners such as warfarin. Stroke and bleeding problems rarely occur with this type of valve. However, the longevity of these valves (10 – 15 years) may be less than that of mechanical valves.

Mechanical valves, which last the longest, are synthetic and made of plastic, cloth and metal. The moving parts are coated to help prevent the formation of a blood clot on the valve. The blood thinner, warfarin (Coumadin®) must also be taken to prevent blood clots. Stroke or bleeding problems may occur with Coumadin®, so strict follow up with a physician is needed to monitor blood-thinning medication.

Choosing between a mechanical or bioprosthetic (tissue) valve is a personal decision and requires careful consideration. We encourage you to speak with both your cardiologist and surgeon to help you decide which type of valve is right for you. Occasionally a patient's medical condition or anatomy may not allow for patient choice. In this situation, your surgeon will determine the valve type that is safest for you.

Types of Replacement Heart Valves



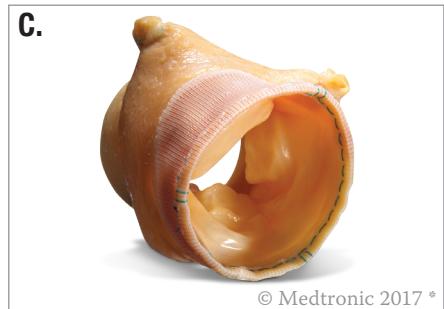
A. Annuloplasty ring

A ring used to repair (reconstruct/rebuild) the ring of your heart valve.



B. Stented valve

A bioprosthetic heart valve.



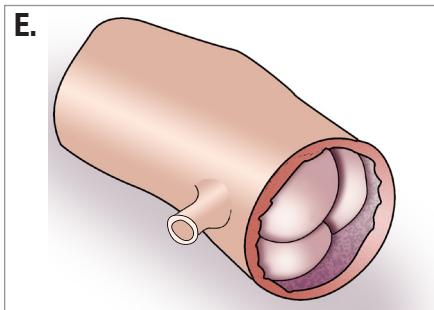
C. Stentless valve

A bioprosthetic heart valve without a sewing ring and stent.



D. Mechanical valve

A valve made from man-made materials.



E. Homograft

A valve taken from a human cadaver.

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Transcatheter Aortic Valve Replacement (TAVR)

TAVR Procedure

The Transcatheter Aortic Valve Replacement (TAVR) is a minimally invasive procedure that is done to replace the aortic valve without open heart surgery. Its use is limited to specific conditions and your doctor will advise you if this is an option for you.

What is Involved in a TAVR Procedure?

Unlike surgical aortic valve replacement, which involves surgically opening the chest to replace a patient's aortic valve, the minimally invasive TAVR can be done through very small incisions.

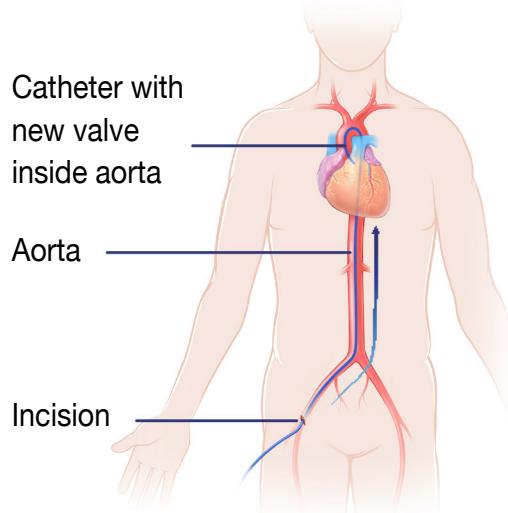
The TAVR procedure uses a catheter to insert the new valve. This can be performed in a few ways, depending on the surgeon's recommendation. These include:

- **Transfemoral approach:** The surgeon enters via a needle puncture through a large artery in the groin (femoral artery).
- **Transapical approach:** The surgeon makes a small incision in the chest between the ribs and enters through a large artery in the chest or through the tip of the left ventricle (apex).
- **Transaortic approach:** The surgeon makes a small incision in the upper chest. The valve is delivered by a catheter through the ascending aorta.

Note: Staff will provide more TAVR information and education to patients evaluated for this procedure.

