

Embolization of Brain Aneurysms and Fistulas

This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is Embolization of Brain Aneurysms and Fistulas?

Embolization of brain aneurysms and fistulas is a minimally invasive treatment for aneurysms and other blood vessel malformations called fistulas that occur in the brain.

An aneurysm is a bulge or sac that develops in an artery because the wall of the vessel is weak. A bulging aneurysm in the brain may compress surrounding nerves and brain tissue resulting in nerve paralysis, headache, neck and upper back pain as well as nausea and vomiting. If an aneurysm in the brain ruptures, causing an opening in the wall, internal bleeding may cause a stroke or death.

A fistula is an abnormal connection or passageway between the arteries and veins. Fistulas may prevent oxygenated blood from completely circulating throughout the brain, causing symptoms including, but not limited to:

- unusual sound in one ear (pulsating or humming)
- neurological symptoms
- increased pressure in the eye (glaucoma)
- double vision
- pain

In embolization procedures, physicians use image guidance to place a small, soft metal coil at the site of a bulge or passageway, where it helps block the flow of blood and prevents a rupture of the vessel.

What are some common uses of the procedure?

Embolization is frequently used to treat aneurysms and fistulas in the brain. It may be performed on both ruptured (broken) and unruptured aneurysms.

Embolization is especially useful for patients who are unsuitable for brain surgery and those who want to avoid a blood transfusion or general anesthesia.

How should I prepare?

Prior to your procedure, your blood may be tested to determine how well your liver and kidneys are functioning and whether your blood clots normally.

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications, general anesthesia, or to contrast materials (also known as “dye” or “x-ray dye”). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or a blood thinner for a specified period of time before your procedure. Also inform your doctor about recent illnesses or other medical conditions.

Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby.

If your aneurysm has ruptured, you may be hospitalized following your embolization procedure. If you aneurysm has not ruptured, you should plan to have a relative or friend drive you home after your procedure.

You should plan to stay overnight at the hospital for one or more days. You will be given a gown to wear during the procedure.

What does the equipment look like?

In this procedure, a catheter and detachable coils are used. A catheter is a long, thin, hollow plastic tube about as thick as a strand of spaghetti.

There are three types of coils:

- bare platinum coils.
- coated platinum coils.
- biologically active coils.

Coils are made of soft platinum wire smaller than a strand of hair and are available in different diameters and lengths. All detachable coils are scientifically proven to be safe and effective and approved by the U.S. Food and Drug Administration (FDA).



Other equipment used during the procedure includes an intravenous line (IV) and equipment that monitors your heart beat and blood pressure.

How does the procedure work?

In an embolization procedure, a catheter, (a long, thin, hollow plastic tube), is inserted through the skin into an artery and, using image-guidance, maneuvered through the body to the site of the aneurysm or fistula. Then, one or more coils are inserted through the catheter and placed at the site of the vessel malformation, where it is anchored. The body responds by forming blood clots around the coil(s), which helps block the flow of blood into the bulge or passageway and keep the vessel from rupturing or leaking.

How is the procedure performed?

Image-guided, minimally invasive procedures such as embolization are most often performed by a specially trained interventional neuroradiologist in an interventional radiology suite.

Prior to your procedure, computed tomography (CT) or magnetic resonance imaging (MRI) may be performed.

You will be positioned on the examining table. You will be connected to monitors that track your heart rate, blood pressure, and pulse during the procedure.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedation medication can be given intravenously. You may also receive general anesthesia.

The area of your body where the catheter is to be inserted will be shaved, sterilized and covered with a surgical drape.

Your physician will numb the area with a local anesthetic. A very small nick in the skin is made at the site.

Using image-guidance, a catheter, is inserted through the skin and advanced to the site of the aneurysm or fistula. Once the catheter is in position, the detachable coils are inserted and positioned in the abnormality.

At the end of the procedure, the catheter will be removed and pressure will be applied to stop any bleeding and the opening in the skin is covered with a dressing. No sutures are needed.

Your intravenous line will be removed.

An x-ray, MRI or angiogram may be done to confirm the position of the coils. If your aneurysm ruptured resulting in a stroke, you will need to remain in the hospital until you are recovered.

If you were treated for an aneurysm that had not yet ruptured, you may stay overnight at the hospital and return home the day after your procedure. This procedure is usually completed in one to two hours; however, it may last up to several hours.

What will I experience during and after the procedure?

Devices to monitor your heart rate and blood pressure will be attached to your body. You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected.

If you receive a general anesthetic, you will be unconscious for the entire procedure and monitored by an anesthesiologist.

The intravenous (IV) sedative will make you feel relaxed and sleepy. You may or may not remain awake, depending on how deeply you are sedated.

You may feel slight pressure when the catheter is inserted but no serious discomfort.

If you were treated for an aneurysm that had not yet ruptured, you should be able to resume your daily activities within 24 hours.

If you were treated for a ruptured aneurysm, you may experience nausea and a low-grade fever following your procedure. Headaches may last from seven days to six months. You may be prescribed aspirin or blood thinners.

Recovery time varies by patient and depends on the amount of the brain damage caused by bleeding from the ruptured aneurysm. Most people are able to care for themselves within 10 days to six months following this embolization procedure. Many patients return to work after one month and begin driving three months later.

Who interprets the results and how do I get them?

The interventional neuroradiologist will evaluate your procedure and results and coordinate appropriate follow-up care with your primary care physician.

What are the benefits vs. risks?

Benefits

- Using detachable coils to close off an aneurysm or fistula is effective in prolonging life and relieving symptoms.
- Embolization is a treatment for cerebral aneurysms and fistulas that previously were considered inoperable. This procedure is less invasive and requires significantly less recovery time than open surgery for aneurysm repair. Additional benefits include minimal blood loss and the option of local anesthesia.
- No surgical incision is needed—only a small nick in the skin that does not have to be stitched closed.

Risks

- Any procedure where the skin is penetrated carries a risk of infection. The chance of infection required antibiotic treatment appears to be less than one in 1,000.
- Any procedure that involves placement of a catheter inside a blood vessel carries certain risks. These risks include damage to the blood vessel, bruising or bleeding at the puncture site and infection.
- There is always a chance that an embolic agent can lodge in the wrong place and deprive normal tissue of its oxygen supply.

- There is a slight risk of death or illness. Coil embolization of unruptured aneurysms and fistulas carries less risk than embolization following a stroke. Approximately seven percent of cases require additional treatment or surgery.

What are the limitations of Embolization of Brain Aneurysms and Fistulas?

- Durable effect: Recurrence depends on the coils' success or failure in controlling the "neck" of the aneurysm or fistula. If the coil completely prevents blood flow into the aneurysm, then the patient need not be concerned about recurrence. The durability of coil embolization varies depending on the size and shape of the aneurysm. Coil embolization of small aneurysms with small necks has better results than embolization of large or giant aneurysms with wide necks. Long-term follow-up has shown permanent success in more than 80 percent of aneurysms treated with coil embolization. Additional medical technologies, such as balloon assistance and microstenting are improving the success of treating brain aneurysms with coil embolization. Unfortunately, large aneurysms with wide necks remain a challenge.

Disclaimer:

This information is copied from the RadiologyInfo Web site (<http://www.radiologyinfo.org>) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at <http://www.radiologyinfo.org> to view or download the latest information.

Note: Images are shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

Copyright © 2009 Radiological Society of North America, Inc.
Send comments via email to: webmast2@rsna.org