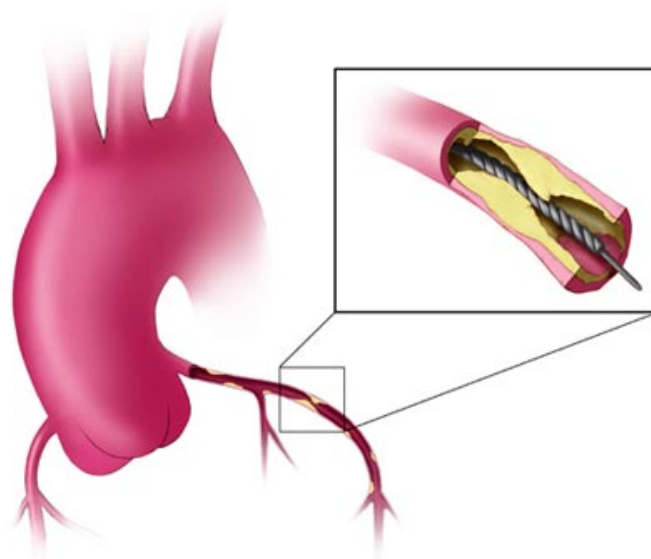




Angioplasty and Vascular Stenting

Angioplasty uses a balloon-tipped catheter to open a blocked blood vessel and improve blood flow. The doctor uses medical imaging to guide the catheter to the blockage. The balloon is inflated to open the vessel and improve blood flow. It may be done with or without a metal mesh tube called a stent. The stent is left inside the blood vessel to help keep it open. Angioplasty is minimally invasive and usually does not require general anesthesia.

Your doctor will tell you how to prepare and if you should take your regular medication. Most angioplasty procedures do not require an overnight stay. However, your doctor will discuss this with you. You may be told not to eat or drink anything several hours before the procedure. Tell your doctor if there's a chance you are pregnant. List any recent illnesses, medical conditions, allergies and medications you're taking. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.



What are Angioplasty and Vascular Stenting?

Angioplasty, with or without vascular stenting, is a minimally invasive procedure. It is used to improve blood flow when a vein or artery is too narrow or blocked. It is usually done in an interventional radiology suite rather than operating room.

In angioplasty, x-ray fluoroscopy or other imaging is used to guide a balloon-tipped catheter (a long, thin plastic tube) into an artery or vein to where it is narrowed or blocked. The balloon is inflated to open the vessel, then deflated and removed.

A wire mesh tube called a stent may be permanently placed in the newly opened vessel to help keep it open. There are different types of stents, including wire mesh. Stents covered in fabric-type material are called stent grafts.

What are some common uses of the procedures?

Angioplasty with or without stenting is commonly used to treat conditions that narrow or block blood vessels and interrupt blood flow. These conditions include:

- coronary artery disease, a narrowing of the arteries that carry blood and oxygen to the heart muscle.
- narrowing of the large arteries due to hardening of the arteries or atherosclerosis. This is a build-up of cholesterol and other fatty deposits, called plaques, on the artery walls.
- peripheral artery disease (PAD), a narrowing of the arteries in the legs or arms.
- carotid artery stenosis, a narrowing of the neck arteries supplying blood to the brain.
- narrowing or blockage in the veins in the chest, abdomen, pelvis, arms and legs.
- renal vascular hypertension, high blood pressure caused by a narrowing of the kidney arteries. Angioplasty and stenting may be used to help improve kidney function.
- narrowing in dialysis fistula or grafts. Fistulas and grafts are artificial blood vessel connections doctors use in kidney dialysis. Angioplasty is generally used when these connections become narrow or blocked. Stenting may also be needed in some cases. See the [Dialysis and Fistula/Graft Declotting and Interventions page](#) for more information.

How should I prepare?

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications, general anesthesia or to contrast materials containing iodine (sometimes referred to as "dye" or "x-ray dye"). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners for a specified period of time before your procedure.

Also inform your doctor about recent illnesses or other medical conditions.

Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the [Safety page](#) for more information about pregnancy and x-rays.

In most cases, you should take your usual medications, especially blood pressure medications. These may be taken with sips of water on the morning of your procedure.

Other than medications, you may be instructed to not eat or drink anything for several hours before your procedure.

You may need to stay overnight at the hospital.

What does the equipment look like?

In these procedures, x-ray imaging equipment, a balloon catheter, sheath, stent and guide wire are used.

The equipment typically used for this examination consists of a radiographic table, one or two x-ray tubes and a television-like monitor that is located in the examining room. Fluoroscopy, which converts x-rays into video images, is used to watch and guide progress of the procedure. The video is produced by the x-ray machine and a detector that is suspended over a table on which the patient lies.