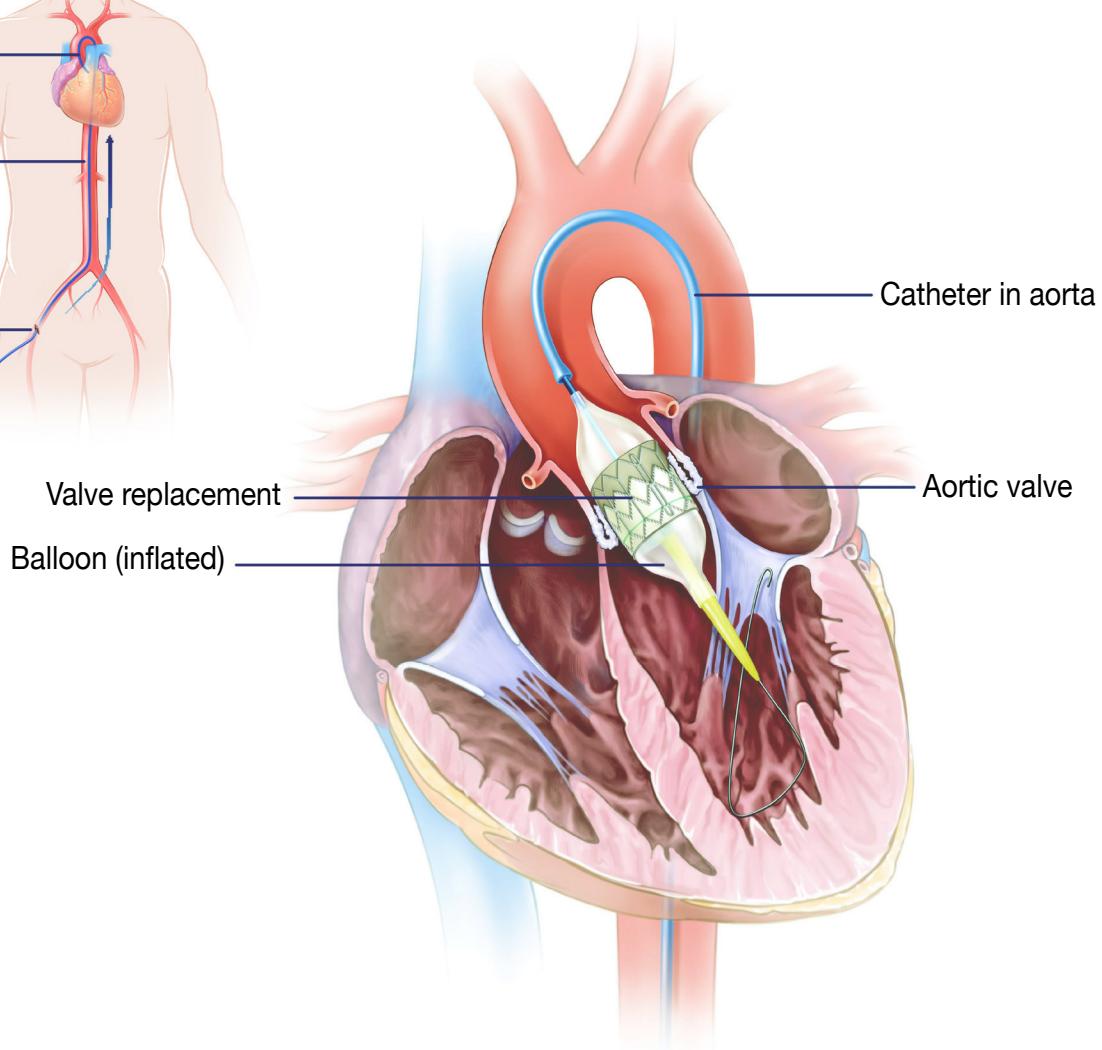
A. Transfemoral Catheter Placement

A catheter with a replacement valve is placed into an artery through a small incision in the groin. The valve is then guided up through the aorta to the heart.



B. Valve Deployment

Once the catheter is in place, the new valve is inserted within the diseased aortic valve.

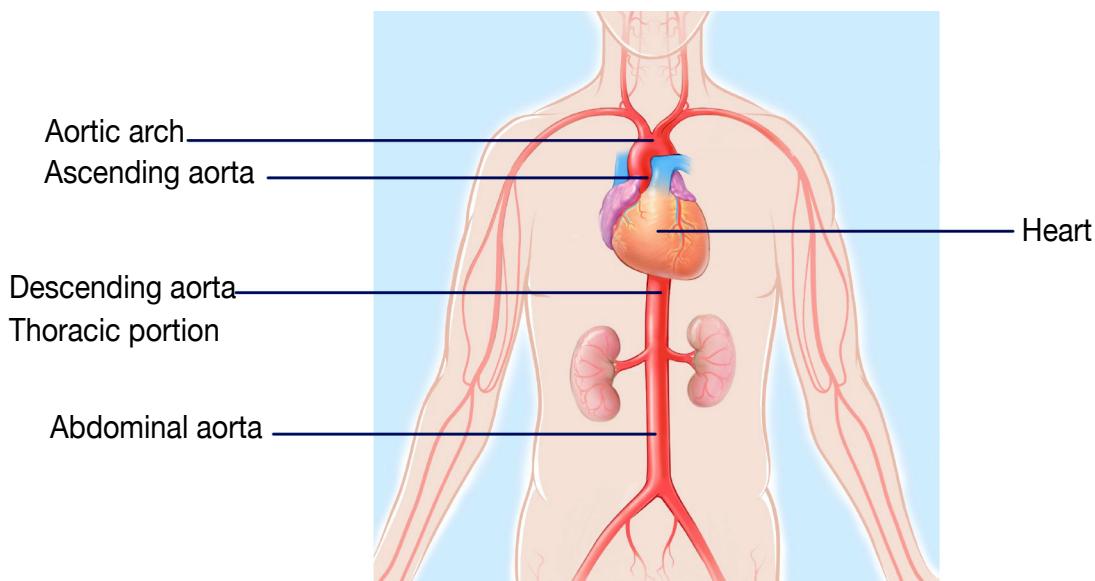


Aortic Aneurysm

The aorta is the largest artery in the body. All of the arteries that carry blood to the body branch off from the aorta. These branches carry blood to the head, neck, arms, legs and vital organs such as the kidneys, liver and brain.

