MAYO CLINIC

PATIENT EDUCATION

About Your Heart-Catheter Procedures

BARBARA WOODWARD LIPS
PATIENT EDUCATION CENTER

Table of Contents

Introduction

A heart catheterization (also called **cardiac catheterization** or heart cath) is done to diagnose and/or to treat problems in your heart. If you have symptoms of a heart problem, your health care provider will do several tests, such as blood tests, a chest X-ray, electrocardiogram (ECG), etc. Depending on the results, a heart catheterization may be needed.

Catheterization refers to any procedure in which a **catheter** (a long, thin, flexible tube) is inserted into your body. During a heart catheterization, a catheter is inserted into a blood vessel and guided to your heart (figure 1). Catheters can be inserted in your neck, arm or leg in an artery or a vein. The right or left side may be used. Often, more than one insertion site is used.

Catheterization can be used both to diagnose and treat heart problems.

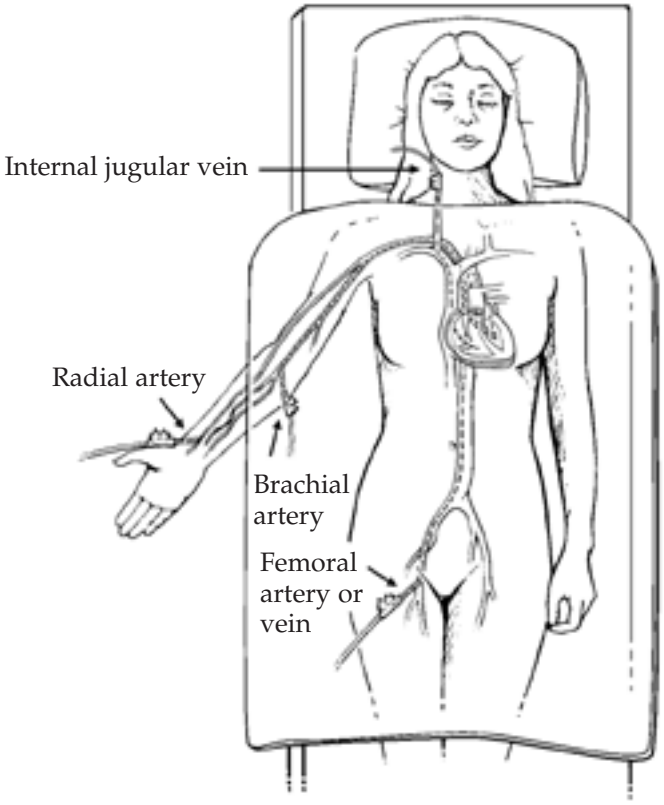

Figure 1. Insertion sites for a cardiac catheterization. Dotted lines show possible path of catheters to heart.

Angiography refers to the injection of contrast material (dye) through a catheter. The contrast material allows your physician to better see the arteries and heart chambers on the X-ray image.

Coronary angiography is a procedure that visualizes the blood vessels of the heart.

However, catheters can be used to do more than inject dye for X-rays.

Catheters can:
- Measure oxygen in the blood
- Measure pressure and blood flow in your blood vessels and heart
- Take samples of your heart tissue (**biopsy**)
- Treat some heart problems

This material is meant to tell you about:
- Different kinds of tests and treatments that may be done during a heart catheterization
- What happens before a heart-catheter procedure
- What happens after a heart-catheter procedure

Words in bold are defined in a word list beginning on page 32. If you have questions about this information or about your procedure, ask a member of your health care team.

Before Your Catheter Procedure

Preparations for all heart-catheter procedures are similar — no matter which procedure you have. If you have any questions about preparation instructions before your heart-catheter procedure, talk with a member of your health care team.

