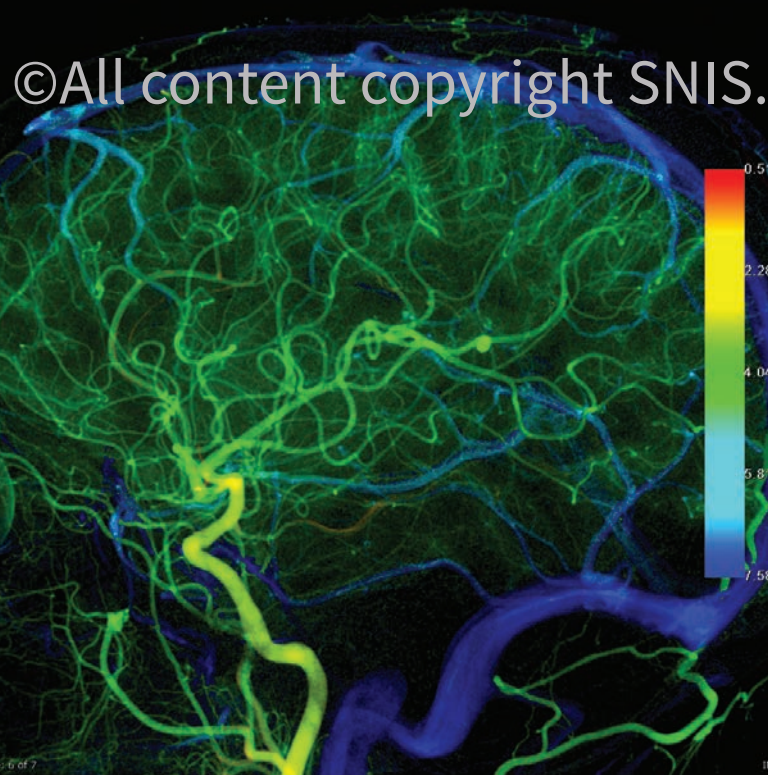


Cerebral Angiography

What is a
cerebral angiogram?

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Right Internal Carotid Artery Angiogram

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What is a cerebral angiogram?

A cerebral angiogram is an x-ray examination of the blood vessels (arteries and veins) of the brain performed by a physician with training in brain imaging. During an angiogram, you are generally awake but sedated, having received IV medications to help relax. A nurse trained in conscious sedation monitors you during the procedure.

A cerebral angiogram is considered an invasive procedure, which carries some risks. The physician who will perform the procedure will explain to you the risks and benefits of the exam before doing it and he/she will require you to sign an informed consent.

Once you arrive to the angiography suites, a nurse will clean the local area of the skin at the puncture site with an antiseptic solution and cover it with a sterile drape. The procedure is accomplished by inserting a thin tube or catheter in the femoral

artery (the large artery in the leg) or radial artery (a major artery in the forearm/wrist) (Figure 1) through a small nick in the skin. Occasionally, an ultrasound (US) probe is used to locate the site of the puncture. Local anesthesia combined with IV sedation makes this procedure very safe, and the procedure is generally performed with just minimal discomfort at the beginning of the angiogram.

Then, under x-ray guidance, the physician directs the catheter through the artery leading up to the brain. Once in position, the catheter is used to deliver X-ray dye (contrast) to the desired location, enabling x-rays of the brain to clearly show the cerebral blood vessels.

Once the angiogram is complete, the catheter is removed. To prevent the artery from bleeding, pressure is applied to the catheter insertion site for approximately 15 minutes, or a device may be used to make sure the artery is completely closed. The angiogram often lasts less than 1 hour. However, upon its completion, the procedure may require you to undergo several hours of bed rest upon returning back to the room, dependent upon the vessel chosen for the procedure and methods used to close the vessel. No bed rest is necessary if the access site is through the wrist artery.

