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Diagnostic Angiogram

Overview

An angiogram is a diagnostic test that uses X-rays to take pictures of your blood vessels. A long, flexible catheter is inserted through the bloodstream to deliver dye into the arteries, making them visible on the X-ray. This test can help diagnose a stroke, aneurysm, AVM, tumor, clot, or 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 Xray, 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, called a contrast agent, into the bloodstream makes your arteries and veins visible (Fig. 1). Contrast agents contain iodine, a substance that X-rays cannot pass through.

To deliver the contrast dye, a catheter is advanced from an artery in the leg or arm to one of four arteries in the neck that lead to the brain. The doctor steers the catheter through the blood vessels while watching a monitor. A fluoroscope is an arc-shaped piece of equipment that generates Xrays from one side and photographs them on the other side (Fig. 2). Contrast dye is injected into the bloodstream to make the blood vessels visible on the monitor. The result is a kind of roadmap of the arteries.

Catheter angiograms provide more detailed images than computed tomography angiography (CTA) or magnetic resonance angiography (MRA). CTA and MRA do not require insertion of a catheter. Catheter angiography has the benefit of combining diagnosis and treatment in patients who may undergo an endovascular procedure such as angioplasty, coiling, or stent placement.

What does an angiogram show?

Angiograms detect problems with the blood vessels such as aneurysms, an arteriovenous malformations (AVM), artery stenosis from plaque build-up, tumors, and clots. (Fig. 3).

Who performs the test?

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



Figure 1. Side view of the head shows a lateral angiogram of the internal carotid artery. The dye passes through the arteries, into the capillaries, and finally the veins.



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. Angiograms of a large aneurysm on the basilar artery (left) and arteriovenous malformation (right).

How should I prepare for the test?

Discuss all medications (prescription, over-thecounter, herbal supplements) you are taking with your health care provider. Some medications need to be continued or stopped the day of the angiogram. Be sure to discuss all allergies to medications, jewelry (nickel), or shellfish (iodine) with your doctor.

Stop taking Coumadin or Eliquis 4 days before the angiogram. The doctor will give you specific instructions to either stop or start taking other blood thinners (aspirin, Xarelto, Plavix, etc.). Do not smoke at least 24 hours before the angiogram.

Don't eat solid food after midnight on the night before the test and don't drink any liquids 2 hours before the procedure. If you are diabetic, stop taking Metformin 48 hours before and 48 hours after the angiogram. If you take short-acting insulin, do not take it the morning of the procedure since you will not be able to eat until afterwards. If you take long-acting insulin in the morning, take half your regular dose. You may take your other morning medications with a small amount of water.

Make arrangements to have someone drive you to and from the hospital.

After check-in, 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. Or the radial artery in the wrist may be chosen. Your doctor will choose the best artery access for your specific condition.

The puncture area is shaved and cleansed. A local numbing agent is given to minimize discomfort as a skin incision is made. The femoral or radial artery is located and a hollow needle is inserted (Fig. 4).

Next, a long guide wire and flexible catheter are passed through the needle to enter the bloodstream. A contrast dye is injected into the bloodstream through the catheter. The dye makes the blood vessels visible on the x-ray monitor. Watching the monitor while injecting dye, the doctor carefully guides the catheter. It passes from the artery in the leg or arm, up the aorta, and to one of four arteries in the neck that lead to the

Spinal Angiogram

Angiography of the blood vessels that feed the spine and spinal cord is performed in the same fashion as cerebral angiography. It may include the same vessels in the neck (like the carotid and vertebral arteries that feed the brain) but will also include arteries in the chest and abdomen. Imaging of these vessels can be blurred by movement from breathing or talking. For this reason, spinal angiography may be performed under general anesthesia in some cases, so that the physician can control your breathing and movement.

The blood supply to the spinal cord varies greatly between individuals. Spinal angiography can be a tedious process because there is one spinal artery for each rib. Every artery that may supply the spinal cord must be imaged, which can make the procedure last longer than a cerebral angiogram.



Figure 4. A catheter is inserted either into the A) femoral artery in the groin, or B) radial artery in the wrist. It is then guided through the arterial system to the brain.

brain. You may feel brief discomfort 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 dye while X-rays are taken. You may feel a hot, flushed sensation that lasts 5-20 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.