Usually, you go to the hospital the morning of your heart-catheter procedure. To prepare for the procedure, regardless of which procedure you have:

- Do not eat or drink anything after midnight.
- On the morning of your procedure, bring with you a current list of all medications (prescription, over-the-counter medications, herbal supplements, vitamins, etc.) that you take, including dosages and how often you take them. **If you take nitroglycerin,** bring your medication with you.
- **If you have diabetes,** contact your primary health care provider before your test, procedure or surgery for instructions on taking insulin and other diabetes medications.
- **If you take a blood thinner** (anticoagulant) medication (such as Warfarin, Coumadin™) or antiplatelet medication, (such as Plavix™, Aggrenox™) or aspirin, ask the health care provider managing these medications if you should stop taking them before the procedure and for how long.

You may rinse your mouth or brush your teeth as long as you do not swallow anything.

If you are already in the hospital, members of your health care team will guide you through the preparations for your heart-catheter procedure.

Before your procedure, the nurses will ask you questions about your health and check your vital signs (temperature, pulse, blood pressure) and check the pulses in your arms and legs.

You will be asked to empty your bladder and change into a gown. The nurses may ask you to remove contact lenses, jewelry or hairpins. An **intravenous** (IV) line may be started in a **vein** in your arm. The IV is used to give you a sedative to help you relax, as well as other medications you may need during the procedure. If you need help while you are waiting for the procedure to begin, ask any member of the staff.

You will be taken on a cart to the procedure area where a nurse or technician will make sure you are ready. A small amount of hair may be shaved off at the place(s) where the electrodes are placed and the catheter inserted.

When the physician is ready to start the procedure, you are moved into a room similar to an operating room with X-ray equipment. When you arrive in the room, you will be moved from the cart onto the X-ray table. Because the table may be tilted during the procedure, safety straps are fastened across your chest and legs. These straps allow you to roll to the left and right.

A technician will put electrodes on you to monitor your heart during the procedure. A blood pressure cuff will be placed on your arm. Though you may be sedated to help you relax, you will be awake during the procedure and able to talk with the staff if you wish.

Personnel in the procedure room wear sterile gloves, gowns, caps and masks to make the area as germ-free as possible. You may notice that staff also wear lead gowns to protect them from daily exposure to X-rays.

The area around the **artery** or vein (catheter insertion site) will be washed with a disinfectant soap and you will be covered with a sterile sheet. Once this sheet is in place, it is important that you keep your hands under it at all times.

The physician will inject an **anesthetic** to numb the area into which the catheter will be inserted. A short plastic tube called a sheath is then put into your artery or vein. You may be given medication to help prevent your blood from clotting, to relax your heart arteries, and to make you comfortable.

A long, thin, flexible plastic tube called a catheter is inserted through the sheath and placed in the correct position in the heart. Once the catheter is in place, the physician can do the necessary test and/or treatment.

Diagnostic Procedures

Coronary angiogram

Coronary angiograms are X-ray pictures of **coronary arteries**, the blood vessels that carry nutrients and oxygen to your heart muscle (figure 2). To see the arteries, a dye is injected into them. Physicians study the angiogram to learn about blockages in the arteries.