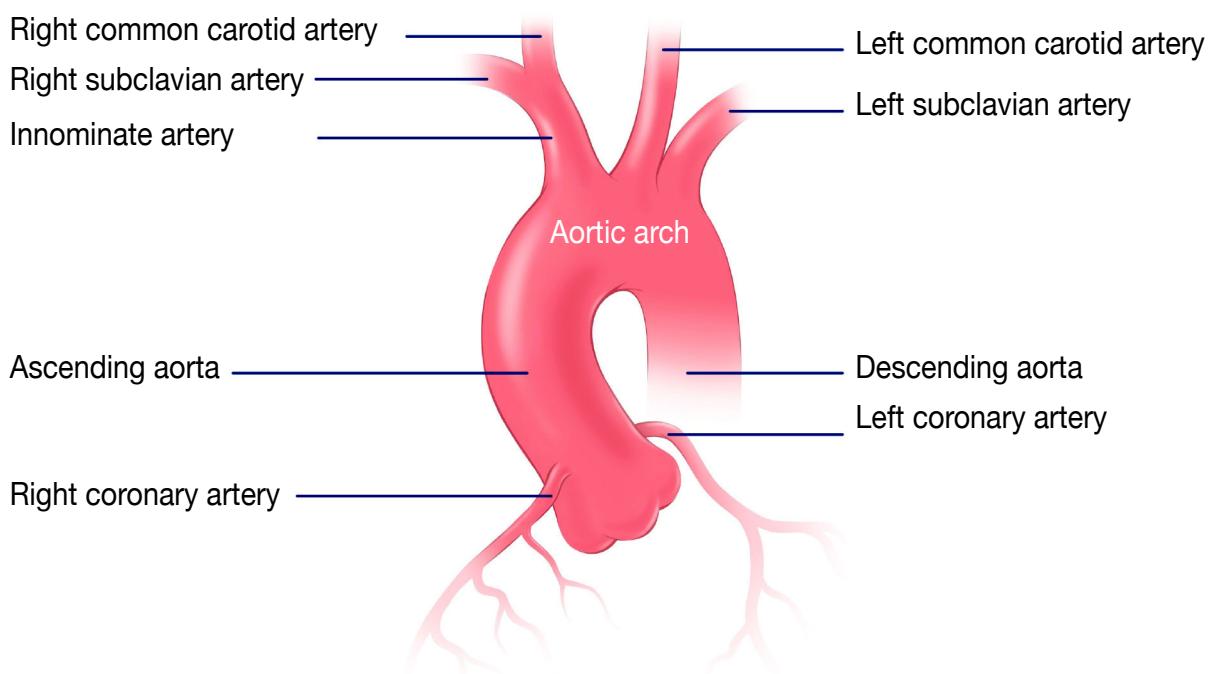
Normal Aortic Anatomy

A. Location of the Aorta



B. Branches of the Aortic Arch

The inset shows major blood vessels branching off the aortic arch.



An **aneurysm** is a weakening or ballooning of the wall of an artery. In an aortic aneurysm, the weakened area can leak or tear open, resulting in death. Aneurysm complications include rupture with severe bleeding, infection, and clot formation with emboli (clots that have broken free and entered the bloodstream). Tearing and separating of the layers of the aorta (**dissection**) can block the blood supply to major organs causing damage to vital organs such as the brain, kidney, liver and coronary arteries.

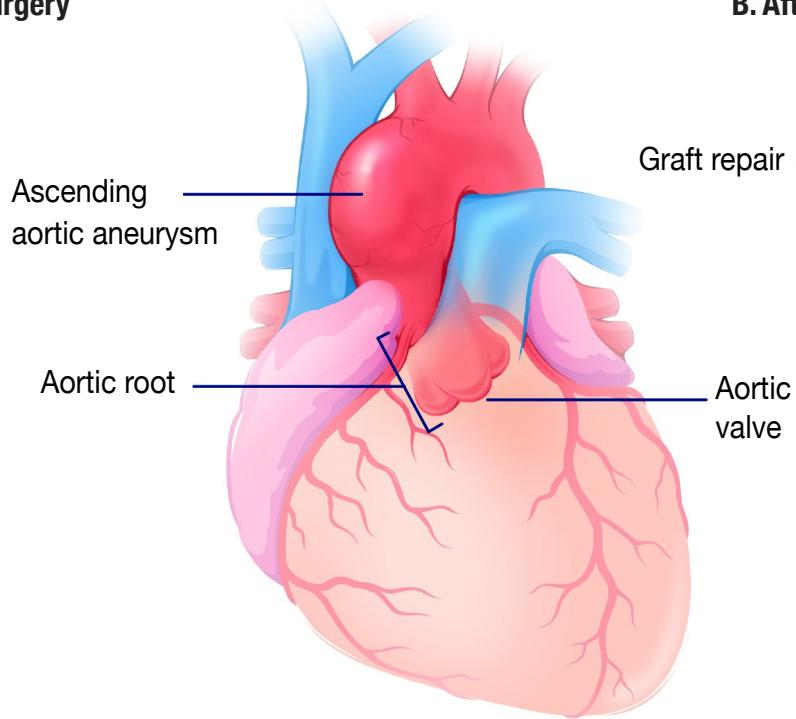
Open Repair

An operation is needed to replace the damaged part of the aorta. A piece of synthetic material (Dacron®, Teflon® or Gortex®) or, in some cases, a piece of cryopreserved (freeze-dried) aorta from a human donor can be used for repairs.

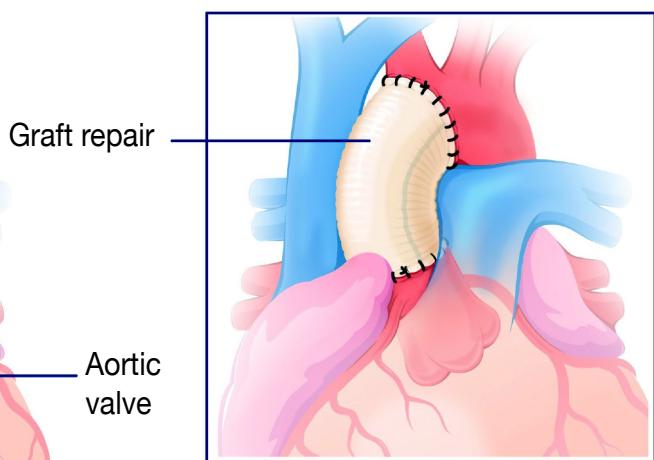
For patients with dissection or aneurysm of the ascending aorta extending into the aortic arch, hypothermic circulatory arrest may be used. This surgical technique involves cooling the body to temperatures between 18-24° C (64-75° F) and stopping blood circulation. Blood is pumped to the brain through various techniques to protect the brain. Once the aortic repair is finished, circulation is restored.

