HEART CATHETERIZATION

How is a catheterization performed?

The patient is brought to the catheterization laboratory and placed on a special examination table. After local anesthesia is given, a catheter is inserted into blood vessels in the groin, arm, or neck. (The catheter is inserted either through a small incision, or by means of a needle-stick. Sometimes, catheters are inserted from more than one site.) The catheter is advanced through the blood vessels to the heart.

Once in the heart, the catheter can be maneuvered to various locations within the heart, and the pressures within various chambers of the heart are measured. Blood samples can be withdrawn from different locations in order to measure the amount of oxygen in the blood (unusual variations in blood oxygen can signal a "shunt" or abnormal blood flow within the heart, often caused by congenital heart defects.) Finally, by injecting dye through the catheter while a series of rapid x-ray images is recorded, "movies" can be made of the blood flowing through the cardiac chambers, or through the blood vessels surrounding the heart-a procedure known as angiography (also called arteriography).

Once the procedure is completed, the catheter(s) are removed. Bleeding is controlled by placing pressure on the catheterization site for 30-60 minutes.

What kinds of heart disease can catheterization and angiography help to evaluate?

Cardiac catheterization and angiography can reveal vital information about overall cardiac function, about function of the individual cardiac chambers, about the cardiac values (whether they are too narrow (stenosis) of too leaky (regurgitation)), congenital heart defects, and about the location and severity of blockages in the coronary arteries (the arteries that supply blood to the heart muscle.)

What are some of the variations used with catheterization and angiography?

Cardiac catheterization is often used therapeutically, that is, to deliver treatment for various heart problems. Therapeutic catheterizations include procedures to dilate narrowed heart valves, procedures to close atrial septal defects (i.e. a hold in the wall separating the left and right atria), and of course, procedures to relieve blockages in the coronary arteries (angioplasty and stent placement).

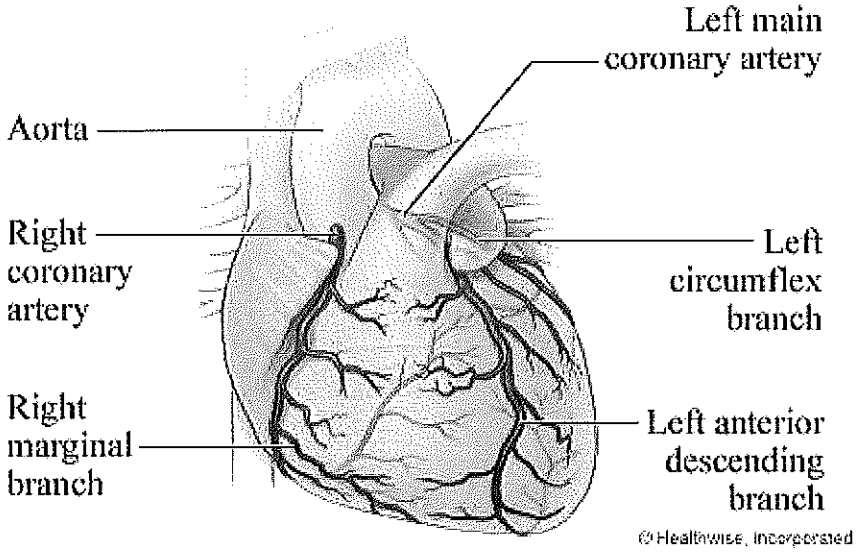
What are the risks of having a catheterization or angiography?

Cardiac catheterization and angiography are relatively safe, but because they are invasive procedures involving the heart, several complications are possible. Nobody should have a cardiac catheterization unless there is a reasonable likelihood that the information gained from the procedure will be of significant benefit.

Minor complications of cardiac catheterization include minor bleeding at the site of catheter insertion, temporary heart rhythm disturbances caused by the catheter irritating the heart muscle and temporary changes in the blood pressure.

More significant complications include perforation of the heart wall (causing a life-threatening condition called cardiac tamponade) sudden blockage of a coronary artery (leading to a heart attack), extensive bleeding, stroke, or an allergic reaction to the dye used in angiography.