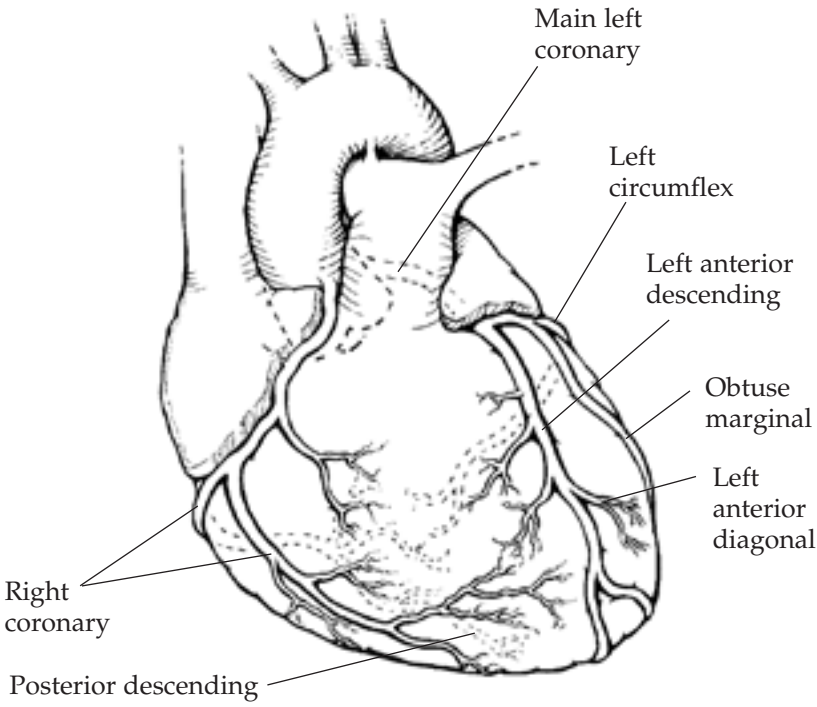

Figure 2. Coronary arteries carry blood to the heart muscle. Dotted lines show arteries on the back of the heart.

After your physician places the catheter in your heart, dye is injected through the catheter to make the heart chambers and blood vessels easier to see. There may be parts of the procedure during which the dye makes you feel warm. A special X-ray camera will photograph your heart and coronary arteries.

During this procedure, at certain times you may be asked to do certain activities, such as taking deep breaths, holding your breath or placing your arms in different positions.

Do not be alarmed if you feel your heart skipping beats; this is normal during angiograms. Your heart rate and blood pressure are continuously monitored to tell your physician about your heart's status.

Tell your physician if you feel heart pain or discomfort.

Depending on what the physician learns during the coronary angiogram, you may also have other studies or one of the catheter-based treatments mentioned below.

Right heart catheterization

Right heart catheterization usually is done to measure the pressures and blood flow through the right heart chambers and the lungs (figure 3). Catheters with tiny built-in sensors make it possible to measure how much blood your heart is pumping. Usually the catheter is inserted through a neck vein or a vein in the groin for a right heart catheterization.

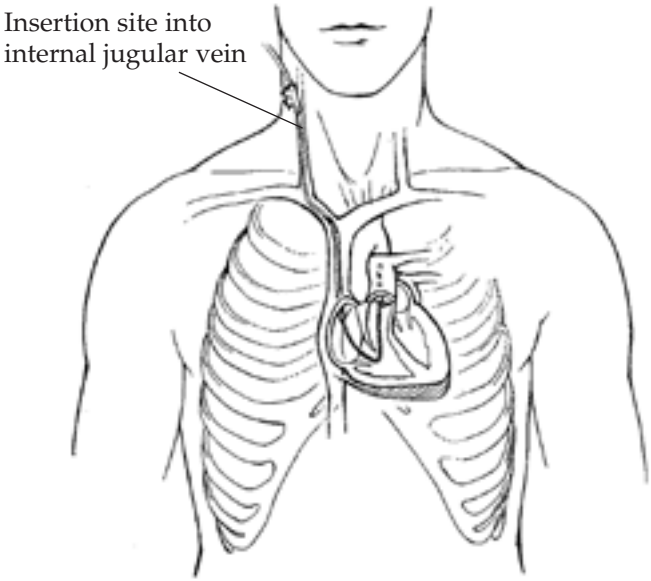

Figure 3. Right heart catheterization

Heart biopsy

Catheters also may be used to get small amounts of heart muscle to look at under a microscope. This procedure is called a biopsy. To get the tissue sample, a special catheter with small jaws on the tip usually is inserted into the right ventricle through a vein (figure 4). These jaws can be opened and closed by the physician doing the procedure. You will not feel the catheter as it removes the tissue sample.