Ascending Aortic Aneurysm Repair

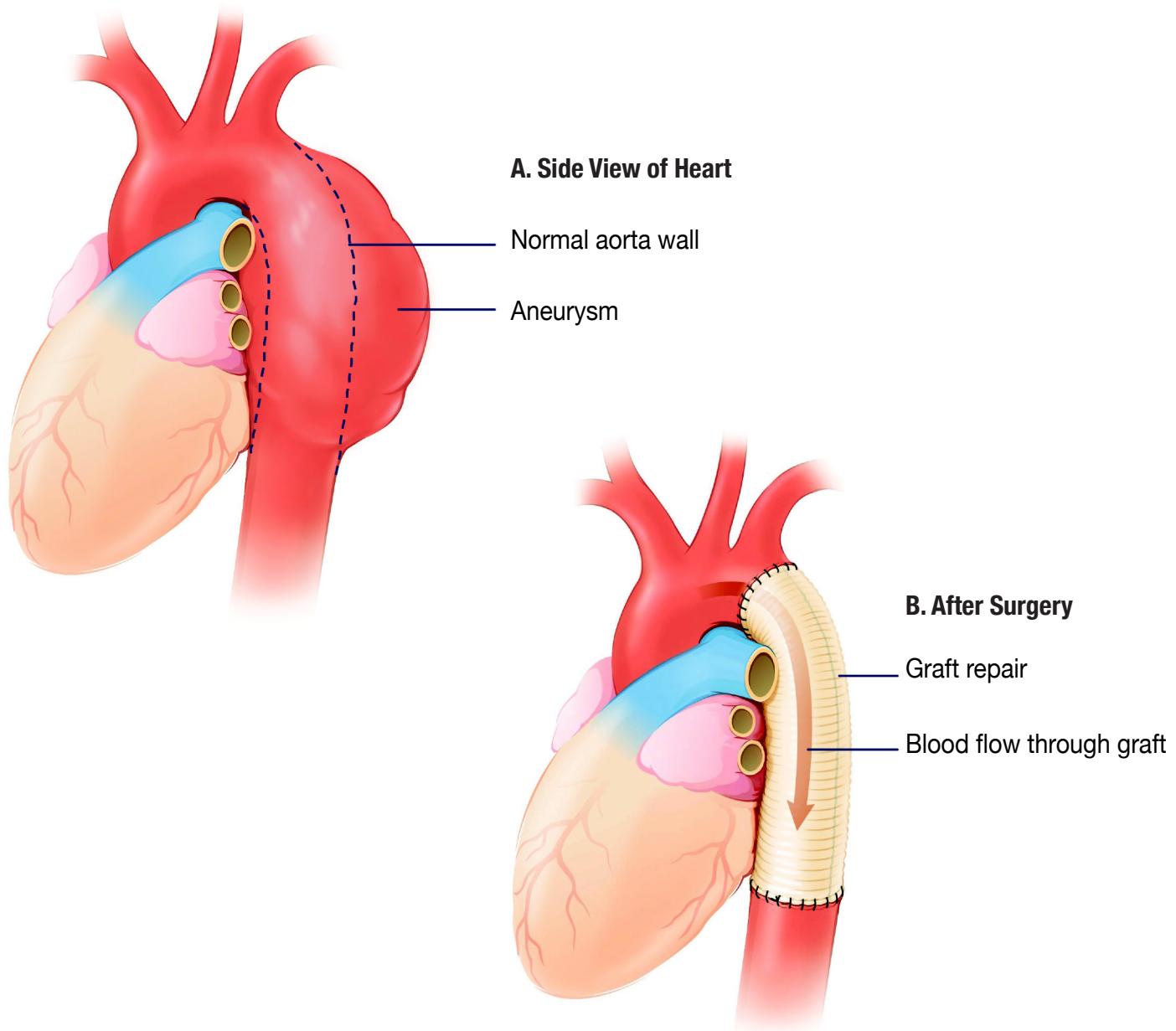
A. Before Surgery



B. After Surgery



Descending Thoracic Aortic Aneurysm Repair



Endovascular-Endograft Aortic Aneurysm Repair

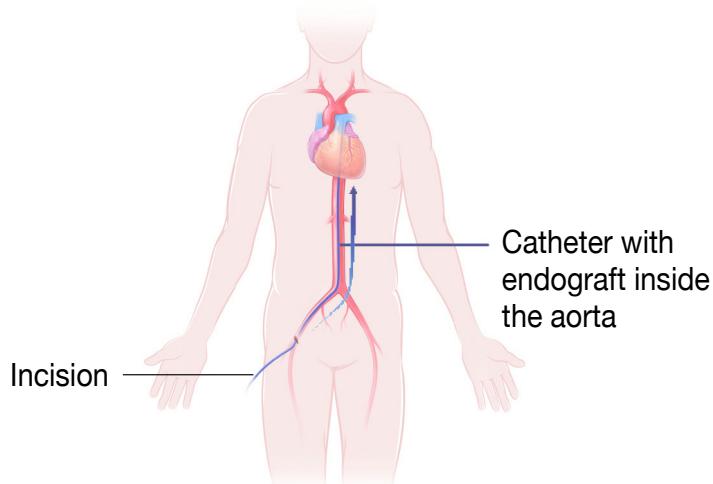
For some patients, having traditional open surgery to repair a damaged aorta may not be the best option. In these cases, your surgeon may suggest a different procedure called a “**stent graft**” or “**endograft placement**” to treat your aortic aneurysm more safely. An **endograft** is a tube of strong synthetic material that is placed inside your aorta to strengthen and seal off the weak area, making a clear path for blood flow. Although this procedure is less invasive than traditional surgery, not all aortic aneurysms can be repaired this way.