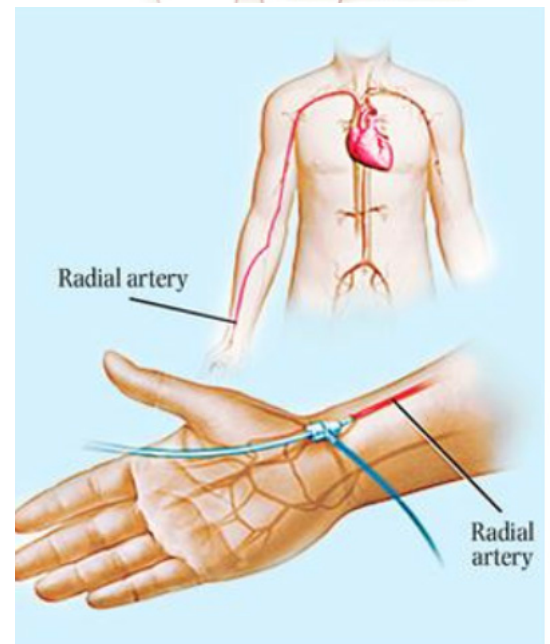
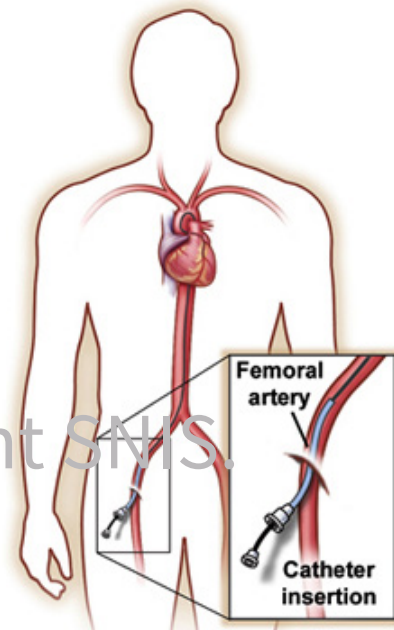


Figure 1. Schematic diagram showing the path from the femoral artery and radial artery to the carotid arteries.

Why an angiogram?

Cerebral angiography is the most definitive way to view the blood vessels of the brain. In addition to providing high-resolution images, an angiogram also provides information about brain blood flow with each heartbeat.

Brain aneurysms (weak spots in the vessel wall that can burst), vascular malformations (abnormal tangles of blood vessels) and vessel blockages (which cause strokes) are among the conditions that can be accurately detected using an angiogram (Figure 2a, b, c). This procedure, depending upon what it reveals, can also facilitate immediate treatment, which may involve directing medications and/or special devices through the catheter to the problem site to resolve the issue. Occasionally, the cerebral angiogram is performed to clarify the shape of a lesion prior to brain surgery.

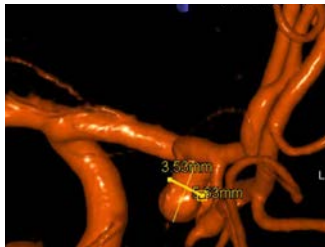
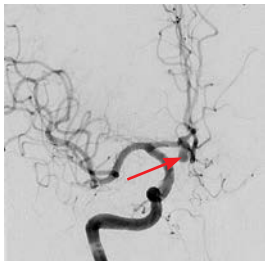


Figure 2a, left, top: anterior-posterior view

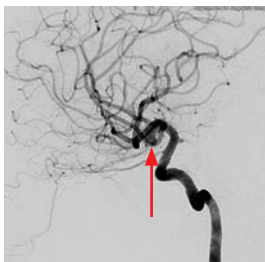


Figure 2b, left, bottom: Lateral view of a cerebral angiogram, right internal carotid artery injection, demonstrating an anterior communicating artery aneurysm (arrow)

Figure 2c, above: 3D rotational view from the same angiogram detailing the aneurysm and its measurements

What are the benefits and risks of an angiogram?