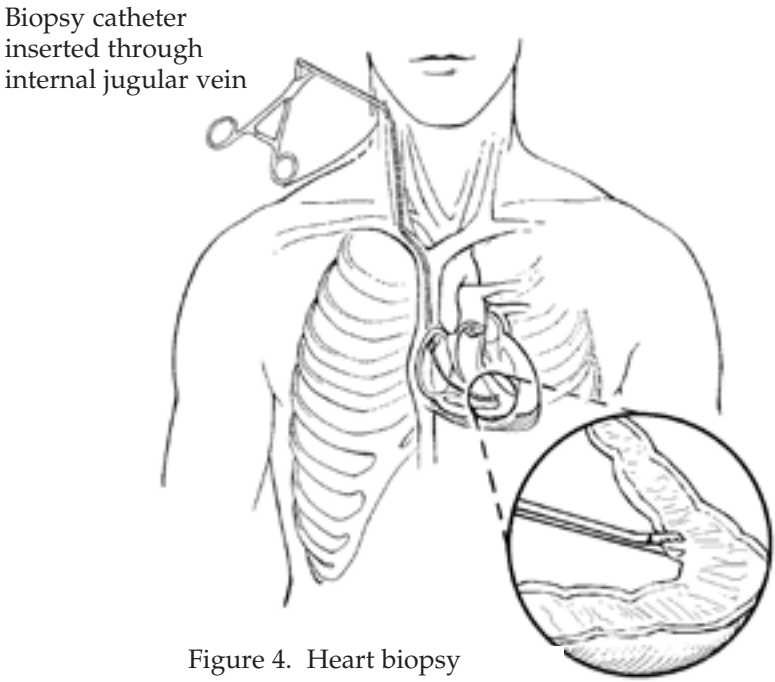

Figure 4. Heart biopsy

Catheter-Based Treatments

Balloon angioplasty

Balloon angioplasty may be done to open a blocked artery. During the procedure, the cardiologist passes a special catheter containing a small, inflatable balloon through a guide catheter. The catheter is placed at the blocked area in your artery and the balloon is inflated (figure 5).

As the balloon expands, it enlarges the inside of the artery wall. After the balloon is deflated, the physician looks at an X-ray picture of the artery to see if the artery remains blocked. Sometimes a blockage will open with one or two inflations, but several inflations may be needed. This is done during the same procedure.