Factors that help your surgeon determine the best treatment options for you include the size and location of your aneurysm, and the overall state of your health.

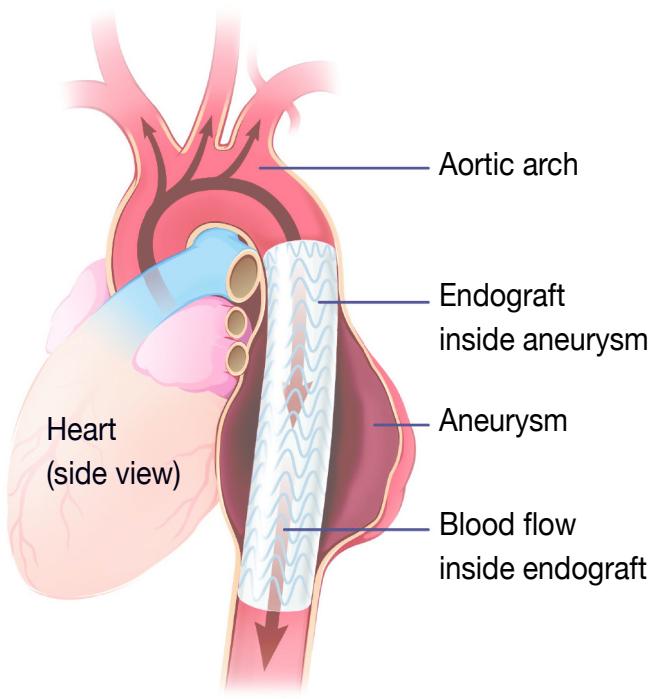
Endograft Repair of Aortic Aneurysm

A. Catheter Placement

A catheter is placed into an artery through a small incision in the groin. The endograft is then guided up through the artery to the location of the aneurysm



B. Aorta with Endograft



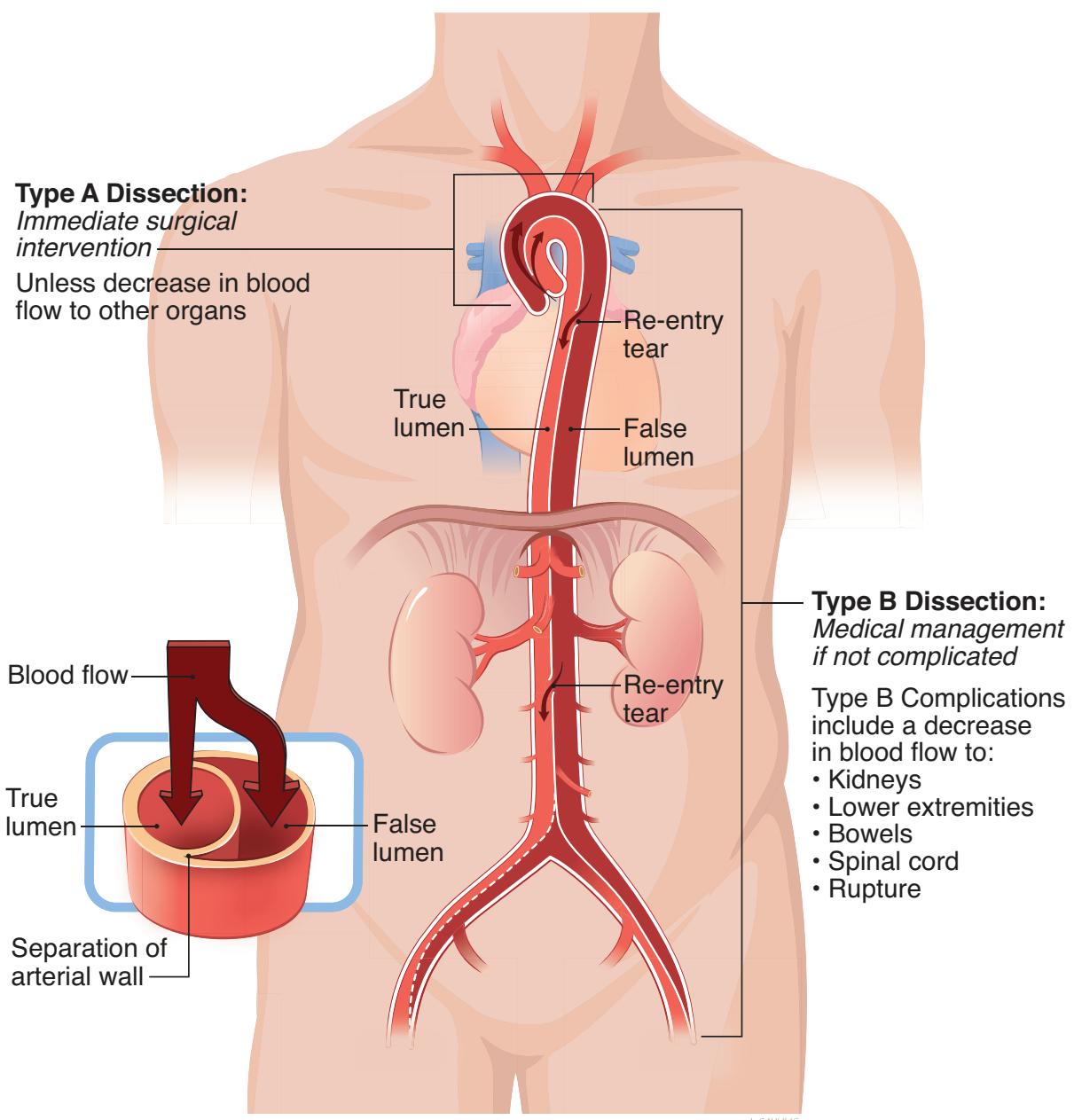
Aortic Dissection

What is an aortic dissection?

