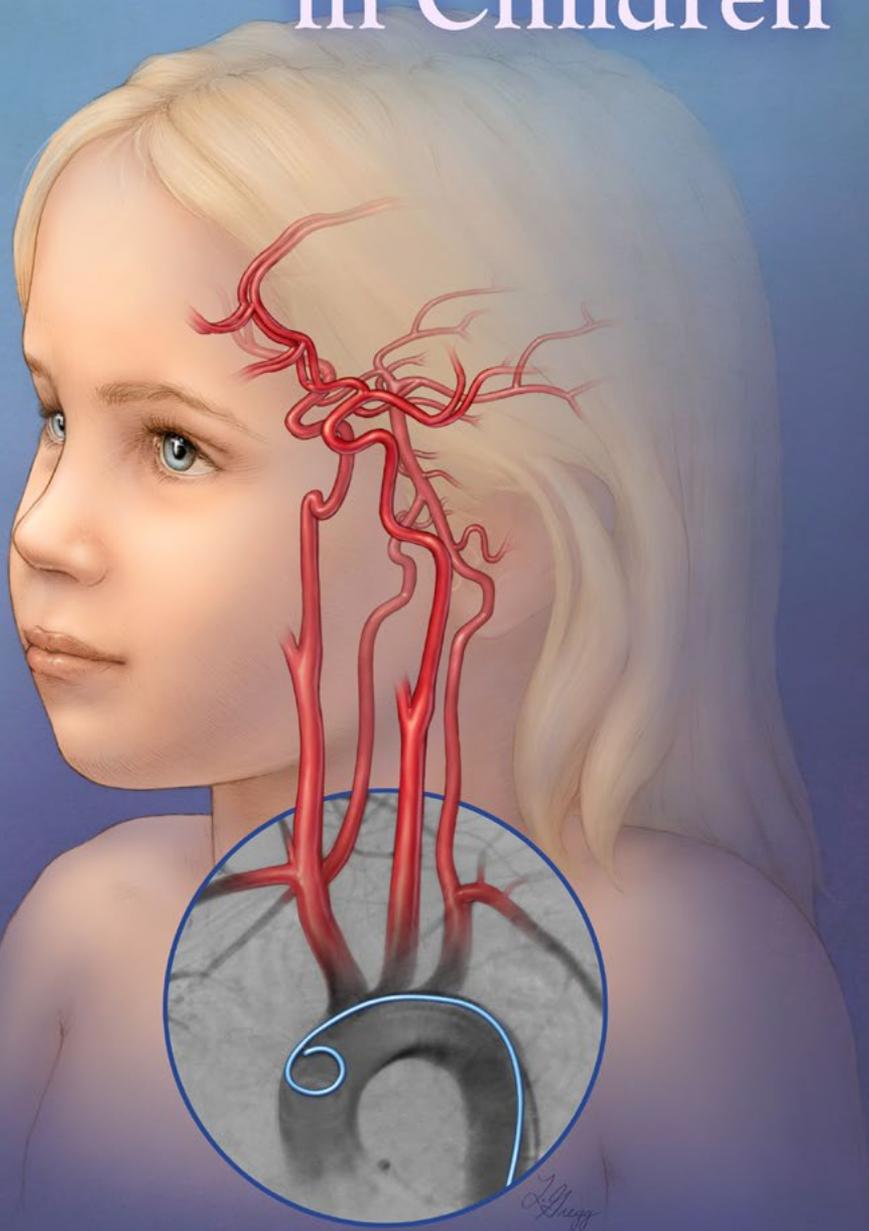


Cerebral Angiography

in Children



JOHNS HOPKINS
MEDICINE

Pediatric Interventional
Neuroradiology



Dear patient and family,

Welcome to Johns Hopkins Medicine! Your doctor has referred you to Johns Hopkins Pediatric Interventional Neuroradiology so that we may examine or treat the blood vessels supplying your child's head and neck. During your stay, your child will be under the care of a dedicated team of experienced healthcare professionals.

Our goal is to make you as comfortable as possible during your visit to the Johns Hopkins Hospital. We hope that you will find this pamphlet useful and informative. Please read it carefully and share with us your questions and suggestions.

Sincerely,
Dr. Philippe Gailloud, Director
Division of Interventional Neuroradiology
The Johns Hopkins Hospital
Email: INR@jhmi.edu

What is a diagnostic cerebral angiogram?

A diagnostic cerebral angiogram is a medical procedure that offers an extremely precise evaluation of your child's blood vessels. Cerebral angiography helps to diagnose medical conditions that involve the arteries and veins in the head and neck, including the brain. During a cerebral angiogram, highly specialized doctors (called neuro-angiographers) are able to examine the blood vessels by using modern sophisticated imaging equipment. In order to take pictures of the blood vessels, a contrast medium, or "dye," is given through a small, soft, and flexible tube called a catheter. This catheter is inserted in the groin and carefully advanced towards the targeted blood vessel under the guidance of low dose x-rays.

Images of the blood vessels are then obtained by injecting the contrast medium through the catheter into the blood vessel, and by taking x-ray pictures as the contrast agent travels through the arteries and veins (Figure 1).