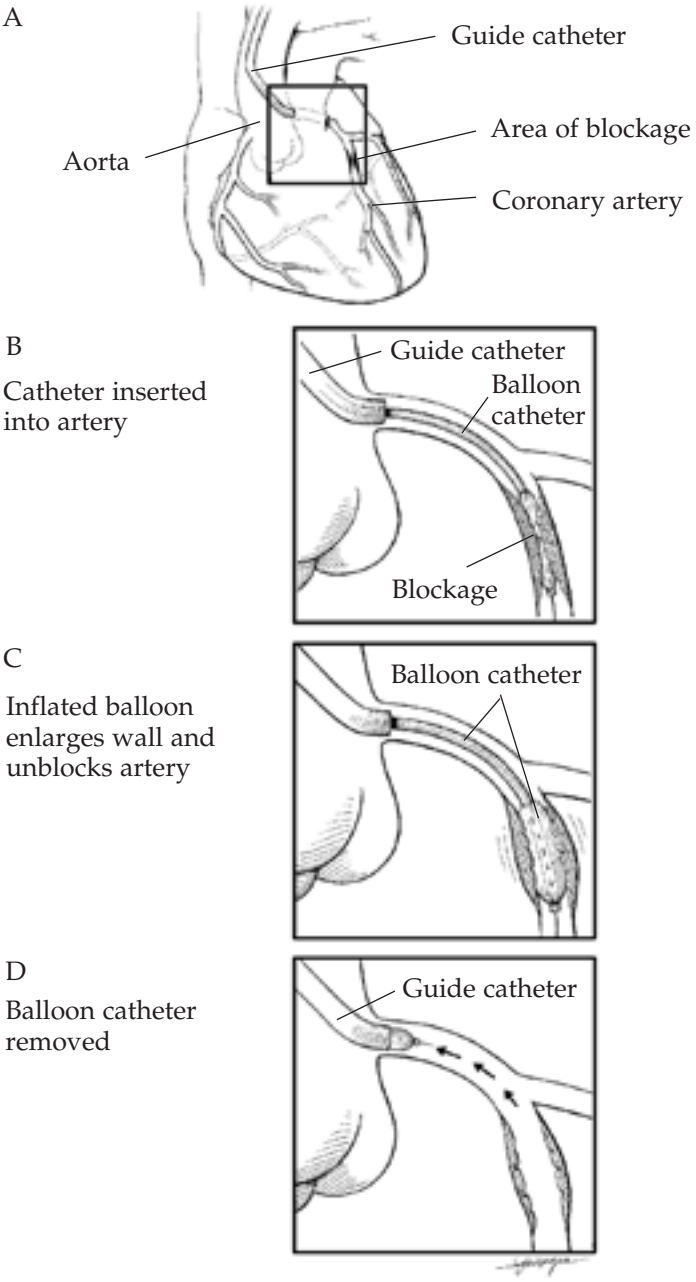

Figure 5. Balloon angioplasty

Stent

A **stent** is a metallic mesh coil that can be placed inside an artery if other procedures do not open the artery enough. One or more stents may be placed. The stent(s) is coiled around a deflated balloon and passed through the guide catheter. When the catheter arrives at the blocked area, the balloon is inflated, expanding the stent. The stent works to keep the blood vessel open (figure 6).

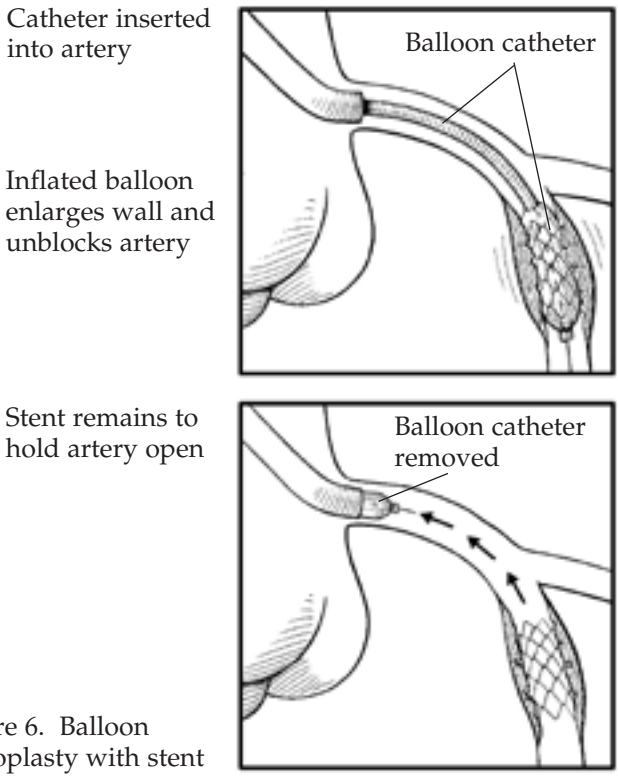

Figure 6. Balloon angioplasty with stent

The balloon is deflated and removed, leaving the stent in place. Stents are used in most catheter-related procedures because they reduce the need for repeat procedures.

Stents may be coated with a medication to prevent repeat blockage. These are called **drug-eluting stents**. Most of the stents now used are drug eluting.

Other treatments

Closing an ASD (atrial septal defect) or PFO (patent foramen ovale)

An atrial septal defect is a hole in the wall (septum) between the right and left atria. A patent foramen ovale usually is a small opening in the wall between the right and left atria that should have closed after birth but has remained open.

In some people, an ASD or PFO can be closed during heart catheterization, a nonsurgical procedure, using a special device that is designed to close an ASD or PFO.