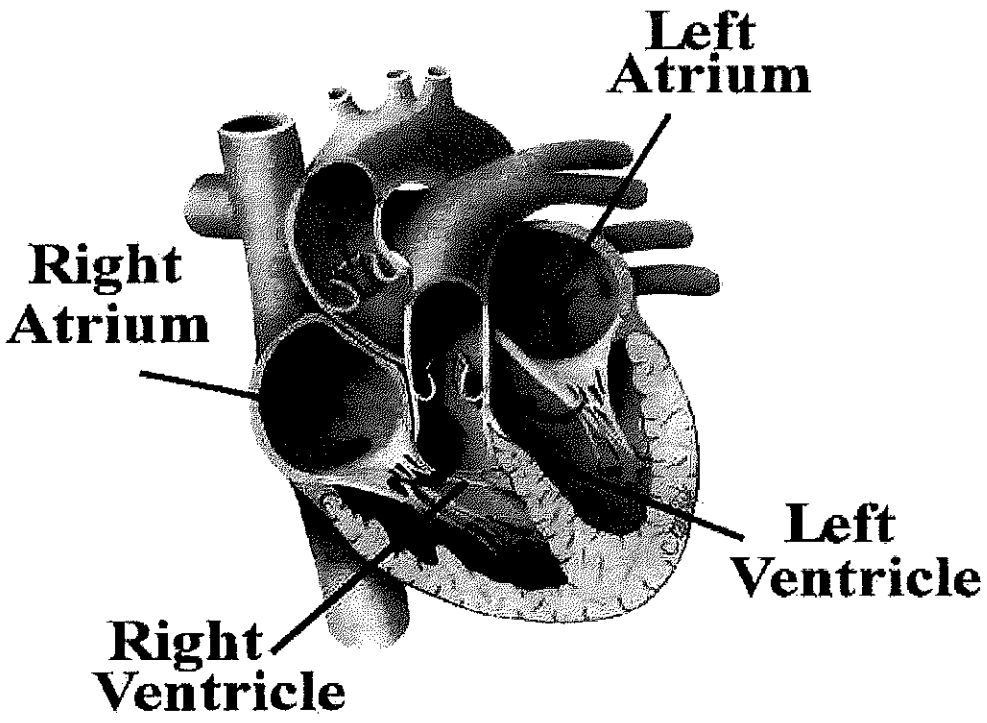
The heart and coronary arteries: Front view



Coronary arteries are blood vessels that provide oxygen-rich blood and other nutrients to the heart muscle. The coronary arteries attach to and wrap around the heart's surface. The left coronary artery branches off into smaller arteries. The most prominent ones are the:

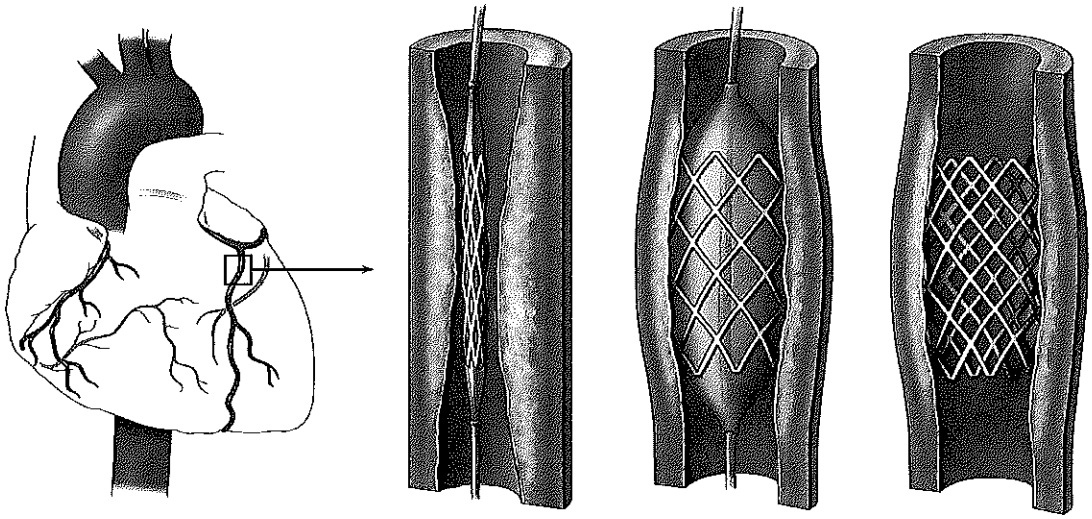
- left anterior descending artery, which supplies blood to the front of the heart.
- Left circumflex artery, which encircles the heart muscle, supplying blood to the back of the heart.