What conditions can be diagnosed with a cerebral angiogram?

Conditions commonly diagnosed by cerebral angiography include cerebral aneurysms, vascular malformations, vascular tumors, strokes and stroke-related syndromes.

How should I prepare?

A member from our staff will call you several days ahead of your child's scheduled appointment to review the preparation for the procedure. A pre-procedure appointment will also be set up with the Johns Hopkins Anesthesiology Department within a 2-week period before your child's procedure date. During this appointment, a physical exam and lab tests will be conducted.

Your child should continue to take all prescribed medications as directed unless told otherwise by your physician. Please notify us as soon as possible if your child:

- Is allergic to iodine-based contrast (used for CT or x-ray exams)
- Has a lung or kidney disease
- Takes insulin for diabetes or a blood thinner such as aspirin

For the safety of your child, it is important that they stop eating and drinking before you arrive for their procedure. The table below explains this. **Please note that failure to follow these instructions will result in cancellation of your child's procedure.**

Diet	Examples	STOP!!!
Solid food	FORMULA, milk products, all food, gum, mints, cough drops	8 hours before arrival
Breast milk	Breast milk	4 hours before arrival
Clear liquids	Water, apple juice, lemon-lime, soda, ginger ale, plain jello, tea, popsicles (without fruit pieces)	2 hours before arrival



Figure 1. A child's cerebral angiogram showing half of the brain's blood vessels viewed from the front

What should you bring on the day of the procedure?

- X-ray, CT, or MRI films related to your child's condition
- A portable DVD player or music device with earphones and CDs with music. Television is available in the recovery area
- Someone to drive you home. **Children of driving age cannot come to the Hospital unaccompanied. They must have an escort drive them home after the procedure**

How is a cerebral angiogram performed?

The procedure is performed in a room specifically designed for angiography of the nervous system, the neuro-angiography suite (Figure 2). This room is equipped with machines that use x-rays to create pictures of the blood vessels as the contrast given through the catheter into the neck and brain. The pictures are recorded and displayed on screens that the doctors watch as they perform the procedure. The doctors will look at the pictures more closely once your child's procedure is finished.