Thrombectomy

To remove blood clots, a special catheter is threaded through the blood vessels to the area of the blockage. When it gets to the clot, different methods are used to break up the clot and remove it.

Peripheral vascular/carotid interventions
To treat blocked peripheral arteries (in the legs) or carotid arteries, balloon angioplasty with or without a stent can be done.

Other procedures can be done in the heart cath laboratory, such as **balloon valvotomy** (using a balloon to open up a blocked valve), **septal ablation** (using a catheter to decrease muscle obstruction), and others. Talk to your health care provider about your specific procedure.

Risks

Risks involved in all catheter-based procedures are similar, although some treatments may have risks specific to that procedure. Talk to your health care provider about your specific risks.

Coronary angiograms are relatively safe, with little discomfort. Your physicians and nurses can discuss all aspects of the procedure with you, including possible complications such as the following:

- **Hematoma** — A bruise around the puncture site that usually disappears in a few days or weeks.
- A **pseudoaneurysm** (swelling of a vessel at the catheter insertion site that looks like an aneurysm) may appear after a catheter-based procedure.
- **Chest pain** — Tell a member of your health care team if you have any chest pain during the procedure. You may feel a type of chest pain called angina that requires medication for relief.
- **Contrast dye reactions** — You may feel a temporary sensation of warmth or a hot flash from the dye. This hot flash is not an allergic reaction. Sometimes the dye causes allergic reactions that may be treated with medication. Tell a member of your health care team about any past allergic reactions to dyes used in X-ray procedures.

- **Artery blockage** — Rarely, a coronary artery will suddenly become blocked.
- **Need for emergency surgery**.
- **Infection** — An infection may occur at the puncture site.
- **Heart attack, stroke, death** — Risk of heart attack, stroke or death associated with a coronary angiogram is very low. While opening blocked arteries, balloon angioplasty and stenting can dislodge blood clots and cause them to travel to another part of the body, possibly causing a heart attack or stroke.

Important: Women who are pregnant or those who think they may be should tell their health care provider before having the procedure.

After Your Catheter Procedure

After your catheter-based procedure, you will go to a recovery area for observation. When your condition is stable, usually after about an hour, you will return to your room on a cart.

If you received an **anticoagulant** (medication to help prevent blood clots) during the procedure, the plastic sheath may not be removed immediately. While the sheath is in place, **it is very important that you do not move the limb in which the sheath is placed and that you do not lift your head from the pillow**. Moving the limb can result in serious bleeding complications. You have to lie flat, but for your comfort, your bed may be tilted, your back rubbed and medications and pillows may be used. Your physician determines how long the sheath must stay in place. The amount of time the sheath is left in depends in part on the procedure done.

After the sheath is removed, a member of your health care team will apply pressure to the puncture sites to prevent bleeding. The amount of time pressure is applied depends on the puncture site and on the procedure done.

After the sheath is removed, you must lie flat for approximately one to six hours to let your artery begin to heal. This is absolutely necessary to avoid bleeding. How long you lie flat depends

on the procedure done. Ask your health care provider if you have questions. During this time, you may receive medication to help your muscles relax and to keep you comfortable. You will be told when you can get up. Activity restrictions depend on whether you had a venous or arterial puncture.

Closure devices may be used to help seal the artery after a catheter procedure. The closure device is placed under your dressing. Tell your health care provider if you have had a closure device in the past and ask for information about closure devices.

When you are back in your room, your blood pressure and pulse will be checked frequently, along with the catheter insertion sites. You may eat and are encouraged to drink plenty of fluids. The amount of fluid you drink and the amount of urine emptied from your bladder may be measured. If you have an IV, it may be removed when you are able to drink fluids.

Depending on your medical condition, your physician will decide how long you should stay in the hospital. You may be discharged from the hospital the same day as your procedure, or you may be hospitalized and discharged one or more days after your procedure.

