

Cerebral Angiogram

basic level

Overview

An angiogram, also called an arteriogram, is an invasive diagnostic test that uses x-rays to take pictures of your blood vessels. A long flexible catheter is inserted through the blood stream to deliver dye (contrast agent) into the arteries making them visible on the x-ray. This test can help diagnose a stroke, aneurysm, arteriovenous malformation, tumor, clots, and arterial stenosis.

How does an angiogram work?

An angiogram works similar to an x-ray. The body casts a "shadow" on film when it is exposed to the x-ray, much like when you hold a flashlight up to your hand and cast a shadow on a wall. Normally your blood vessels cannot be seen in an x-ray, but adding a dye (contrast agent) into the blood stream makes your blood vessels visible (Fig. 1). Contrast agent contains iodine, a substance that x-rays cannot pass through.

To deliver the contrast agent, a catheter is inserted into the large femoral artery in the upper leg (groin area). The long, flexible catheter is advanced from the femoral artery to one of four arteries in the neck that lead to the brain. While viewing an x-ray monitor, called a fluoroscope, the doctor steers the catheter through the blood vessels. A fluoroscope machine, also called a C-arm, is an arc shaped piece of equipment that generates x-rays from one side and photographs them on the other side (Fig. 2). Contrast is injected into the bloodstream to make the blood vessels visible on the monitor. The result is a kind of roadmap of the arteries.

Today many catheter angiographic studies have been replaced by less invasive methods such as computed tomography angiography (CTA) and magnetic resonance angiography (MRA) that do not require a catheter be inserted. Catheter angiography has the benefit of combining diagnosis and treatment in patients who may undergo surgery or other endovascular procedure such as angioplasty, coiling, balloon, or stent placement.

What does an angiogram show?

Angiograms are very good at detecting problems with the blood vessels such as an aneurysm, arteriovenous malformation (AVM), arterial stenosis (narrowing of the arteries due to atherosclerosis), tumor, and clots (Fig. 3).



Figure 1. Lateral view angiogram of the head. Contrast agent makes arteries visible on the skull x-ray.



Figure 2. A fluoroscopic C-arm is an arc-shaped piece of equipment that generates x-rays from one side and photographs them on the other side.

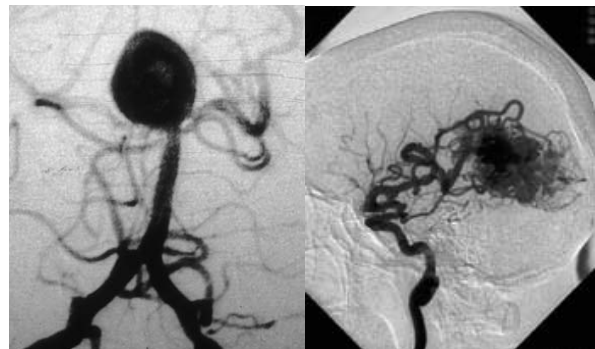


Figure 3. (left) Anterior view angiogram of a large aneurysm on the basilar artery. (right) Lateral view angiogram of an arteriovenous malformation (AVM).

Who performs the test?

A doctor who specializes in interventional radiology will perform the test in the angiography suite of the radiology department.

How should I prepare for the test?

Don't eat or drink after midnight on the night before the test. You should take your normal morning medication with a small amount of water. Make arrangements to have someone drive you to and from the hospital. Before the test, you will be asked to change into a hospital gown and an intravenous (IV) line will be placed in your arm. The radiologist or nurse will discuss the test with you, explain the risks, answer any questions, and have you sign consent forms.

What happens during the test?

Step 1: prepare the patient

You will lie on your back on an x-ray table. Your head is positioned so that it will not move during the test. Your blood pressure and heart rate will be monitored throughout the test.

Step 2: insert the catheter

The catheter is usually inserted into the femoral artery in the groin, however other arteries may be chosen. The inner thigh and groin area is first shaved and cleansed. A local numbing agent is given to minimize discomfort as a skin incision is made. The femoral artery is located and a hollow needle is inserted into the artery. The catheter is passed through the hollow needle and then carefully guided through your bloodstream to the correct artery in your neck or brain (Fig. 4). The doctor guides the catheter by watching the fluoroscope monitor while injecting dye to make the vessels visible. You may feel brief pain when the catheter is inserted, but most catheter manipulation is painless.

Step 3: take x-ray pictures

When the catheter is placed correctly, the doctor injects the contrast agent while x-ray pictures are taken. You may feel a hot, flushed sensation that lasts 5 to 20 seconds. At this point you should remain very still so that the x-ray images will not be blurred. This may be repeated several times in order to view all necessary arteries.

What happens after the test?

Once the x-rays have been taken, the catheter will be removed and pressure is applied to the puncture site for 10 to 15 minutes so that your artery will not bleed. A bandage may be tightly applied, and you must stay on your back in bed for the next 6 hours, keeping your bandaged leg as straight as possible. If an angio-seal was used, you must remain flat on your back for only 2 hours. You may feel a pea-size lump in your groin or mild tenderness at this site. Notify the nurse if any pain, swelling, or bleeding occurs at the incision site.