A guide wire is a thin wire used to guide the placement of the diagnostic catheter, angioplasty balloon catheter and the vascular stent. A sheath is a vascular tube placed into the access artery, such as the femoral artery in the groin.

A balloon catheter is a long, thin plastic tube with a tiny balloon at its tip. A stent is a small, wire mesh tube. Balloons and stents come in different sizes to match the size of the diseased artery.

Stents are specially designed mesh, metal tubes that are inserted into the body in a collapsed state on a catheter. They are expanded inside the vessel to prop the walls open. In some cases, a stent may have a synthetic fabric covering.

Other equipment that may be used during the procedure includes an intravenous line (IV), ultrasound machine and devices that monitor your heart beat and blood pressure.

How does the procedure work?

Using image guidance, the balloon catheter is inserted through the skin into an artery. It is advanced to the site of the blockage where the balloon is inflated to open the vessel. It is deflated once the vessel is open. In this process, the balloon expands the artery wall, increasing blood flow through the artery. A stent may be placed at the treatment site to hold the artery open.

How is the procedure performed?

Angioplasty and stenting should only be performed by a physician specially trained in these minimally invasive techniques.

You will be positioned on the examining table.

You may be connected to monitors that track your heart rate, blood pressure and pulse during the procedure.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedative medication can be given intravenously. Moderate sedation may be used. As an alternative, you may receive general anesthesia.

The area of your body where the catheter is to be inserted will be sterilized and covered with a surgical drape.

Your physician will numb the area with a local anesthetic.

A very small skin incision is made at the site.

A sheath is first inserted into the blood vessel.

Guided by live x-rays, the doctor inserts the catheter through the skin and guides it through the blood vessels until it reaches the blockage. Once the catheter is in place, contrast material will be injected into the artery to perform an angiogram. An angiogram is an x-ray picture of the inside of the blood vessels. This will help identify where the blockage is.

Using x-ray guidance, the doctor crosses the narrowing or blockage with a guide wire. This allows the balloon-tipped catheter to pass over the wire. Once across the blockage, the balloon will be inflated for a short time. Sometimes the balloon needs to be inflated more than once. Or, other blood vessels need to be treated during the same procedure.

More x-rays are taken to see how much blood flow has improved. The balloon catheter, wire, and sheath will be removed.

Many times, stents need to be permanently placed inside the blood vessel to help keep it open. Some stents can open on their own. Others need a balloon to open. Balloon stents are typically expanded against the blood vessel wall. When the balloon is deflated and removed, the stent remains. The permanent stent acts like a scaffold for the artery. Drug-coated stents have been approved for use by the U.S. Food and Drug Administration (FDA). The drug is slowly released to help keep the blood vessel from narrowing again. This is a condition called restenosis

Drug-coated balloons may also be used for patients with PAD or dialysis fistulas. When the balloon is inflated, the drug enters the wall of the blood vessel. It stays there for some time even after the balloon has been removed.

At the end of the procedure, the catheter will be removed and pressure will be applied to stop any bleeding. The opening in the skin is then covered with a dressing. No sutures are needed.

You may need to lie in bed with your legs straight for several hours. When an arm or wrist was used for access, you may have activity restrictions to follow.

When the procedure is done, you will be transferred to a recovery room or to a hospital room.

Your intravenous line will be removed.

Talk to your doctor about how long the procedure will take.

This procedure is often done on an outpatient basis. However, some patients may require admission following the procedure. Please consult with your physician as to whether or not you will be admitted.

What will I experience during and after the procedure?

Devices to monitor your heart rate and blood pressure will be attached to your body.

You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected. Most of the sensation is at the skin incision site, which is

numbed using local anesthetic. You may feel pressure when the catheter is inserted into the vein or artery.

If the procedure is done with sedation, the intravenous (IV) sedative will make you feel relaxed, sleepy and comfortable for the procedure. You may or may not remain awake, depending on how deeply you are sedated.

You may feel slight pressure when the catheter is inserted, but no serious discomfort.

As the contrast material passes through your body, you may experience a warm feeling which quickly subsides.

It is common for patients to feel some mild discomfort when the balloon is inflated. This is because the artery is being stretched. Discomfort is more noticeable when veins are opened or dilated. This discomfort should decrease as the balloon is deflated.

The site where the catheter was inserted may be bruised and sore. This is temporary.

Your blood pressure and heart rate will be monitored for several hours. Your catheter site will be checked for bleeding or swelling, too. Bleeding at the site where the catheter entered the vein when veins are treated is less likely. Therefore, you may be discharged earlier if the procedure is performed for vein disease such as dialysis fistula. Your doctor may prescribe medicine to relax your arteries, protect against artery spasm and prevent blood clots

If contrast material was used, your body will get rid of it during urination. Your urine will not be discolored. You may be asked to drink extra fluids to help flush out the contrast material.