If you leave the hospital the same day as your procedure, you must stay within 30 miles of the hospital for one night. Someone should stay with you for the first 24 hours after your procedure.

If you had a catheter-based treatment, you will probably stay in the hospital overnight.

What you need to know before receiving sedation

If you receive intravenous (IV) sedation, **for the first 24 hours after being sedated** it is common to have lapses of memory, slowed reaction time and impaired judgment.

Therefore:

- Arrange for someone to accompany you to and from your appointment.
- Do not drive or operate motorized vehicles or equipment. If you will be going home after a procedure that requires sedation, make arrangements for someone to drive you home.
- You may wish to have a responsible adult stay with you for the remainder of the day.
- Rest for the remainder of the day.
- Do not return to work.
- Do not assume responsibility for small children or anyone dependent on your care.
- Do not ride a bicycle or use in-line skates.

- Avoid rough play and participation in sports.
- Do not drink alcoholic beverages.
- You may wish to avoid making important decisions or signing legal documents.

Discomfort

Normally the puncture site is slightly tender and swollen. There may be a small area of discoloration or a small knot in the area of the puncture.

Tenderness at the puncture site may persist for 24 to 48 hours. You may take a nonaspirin pain reliever containing acetaminophen such as Tylenol™ in the recommended dose as needed for discomfort.

Medications

Take all your previously prescribed medications, including aspirin, as you normally do unless your physician tells you otherwise. You may be prescribed new medications after your procedure, especially if you have a stent.

Activity restrictions

Activity restrictions depend on the procedure you had and whether you had a venous or arterial puncture.

It is common to have activity restrictions for up to three days after your procedure. For three days after your procedure, avoid strenuous activities and do not participate in sports. Do not:

- Lift or move heavy (weighing more than 10 pounds) objects.
- Do strenuous exercise (biking, weight lifting, aerobics, golfing).
- Strain.
- Climb stairs.
- Participate in sexual activity.

Ask a member of your health care team about returning to work.

Do not shower until the morning after your procedure. At that time, you may remove the bandage. Do not soak in a tub for three days. Keep the site clean and dry. Do not use powders or creams on the site.

When to call your physician

Call your physician if any of the following symptoms occur.

- Bleeding or inflammation at the puncture site
- New or expanding swelling
- Pain or discomfort at the puncture site
- Signs of infection (redness, drainage, fever)
- Change in color, temperature or sensation in the arm or leg that is the site of the puncture
- Unusual feeling of weakness or faintness

If you have active bleeding or swelling of the puncture site:

- Call **911** or your designated emergency number.
- Lie down and apply firm pressure with two or three fingers over the puncture site until help arrives.
- **Do not** try to drive yourself to the hospital.

If you have questions or concerns, call the emergency room. Tell the emergency staff the procedure you had done, the puncture site and the name of the physician who did your procedure.

Follow-up appointments

Before you leave the hospital, ask a member of your health care team about follow-up appointments.

Frequently Asked Questions

What time do I go to the hospital?
A member of your health care team will talk to you about what time to report to the hospital.

What time will my procedure be done?
The time your procedure will be done is uncertain. Several people have these procedures every day, and the length of each procedure varies. Also, emergency cases are done before nonemergency procedures. Members of your health care team may be able to give you a better idea on the day of your procedure.

Should I take my medications before my procedure?
Do not take your medications the morning of your procedure unless you have been told to do so by your physician.

- **If you have diabetes**, contact your primary health care provider before your test, procedure or surgery for instructions on taking insulin and other diabetes medications.
- **If you take a blood thinner** (anticoagulant) medication (such as Warfarin, Coumadin™) or antiplatelet medication, (such as Plavix™, Aggrenox™) or aspirin, ask the health care provider managing these medications if you should stop taking them before the procedure and for how long.

Can I drive after my procedure?
You cannot drive the day of your procedure. Arrange for someone to take you home after your procedure and stay overnight with you. If you leave the hospital the day of your procedure, you must stay within 30 miles of the hospital overnight.