The aorta is the main blood vessel that carries blood out of your heart to supply the rest of your body. It comes out of the heart and curves around to the back and down into your abdomen. The wall of the aorta has 3 layers:

- The Intima or inner layer
- The Media or middle layer
- The Adventitia or outer layer

Figure 1
Types of Aortic Dissections



An aortic dissection happens when a tear in the inner layer of your aorta allows blood to leak into the middle layer. This creates two passages for blood: a true lumen, which is the normal passageway of blood, and a false lumen, the newly created passageway. A dissected aorta is shown in Figure 1.

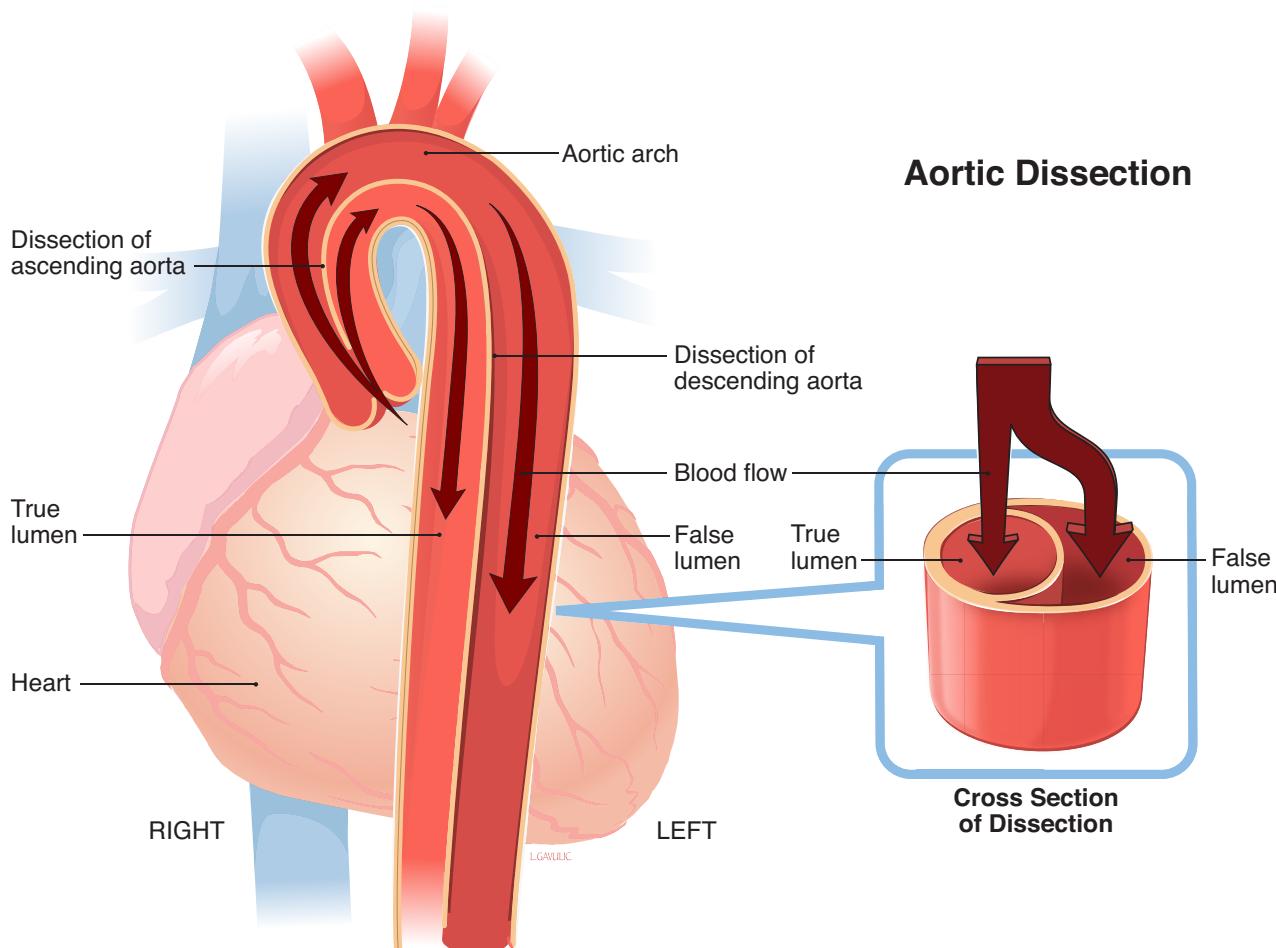
The two major types of aortic dissection, Type A and Type B, are defined by the location of the tear.

Type A dissection—The tear begins in the upper aorta (ascending aorta) and progresses throughout the vessel, often extending as far as the arteries in the leg.

Type B dissection—The tear is located in the arch and/or the lower aorta (descending aorta), but may extend into the abdomen.

What causes an aortic dissection?

An injury or weakness can cause this tear. Sometimes the exact cause of the tear is not known.