General anesthesia is used in most children undergoing a cerebral

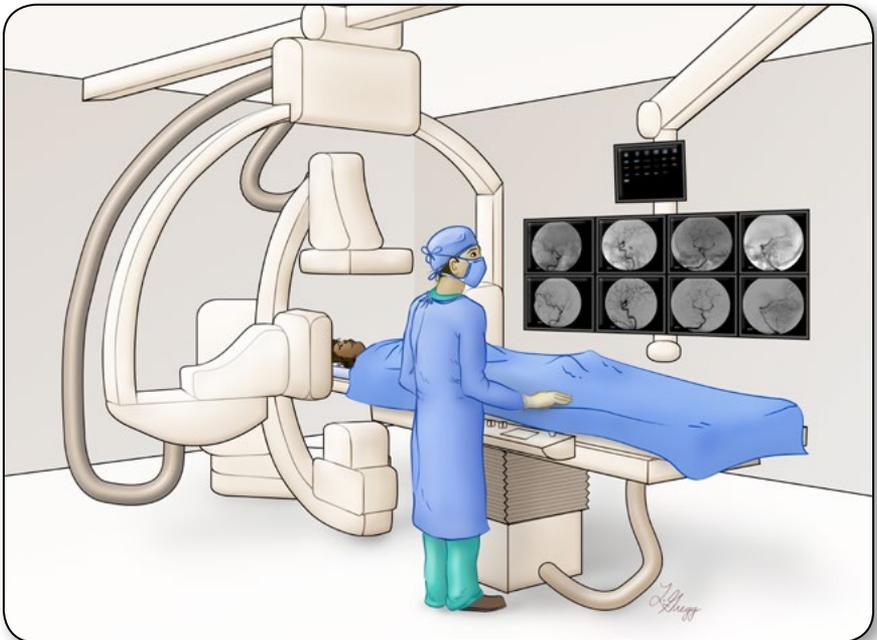


Figure 2. Neuroangiography suite and equipment

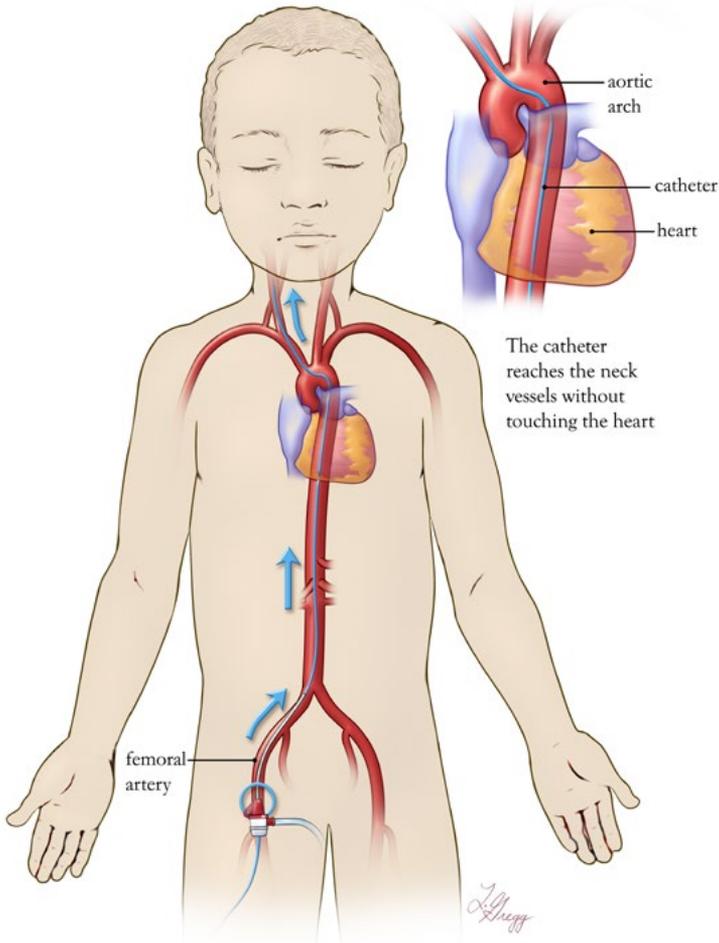


Figure 3. Here we see the path traveled by the catheter from the groin area to the head and neck where the contrast is injected

angiogram. However, adolescents may undergo the procedure under sedation and local numbing at the site of catheter insertion, as routinely performed in adult patients. (Please refer to the adult pamphlet for an explanation of cerebral angiograms performed under sedation.)

Parents can accompany their child into the angiography suite until general anesthesia is started. Once your child is sleeping, the skin of the groin is cleaned, and a catheter is inserted into the main artery of the leg (the femoral artery). This is performed without the need for a skin incision. Accessing the artery in the groin allows your doctor to investigate all the arteries of the head and neck from a single puncture site. Of note, the catheter does not cross or

even come close to the heart during a cerebral angiogram. Once the catheter is guided into the vessels to be examined and the tip of the catheter is in an adequate position, the contrast agent is injected and x-ray pictures of the vessels are taken (Figure 3).

What happens after the procedure?

At the end of the procedure, the catheter is removed from the groin. The doctor holds pressure at that site for 15 to 20 minutes, and a band-aid is applied. The anesthesia team then wakes up your child, and brings him or her to the pediatric recovery room. You can stay with your child in the recovery room (two visitors allowed at a time). After about an hour, you and your child will be coming back to the neuro-angiography recovery room.

Your child will need to stay in the recovery room for a total of five to six hours after the procedure. It will be very important during this time that your child keeps his or her leg straight. Moving or bending the leg carries a small risk of complication, such as a groin hematoma, or bleeding at the site where the catheter was inserted. Therefore, during the first two hours, your child's bed will remain flat. After the first two hours, the head of the bed will be gradually lifted. Once fully awake in the recovery room, your child may have something to eat and drink.

During the recovery period, your doctors will come check your child and discuss the angiogram findings with you. At the end of the recovery period, you and your child will be discharged with written instructions. One of the neuroradiology nurses will review this information with you before you leave, and answer any questions. In most cases, it is fine for your child to travel by plane the day after the procedure. Please be sure to take any x-ray films you may have brought with you home.

What kind of complications can occur?

Cerebral angiography in children is very safe. In fact, our team is constantly evaluating its experience with cerebral angiography in children. In a report of 241 consecutive cerebral angiograms published in the journal *Stroke* in 2007, no occurrence of intra-procedural complications was found. In particular, there was no cerebral complication such as a stroke. However, complications can happen during cerebral angiography, which include allergic reactions to the contrast agent, kidney impairment, damage or blockage to a blood vessel potentially causing a stroke, and bleeding at the site of where the catheter was inserted (the groin). Our team will discuss these risks with you in detail before your child's procedure.

Glossary of terms used:

Aneurysm: focal weakening of the wall of an artery causing it to stretch, balloon, or bulge

Angiogram: a radiologic test that uses x-rays to visualize the blood vessels in the body

Artery: a blood vessel that carries high-pressure, oxygenated blood from the heart to the organs of the body (at the exception of the pulmonary arteries that carry non-oxygenated blood back to the lungs).

Catheter: a thin, flexible tube that is used to navigate and deliver contrast into the blood vessels

Cerebral: involving the brain

Contrast (“x-ray dye”): an iodine-based substance that is injected into the blood vessels to make them visible to x-rays

Groin: the bend of the leg between the top of the thigh and the trunk

Hematoma: a blood clot resulting from vessel leakage

Neuroangiography: a diagnostic test used to examine the blood vessels of the brain, neck, spine, and spinal cord

Stroke: brain damage due to the blockage of a blood vessel in the head or neck

Stenosis: narrowing of a blood vessel

Vascular malformation: an abnormal group of blood vessels

Vein: a blood vessel that carries low-pressure, non-oxygenated blood from the organs of the body to the heart (at the exception of the pulmonary veins that carry oxygenated blood from the lungs to the heart).