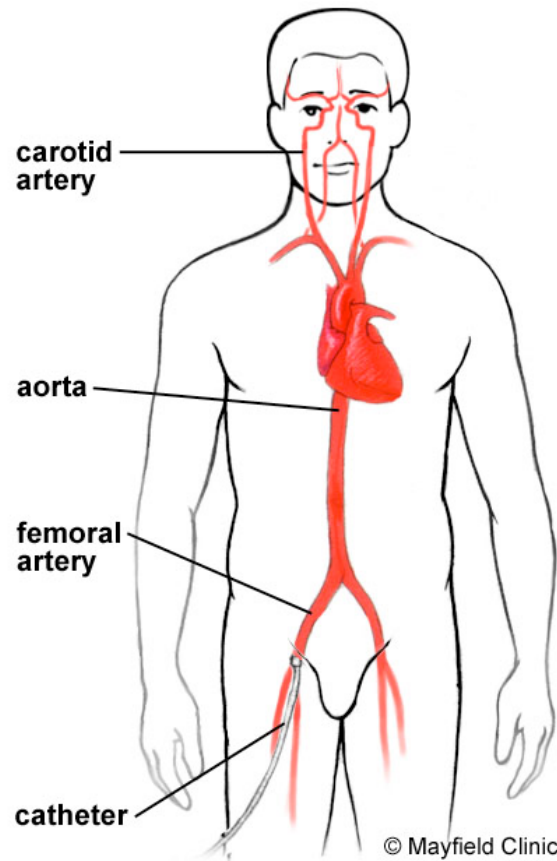


Figure 4. A catheter is inserted into the femoral artery in the groin and is guided through the arterial system to the arteries in the brain.

Discharge instructions

Discomfort

1. A pea-size lump in your groin or mild tenderness and bruising at the incision site is normal. You may take ibuprofen and apply a warm compress for discomfort.
2. Mild headache can develop after the procedure. Drink plenty of fluids, especially water over the next few days; this will help flush out the contrast dye.

Activity

3. Do not drive for 3 days after the procedure or until discussed with your doctor.
4. Do not lift anything heavier than 10 pounds (e.g., gallon of milk) for 3 days.

Bathing/incision care

5. You may shower 24 hours after the procedure. No baths, hot tubs, or swimming for 3 days.
6. Remove the bandage before showering. Gently clean the site using soap and water. Dry thoroughly and apply a new bandage. If steri-strips are in place, allow them to fall off on their own.
7. Check for signs of infection such as swelling, redness, yellow or green discharge, warm to the touch.

8. Keep your dressing clean and dry. Change the dressing daily. Wash your hands before and after.
9. Do not apply creams, lotions, or ointments on or near your incision.
10. If bleeding occurs at the puncture site, lie down and apply firm pressure.
11. If you received an angio-seal to close the artery puncture site, the body will absorb the collagen plug in about 60 to 90 days. During this time, carry your patient information card with you at all times.

When to call your doctor

12. If your temperature exceeds 101° F or if the incision begins to separate or show signs of infection, such as redness, swelling, pain, or drainage.
13. Go to the nearest emergency room if you experience a large swelling or sudden pain at the puncture site, or loss of sensation, numbness or swelling of the leg.

What are the risks?

An angiogram is an invasive test, so it is not without risk. There is a very small risk of the catheter damaging your artery or loosening a piece of plaque lining the artery wall. This loose piece of plaque can travel up the artery into the brain and could block blood flow causing a stroke.

Some people are sensitive to the contrast agent used. The most common side effects from the iodine contrast are a brief metallic taste in your mouth and a feeling of warmth throughout your body.

An extremely rare reaction occurs when you experience severe hives and have difficulty breathing. Medications such as antihistamines can reverse this reaction. If you have diabetes or kidney problems you may experience kidney failure, but this too is extremely rare.

Be sure to tell your doctor if you are pregnant or have a history of allergies (to medications, previous iodine injections, or shellfish), diabetes, asthma, a heart condition, kidney problems, or thyroid conditions. Also tell them if you take any blood thinning medication such as aspirin or Coumadin.

How do I get the test results?

The radiologist will promptly review your images and communicate directly with your referring doctor, who in turn will discuss the results with you.

Sources & links

If you have further questions about this diagnostic test, contact the doctor that ordered the test or visit www.radiologyinfo.org.

Glossary

aneurysm: a bulge or weakening of an arterial wall.

angiogram: a type of X-ray that takes pictures of blood vessels with the help of contrast dye injected via a catheter.

arteriovenous malformation (AVM): a congenital disorder in which there is an abnormal connection between arteries and veins without an intervening capillary bed.

atherosclerosis: A degenerative disease of the arteries in which fatty plaques and scar tissue form on the inner walls and block the free flow of blood.

catheter: a thin flexible tube made of rubber or plastic used to insert or remove fluids from the body.

contrast agent: a liquid (usually iodine or gadolinium) that is injected into your body to make certain tissues show up clearly during diagnostic imaging (angiography, CT, myelogram, MRI).

fluoroscope: an imaging device that uses x-ray or other radiation to view structures in the body in real time, or "live". Also called a C-arm.

iodine: a non metallic element used in contrast agent that makes vessels and tissues show up on diagnostic imaging (angiogram, CT, myelogram).

radiologist: a doctor who specializes in reading X-rays and other diagnostic scans.

X-ray: electromagnetic radiation used in diagnostic imaging to view shadows of tissue density in the body, also called roentgenogram.

updated > 2.2010

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