Risk factors for aortic dissection include:

- Uncontrolled high blood pressure.
- Atherosclerosis (deposits of plaque on inner walls of arteries).
- Blunt injury to your chest.
- History of an aneurysm.
- Born with a problem affecting your aorta or aortic valve (bicuspid aortic valve).
- Having a condition that causes inflammation of your blood vessels such as giant cell arteritis.
- Smoking.
- A Family history of aortic aneurysms or aortic dissection
- Connective Tissue Disorders:
 - Marfan Syndrome
 - Ehlers-Danlos Syndrome

How is an aortic dissection treated?

Treatment may include surgery or medications, depending on the area of the aorta involved.

Type A Aortic Dissections typically require emergent surgery to repair or replace the injured section of the aorta.

Type B Aortic Dissections are most often initially treated with aggressive control of your blood pressure. Your doctor will monitor your dissection with a CT scan or MRI to watch for growth over time. Your doctor will discuss surgical options with you should it become necessary.

Other Heart Procedures

Atrial Fibrillation Correction Surgery (Maze or Cox-Maze)

Atrial fibrillation is the most common irregular heart rhythm. This rhythm starts at the top chambers of the heart (atria) and instead of traveling through the heart in an orderly fashion, many impulses are sent causing an irregular heart beat.

The Maze procedure can be done by itself or along with other open heart operations. During the Maze operation, incisions or lesions are created in the top chamber or chambers of the heart to interrupt the conduction of abnormal impulses. This creates a “maze” which makes only one path for the impulse to travel.

It can take up to 6 months for a patient to resume a normal heart rhythm after this operation. You may be on medication to help keep your heart beat regular. Your doctor will also prescribe a ‘blood thinner’ to prevent blood clots.

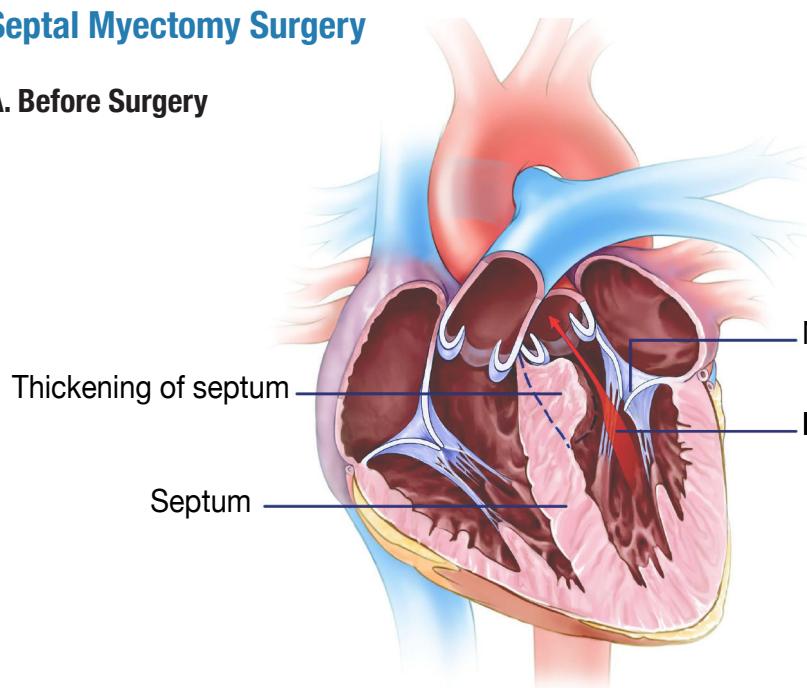
Septal Myectomy

In Hypertrophic Obstructive Cardiomyopathy, the heart muscle thickens abnormally (hypertrophy), usually in the ventricular septum (between the left and right ventricles).

This thickening interferes with the normal function of the heart by obstructing the outflow of blood from the left pumping chamber (left ventricle) to the rest of the body. It also reduces the ability of the mitral valve to close properly. If needed, surgical treatment options are available, including a septal myectomy, which removes the muscle thickening. A septal myectomy is an open-heart procedure in which your surgeon removes part of the thickened, overgrown septum between the ventricles. Removing part of this overgrown muscle improves blood flow and reduces mitral regurgitation. While this is open-heart surgery, the benefits are immediate, improving symptoms in 90% of patients.

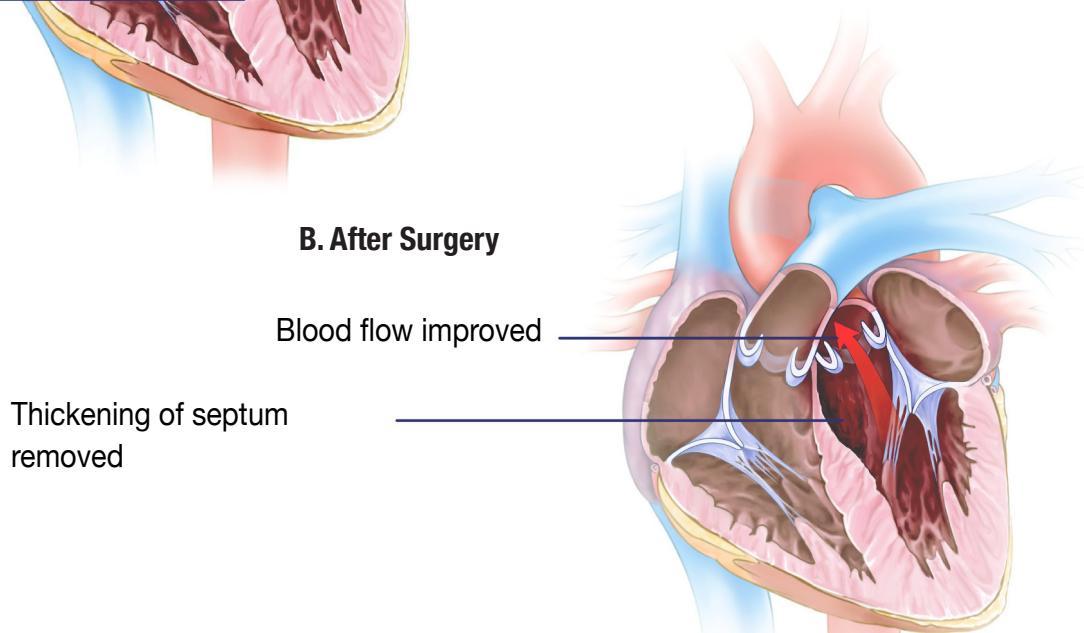
Septal Myectomy Surgery

A. Before Surgery



The illustration shows a cross-section of a heart with thickened septum and how removal of thickened area improves blood flow.