When will I get my results?
The physician who ordered the test for you will discuss the results. This will be arranged before you leave the hospital.

Research

While you are at Mayo Clinic, you may be asked to participate in a research study. Researchers design studies to test the safety and effectiveness of medical treatments or to gain information about specific medical conditions. Treatments can be a drug, an implantable device (such as a stent), or a catheter-based technique. Some studies test treatments that already have been proven, comparing them to other forms of therapy to see which ones are better.

The decision whether or not to take part in a study is entirely up to you. If you are asked to participate in a study, be sure you understand the study's purpose, how long it will last, and your responsibilities. Know that you can stop at any time and that your decision — either to participate or not or to stop — in no way affects your medical care at Mayo Clinic.

If you have questions about a study in which you are asked to participate, speak with your health care provider.

Summary

You can help to ensure the success of your catheter-based procedure. Make healthy lifestyle choices, such as following a healthy, low-fat diet, exercising regularly and avoiding exposure to tobacco. Follow the recommendations of your physician regarding future checkups.

If you have questions about this information, your procedure or your condition, ask a member of your health care team on the appropriate Mayo Clinic campus.

Mayo Clinic: Scottsdale and Phoenix, Ariz.
480-301-8000

Mayo Clinic: Jacksonville, Fla.
904-953-2000

Mayo Clinic: Rochester, Minn.
507-284-2511

Word List

Anesthetic — Medication that prevents you from feeling pain. When it is injected to numb a small area, it is called "local." If it is used to put you to sleep, it is called "general."

Angina — Chest pain or discomfort caused when the heart does not get enough oxygen because there is too little blood flow in the coronary arteries.

Angiography — Method of taking X-ray pictures of the coronary arteries.

Anticoagulant — Medication that keeps blood from clotting; also called "blood thinner."

Artery — Blood vessel that carries blood from the heart to other parts of the body.

Balloon valvotomy — Procedure in which a balloon is used to open a blocked valve.

Biopsy — Method of taking a small sample of tissue for examination.

Cardiac — Pertaining to the heart.

Cardiac catheterization — Test done by introducing a small catheter into a blood vessel and guiding it into the heart. The test measures the blood flow and can determine the position and size of structural defects.

Catheter — Thin, flexible tube that can be guided into a body organ (for example, a cardiac catheter is guided into the chambers of the heart).

Coronary — Related to arteries that supply blood to the heart.

Coronary arteries — Arteries supplying blood to the heart muscle itself.

Drug-eluting stent — Coil of material coated with medication that is meant to prevent repeat blockage.

Hematoma — Blood-filled swelling beneath the skin or in an organ.

Intravenous (IV) — Into a vein.

Pseudoaneurysm — Swelling of a vessel, giving the appearance of an aneurysm.

Septal ablation — Destruction of excess muscle to decrease obstruction.

Stent — Coil of material that can be placed inside an artery to help keep it open.

Vein — Blood vessel that carries blood to the heart.

BARBARA WOODWARD LIPS PATIENT EDUCATION CENTER

Mrs. Lips, a resident of San Antonio, Texas, was a loyal patient of Mayo Clinic for more than 40 years. She was a self-made business leader who significantly expanded her family's activities in oil, gas and ranching, even as she assembled a museum-quality collection of antiques and fine art. She was best known by Mayo staff for her patient advocacy and support.

Upon her death in 1995, Mrs. Lips paid the ultimate compliment by leaving her entire estate to Mayo Clinic. Mrs. Lips had a profound appreciation for the care she received at Mayo Clinic. By naming the Barbara Woodward Lips Patient Education Center, Mayo honors her generosity, her love of learning, her belief in patient empowerment and her dedication to high-quality care.

MAYO CLINIC

200 First Street SW
Rochester, Minnesota 55905
www.mayoclinic.org

MC1311-01rev0209