Step 4: remove the catheter

Once X-rays have been taken, the catheter is removed and pressure applied to the puncture site for 10-15 minutes so that your artery will not bleed. A bandage may be tightly applied.

A vascular closure device is used to close the puncture site in the femoral artery. It seals the opening by pressing an anchor inside the artery against a collagen plug outside the artery. In 60-90 days, the body absorbs the plug naturally.

What happens after the test?

Femoral access: You must stay on your back in bed for the next 2 hours, keeping your bandaged leg as straight as possible. If a vascular closure device was not used, you must remain flat on your back for 4 hours. You may feel a pea-sized lump in your groin or mild tenderness at this site.

Radial access: An inflatable band is placed across your wrist. During the next couple of hours, air is slowly released to control bleeding while the puncture closes. There are no restrictions to movement. You do not have to lie flat in bed.

Notify the nurse if any pain, swelling, or bleeding occurs at the incision site.

You will be given discharge instructions to follow at home. In general, you can expect:

Restrictions

- No strenuous activity, including sex. Don't lift anything heavier than 5 pounds for 3 days.
- If you had a radial artery access, avoid repetitive wrist activity like typing for 2 days.
- Don't drink alcohol. It thins the blood and increases the risk of bleeding.
- Don't smoke or use nicotine products: vape, dip, or chew. Smoking is a major risk for aneurysm formation and rupture.
- Get up and walk 5-10 minutes every 3-4 hours. Gradually increase your walking time as you are able. Wait 3 days before exercising.
- You may return to work in 3-5 days, unless the surgeon says otherwise.
- There are no driving or flying restrictions.

Incision care

- You may shower the day after with the bandage in place. Remove the bandage after showering. Gently wash the site with soap and water every day. Don't scrub or pick at the puncture site. If there is a stitch or scab, leave it alone until it falls off on its own in 10-14 days. Pat dry and leave open to air unless otherwise instructed to cover it.
- Don't soak the incision in a bath or pool for 3 days.
- Don't apply lotion or ointment on the incision.
- A pea-sized lump in your groin or mild tenderness and bruising at the puncture site is normal. A warm compress and Tylenol can ease discomfort.
- If bleeding occurs at the puncture site, lie down and apply firm pressure.
- You may have a vascular closure device to seal the artery puncture. The body will absorb the collagen plug in 60-90 days. During this time, carry your patient information card with you.

Medications

- Mild headache can develop after the procedure. Drink plenty of water during the next few days to flush out the contrast dye.
- You may take acetaminophen (Tylenol).

When to call your doctor

- Fever higher than 101.5° F (unrelieved by Tylenol).
- Signs of incision infection, such as spreading redness, swelling, pain, or colored drainage.
- Go to an emergency room if you have brisk bleeding that doesn't stop, a large swelling or sudden pain at the puncture site, or loss of sensation, numbness, or swelling of the leg.

Call 911 if you have:

- Facial droop, slurred speech, arm weakness, or confusion (signs of a stroke).
- Trouble breathing (blood clot in lung).
- Sudden severe headache, popping or snapping sensation in the head, nausea and vomiting, or a stiff neck (signs of an aneurysm rupture).

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 dye. 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.

A rare reaction can occur when you experience severe hives and have difficulty breathing. Medications such as antihistamines can reverse this reaction. In rare cases, if you have diabetes or kidney problems, you may experience kidney failure.

Be sure to tell you 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 the doctor if you take any blood thinners such as aspirin or Coumadin.

How do I get the test results?

The radiologist will promptly review your images. They will send a report directly to your doctor, who in turn will discuss the results with you.

Sources & links

If you have further questions about this diagnostic test, contact the doctor who ordered the test.

Links

www.radiologyinfo.org

Glossary

aneurysm: a bulge or weakening of an artery 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): an
- abnormal connection between arteries and veins without an intervening capillary bed.
- **atherosclerosis:** a buildup of fatty plaques and scar tissue on the inner walls of arteries that block the free flow of blood.
- **catheter:** a long tube made of soft, flexible plastic that can be threaded through arteries.
- **contrast agent:** a liquid (usually iodine or gadolinium) that is injected into your body to make certain tissues show up clearly during diagnostic imaging.
- **fluoroscope:** an imaging device that uses X-ray or other radiation to view structures in the body in real time. 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.



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