The right marginal branch usually extends from the right coronary artery and supplies blood to the lower right side of the heart.



The heart has four chambers: two atria and two ventricles.

- The right atrium receives oxygen-poor blood from the body and pumps it to the right ventricle.
- The right ventricle pumps the oxygen-poor blood to the lungs.
- The left atrium receives oxygen-rich blood from the lungs and pumps it to the left ventricle
- The left ventricle pumps the oxygen-rich blood to the body.



^ deflated balloon in artery

^ inflated balloon compresses plaque against artery wall

^ stent placement in artery

Cardiac catheterization is done using a thin, soft tube called a catheter. A doctor inserts the catheter into a blood vessel, typically in the groin area, using a special needle. The doctor the slowly guides the catheter through blood vessels toward the heart. The catheter tip is moved into various positions in the heart's chambers and vessels (coronary arteries).

What is a Cardiac Catheterization?

Cardiac Catheterization (cath) is a specialized study of the heart during which a catheter, or then hollow flexible tube, is inserted into the artery of the groin or arm. Under x-ray visualization, the tip of the catheter is guided to the heart. Pressures are measured, x-rays, and angiogram (angio) movie of the heart and blood vessels are obtained while injecting an iodinated colorless "dye" or contrast material through the catheter. Coronary angios are obtained by injecting the contrast material into the opening or mouth of a coronary arter. The iodinated solution blocks the passage of x-rays. X-ray movie pictures taken during the injection of the contrast material allow the coronary arteries to be visualized. In other words, coronary arteries are not visible on x-ray films. However, they can be made temporarily visible by filling the coronary artery with a contrast solution that blocks x-ray.

The coronary arteries are vital because they supply oxygen and nutrients to the heart muscle. Without blood flow, the muscle would sustain permanent damage in the form of a heart attack or myocardial (pronounced my-ow-card-yull) infarction (pronounced in-fark-shun).

Cardiac catheterization (cath) is also known as heart cath, angiogram (angio) (pronounced an-gee-o-gram) or arteriogram (pronounced ar-tee-rio-gram). The latter two terms describe the use of contrast material to take x-ray pictures of the heart.

If catheters are introduced through the femoral (pronounced fem-rull) or groin artery, the procedure is known as "left heart" catheterization, because the catheter goes from the femoral artery to the aorta, coronary arteries, ad the left ventricle (LV). This accounts for the majority of procedures. Left heart cath can also be performed by using the artery in the arm.

If a catheter is also placed in the right femoral vein to measure pressures within the right side of the heart, the procedure is called "right heart" cath. This is used in patients with congenital heart disease, diseases of the heart valve, or certain conditions involving the pericardium (pronounced perry-card-e-yum), or sac of the heart. This may also be used in certain diseases of the heart muscle, heart failure, shock, of when measurements of heart output of lung pressures are needed. Right and left heart cath is a combination of both.

What preparations are needed?

If an outpatient procedure is planned, the following checklist needs to be followed:

- pack a small overnight bag in case you need to spend the night in the hospital. Leave all valuables at home. Pack your contact lenses (with solution) and eye glasses if you wish to view the pictures during the procedure.
- If the procedure is scheduled prior to noon, do not eat or drink after midnight. Medications prescribed by your doctor may be taken with sips of water. If the procedure is scheduled for the afternoon, you may be allowed to have an early liquid breakfast (juice, tea, broth, water, etc) prior to 7am.
- Make certain that you have directions to the lab and the time that you are to report there. Call our office if you have any questions. Also, make sure hat you receive instructions about eating, drinking and the use of prescribed medications.
- Diabetic patients, particularly those on insulin, need clarification about the insulin does and whether it will be used before or after the procedure.
- Make arrangements to have a family member or friend drive you home. There is a waiting area provided for their use.
- If you are given lab results and EKG by your doctor, please be sure to give them to the nurse when you arrive. Also, bring all your regular medicines (or at least a list) with you.
- The preparations are similar if you are already hospitalized on the day of the procedure.