At home, you should rest and drink plenty of fluids. Avoid lifting heavy objects and strenuous exercise for at least 24 hours. You should avoid smoking permanently. Smoking is a major cause of atherosclerosis. If bleeding begins where the catheter was inserted, you should lie down. Apply pressure to the site and call your doctor. Tell your doctor right away if your leg changes color or if you feel pain or warm where the catheter was inserted.

After the procedure, you may be prescribed aspirin or blood thinners. These drugs can prevent blood clots from forming. Your doctor will monitor the effect of some medicines with frequent blood tests.

Magnetic resonance imaging (MRI) can probably be done right after stenting. However, make sure you tell the MRI department that you have a stent. Today's stents are considered safe for MRI, but you may need several weeks after stenting for MRI to be safe. Metal detectors do not affect a stent. Your doctor may give you a card with stent information. Keep it in your wallet. Show this to the MRI department to help determine safety.

Who interprets the results and how do I get them?

The interventional radiologist can tell you whether the procedure was a success by comparing your before and after angiograms.

Your interventional radiologist may recommend a follow-up visit after your procedure or treatment is complete.

The visit may include a physical check-up, imaging procedure(s) and blood or other lab tests. During your follow-up visit, you may discuss with your doctor any changes or side effects you have experienced since your procedure or treatment.

What are the benefits vs. risks?

Benefits

- Compared to bypass surgery, balloon angioplasty and stent placement are much less invasive and relatively low-risk, low-cost procedures.
- These procedures are performed using local anesthesia. Because general anesthetic is not required in most patients, there is no extended stay in the hospital.
- No surgical incision is needed—only a small nick in the skin that does not have to be stitched.
- You will be able to return to your normal activities shortly afterwards.

Risks

- Major complications after angioplasty are rare. However, inserting the catheter may injure the artery. There is also a very small risk of blood clots or tearing the artery.
- When angioplasty is done alone, blockages can recur. Most of these arteries can be opened again successfully. This can also occur when a stent is placed in the artery at the time of the angioplasty.
- Heavy bleeding from the catheter insertion site may require special medication or a blood transfusion.
- There is a risk of stroke when angioplasty and/or stenting are performed on the carotid artery.
- A rare complication associated with angioplasty is abrupt vessel closure. This blockage in the treated area typically occurs within 24 hours of the procedure. If it happens, medication to dissolve clots followed by angioplasty or stenting may be used. In some cases, emergency bypass surgery may be needed.
- Other rare complications include heart attack and sudden cardiac death.
- Any procedure where the skin is penetrated carries a risk of infection.
- There is a very slight risk of an allergic reaction if contrast material is injected.
- Any procedure that involves placement of a catheter inside a blood vessel carries certain risks. These risks include damage to the blood vessel, bruising or bleeding at the puncture site, and infection. However precaution is taken to mitigate these risks.
- Contrast material may cause a decrease in kidney function, particularly if it already exists. Your doctor will check your kidney function before the procedure in order to lower this risk. See the Contrast Materials page for more information.

What are the limitations of Angioplasty and Vascular Stenting?

Angioplasty with vascular stenting is just one way to treat narrowed or blocked arteries. Medication and exercise are often the first step.

Angioplasty does not reverse or cure the underlying disease of atherosclerosis. It is very important for patients to make lifestyle changes, including eating a healthy diet that is low in saturated fat, exercising and not smoking. Patients with diabetes, high blood pressure and/or high cholesterol need to follow the treatment plan prescribed by their doctors.

Angioplasty may have to be repeated if the same artery becomes blocked again, a condition called restenosis. If a stent is placed, the chance of restenosis is reduced but it can still occur.

Only about half of patients with renal vascular hypertension caused by atherosclerosis have their blood pressure successfully treated or improved by angioplasty/stenting. By the time it is done, many of these patients have disease in small arteries within the kidney that does not respond to angioplasty.

Angioplasty and vascular stenting for peripheral artery disease (PAD) affecting arteries in the pelvis and legs is less successful when multiple leg vessels are narrowed or when small vessels have to be opened. Patients with PAD can benefit from quitting smoking, proper diet, regular exercise and controlling blood cholesterol.

Carotid artery angioplasty and stenting is approved by the FDA. A dedicated filter device may be used during stenting to help keep blood clots and other plaques from passing into the brain. This helps lower the risk of stroke. Surgical repair has been done for many years. It has been proven effective and safe when done by skilled surgeons. Talk to your doctor about the risks and benefits of carotid artery stenting.

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