B. After Surgery

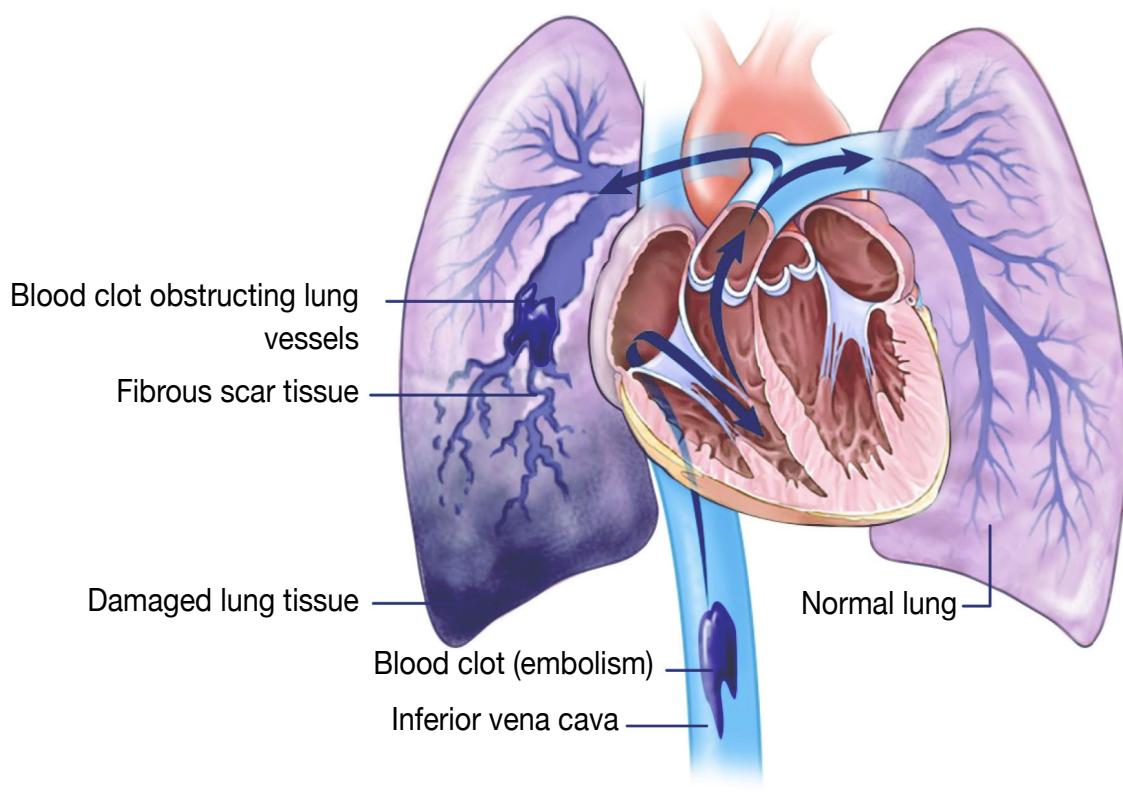


Pulmonary Thromboendarterectomy

In Chronic Thromboembolic Pulmonary Hypertension, old blood clots obstruct the lungs. Patients may have breathlessness, fatigue, chest pain, and need home oxygen. Pulmonary thromboendarterectomy, a surgical treatment for this condition, requires open-heart surgery with support by the heart-lung bypass machine and an incision of the middle of your chest (breastbone or sternum). This surgery also requires cooling- deep hypothermic circulatory arrest with the body cooled to temperatures between 18-24° C (64- 75° F). While your blood circulation is intermittently stopped, obstructions are carefully removed from each of the branches of the lung and then blood flow is restored with the heart-lung machine. The entire procedure takes 6-8 hours to perform.

Most patients feel a significant improvement in their symptoms. Not only can they be more active, usually they can stop using home oxygen. Patients still need blood-thinning medications for life to prevent future clots.

Pulmonary Artery Thromboendarterectomy



Blood Transfusion and Surgery

Our team is dedicated to reducing the need for blood transfusions. However, you may need a blood transfusion during or after your surgery.

Before your heart surgery, you and your family may have questions about the use of blood transfusions. At the Frankel CVC, our team is dedicated to reducing the need for blood transfusions. However, you may need a blood transfusion during or after your surgery. Because of this, it is important to make sure you follow your surgeon's instructions regarding medications to stop before your surgery.

Your surgeon will discuss your risk and explain techniques that can minimize the need for blood transfusion. One helpful technique is eating a well-balanced, iron rich diet a few weeks/months before your surgery. This may boost your red blood count, reducing the need for a blood transfusion.

Prior to surgery, some patients ask about donating their own blood for their surgery. It is not recommended for the following reasons:

- It can potentially put you in an anemic (low blood count) state before surgery – increasing your risk for requiring a blood transfusion.
- It's expensive – the cost varies and most health insurance companies do not cover it.

Notes