What happens after arrival in the cath lab?

- You will check in at the admission desk
- If you have not had recent blood work or an EKG, they will be obtained by the nurse
- You will be questioned about your history, medications, and allergies. (if you have an allergy to iodine and shellfish, or have had prior problems during an x-ray procedure or cardiac cath, please be sure to notify the nurse). You will then change into a hospital gown.
- Make sure that you empty your bladder before being taken to the cath lab.
- The nurse will check your pulse and blood pressure
- The pulse area on your arm or leg may be marked with a felt-tip pen
- An IV will be started in your arm with the use of a small needle or plastic tube. This will allow the administration of fluids and medications.
- You may be given medications (by mouth or IV) to help you relax.
- When preparations are complete and the cath lab is ready, you will be transferred there.

How long does it take?

The actual left heart cath procedure usually takes approximately 10-15 minutes. However, it may take longer if the patient has unusual anatomy of the arteries and there are technical difficulties. Additional time will be needed if the patient has had prior bypass surgery since additional pictures of the bypass vessels are needed. This can add another 10-15 minutes to the procedure time. An additional 10-15 minutes are needed if the patient requires right heart cath.

Approximately three to four hours after the procedure, the patient gets out of bed. The patient is usually discharged within 6 hours of the procedure unless additional treatment or procedures are required. A little soreness and a band-aid are usually the only traces of the procedure. Some patients may display a bruise at the site.

Following discharge, the mild soreness and slight bruising should resolve. However, some patients may experience tenderness and mild pain that can last a few days. If there was bruising at the time of discharge, the area of discoloration may increase in size. This does not necessarily indicate additional bleeding and may be due to the spread of blood pigments under the skin. However, you must notify your cardiologist if you note an increased swelling, particularly if it pulsates. Persistent fever is rare and also requires that the patient contact the cardiologist's office. You may be instructed to drink plenty of fluids on the night of the procedure to compensate for the urinary fluid loss induced by the contrast material.

How safe is the procedure?

Cath is a relatively safe procedure and is carried out all over the world on an outpatient basis. However, it must be recognized that the procedure is frequently carried out in patients with heart disease and that catheters have to be inserted into blood vessels. Despite this, the risk of a serious complication is estimated to be less than 4 and probably around 1-2 per thousand. Rare serious complications can include death, a heart attack, stroke and need for emergency surgery. Occasionally, patients may exhibit a rash as an allergic reaction to the contrast material. Serious allergic reactions are rare and can usually be controlled. Rarely, the contrast material may affect kidney function. This problem is more likely to occur if the patient has underlying kidney disease, and is more likely among diabetics than among non-diabetics. Other frequent complications can include bleeding that requires blood transfusion or surgical repair, blood clots, and sustained abnormal cardiac rhythm.

What is the reliability of the test?

Cardiac cath is the "gold standard" against which all other coronary diagnostic tests are measures. However, it should be remembered that it can only pick up "fixed" coronary artery diseasee (CAD) and may miss coronary spasm where the blockage may come and go. In these cases, medications can be used to provoke and confirm, or exclude, the presence of spasm.

How quickly will I get the results?

The cardiologist will give the patient and family a preliminary report immediately after the procedure. However, a final report will not be available until the patient is ready to go home. Some cardiologists will meet with the family prior to discharge, while others will set up a subsequent appointment to go into the details of the procedure and how it will change treatment. If there are serious blockages, and if indicated by the patient's clinical picture, hospitalization for medical treatment may be scheduled. Others may be set up for a balloon angioplasty or stent procedure, or even bypass surgery. In some cases, the angioplasty and stent procedure may be required and carried out immediately following cardiac cath. This will be discussed with the patient and family before it is preformed. However, the far majority of patients go home on the same day of the procedure.