Benefits

A cerebral angiogram offers the most detailed depiction of the brain's blood vessels. Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and ultrasound are often useful in studying blood vessels. Sometimes, the level of detail available only through catheter cerebral arteriography is necessary for your doctor to conduct an accurate and precise evaluation to help establish the correct diagnosis and assist with treatment planning. A different specialist such as a neurologist, neurosurgeon or radiologist may refer you for this procedure. In certain emergencies, the catheter angiogram combines diagnosis and treatment into a single procedure.

Risks

All medical procedures carry some risks. The most serious risk of a cerebral angiogram is stroke. Stroke can result from blood clots that dislodge from blood vessel plaques or from the catheter. Catheter-induced tears in the lining of blood vessels (called "dissections") can also cause a stroke. In both of these situations, blood flow is restricted depriving brain cells of the vital oxygen they need to survive. Overall, the risk of stroke during diagnostic angiography at high-volume centers is less than 1 percent. Stroke, although uncommon, can result in permanent deficits including inability to move, inability to speak, or vision loss.

More common, but less severe, complications include bleeding, bruising or infection at the blood vessel puncture site and allergic reactions to x-ray dye or medications used for sedation. There is also some exposure to radiation, usually not significant for a cerebral angiogram for diagnostic purpose.

All efforts are made to ensure these risks are minimized during a cerebral angiogram. Some risks may be patient-specific and would be discussed prior to performing the procedure. The physician that performs your angiogram usually obtains the informed consent prior to the exam and he/she is able to answer all the questions you may have.

How do you prepare for an angiogram?

Prior to having an angiogram, your doctor needs to know if you:

- Are pregnant or breast feeding
- Have any allergies, especially to iodine dye
- Have bleeding problems or are on any blood thinners
- Have diabetes, especially if you take Metformin
- Have any kidney disease
- The list of medications you are taking has to be available to verify if any contraindications exist. Some medications (i.e., blood thinners) are also required to be suspended for a certain period of time prior to the cerebral angiogram

You will be asked not to eat or drink for several hours prior to the angiogram, typically starting from the night before the procedure. You may also be asked

to not take specific medications. Blood tests may be performed prior to the procedure.

What is the recovery time after an angiogram?

Since angiograms are usually performed under sedation, you will be asked not to drive or operate machinery or power tools, ride a bicycle or drink any alcoholic beverages until the medicines completely disappear from your system the next day. After the procedure, you might feel a little sleepy or tired, but this feeling will slowly wear off.

It is also important not to perform any heavy lifting for about a week after the procedure to allow the blood vessel puncture site in the leg or arm to heal. Showers are permitted the next day after the procedure, usually 24 hours later; however, you should not submerge the site under water (i.e. no baths or swimming) until the skin nick is completely healed.

Care of the catheter insertion site

If you have strips of tape on the incision the doctor made, leave the tape on for the rest of the day. Watch for bleeding from the incision. A small amount of blood (up to the size of a quarter) on the bandage can be normal. You may have some bruising around the incision in your groin or wrist/forearm but you should not have much pain. Keep the catheter insertion site clean and dry.

If any active bleeding from the site of the puncture occurs when you are back home it is important not

to panic but to ask someone to apply pressure with the fingers and compress to avoid blood loss, keep the pressure for 15 minutes. After that, if the bleeding does not stop, then call 911.

Restarting diet and medications

Your doctor will tell you if and when you can restart your medications. Normally, most medications can be restarted shortly after the procedure once you arrive home. However, your doctor may give you special instructions about when it is safe to take your blood thinners again, such as aspirin. Also, you are usually asked to stop Metformin before the procedure and restart 48 hours after to minimize the risk of lactic acidosis.

Be safe with your medications. Take pain medicines exactly as directed. Normally, over the counter pain medications can be used to control discomfort at the puncture site. Stronger pain medications are usually not prescribed after cerebral angiography.

You can eat your normal diet. Drink enough fluids to keep your urine clear or pale yellow.

Finally, do not forget to keep all follow-up appointments as directed by your physician.

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