Brain Embolizations

Embolization blocks the flow of blood and prevents brain aneurysms from bleeding. Embolization can also be used to block the flow of blood into arteriovenous malformations (AVMs), which are abnormal connections between blood vessels in the brain. AVMs may prevent oxygenated blood from completely circulating throughout the brain and can cause a variety of problems, including headache and weakness. Embolization treats brain aneurysms and AVMs previously thought inoperable and is much less invasive than open surgery.

Your doctor will instruct you on how to prepare, including any changes to your medication schedule. Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, allergies and medications you're taking, including herbal supplements and aspirin. You may be advised to start taking aspirin or other blood thinners several days prior to your procedure. You also may be told not to eat or drink anything after midnight before your procedure. Plan to stay at the hospital overnight. Leave jewelry at home and wear loose, comfortable clothing. You will be asked to wear a gown.

What is a brain embolization?

Embolization of brain aneurysms (http://www.radiologyinfo.org) and arteriovenous malformations (http://www.radiologyinfo.org) (AVM) is a minimally invasive treatment. These problems are typically identified in adults; however, aneurysms and AVMs can also occur in children.

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 artery wall, the resulting bleeding in the head may cause a stroke or death.

An AVM is an abnormal connection or passageway between the arteries and veins. AVMs 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/headache

In embolization procedures, doctors use image guidance to place material within the aneurysm, where it helps block the flow of blood and prevent rupture of the aneurysm. A stent may also be used. At times, patients may be required to take blood thinning medication after a brain embolization procedure. Your doctor will instruct you on what you will need to do after the procedure.

What are some common uses of the procedure?

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

How should I prepare for the procedure?

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Prior to your procedure, your doctor may test your blood to check your kidney function and to determine if your blood clots normally.

Your blood may also be tested to verify that you respond to blood thinners.

Tell your doctor about all the medications you take, including herbal supplements. List any allergies, especially to local anesthetic (http://www.radiologyinfo.org) , general anesthesia (http://www.radiologyinfo.org) , or contrast materials (http://www.radiologyinfo.org) .

Tell your doctor about recent illnesses or other medical conditions.

Women should always tell their doctor and technologist (http://www.radiologyinfo.org) if they are pregnant. Doctors will not perform many tests during pregnancy to avoid exposing the fetus (http://www.radiologyinfo.org) to radiation. If an x-ray is necessary, the doctor will take precautions to minimize radiation exposure to the baby. *See the Radiation Safety (https://www.radiologyinfo.org/en/info/safety-radiation) page for more information about pregnancy and x-rays.*

If your aneurysm has ruptured, you will be hospitalized for several days following your embolization procedure in order to prevent additional problems. If your aneurysm has not ruptured, you should plan to have a relative or friend drive you home after your procedure or the following day, depending on what your doctor recommends.

You should plan to stay overnight at the hospital for one or more days.

The nurse will give you a gown to wear during the procedure.

What does the equipment look like?

This procedure may use a catheter (http://www.radiologyinfo.org) , detachable coils, metallic stents, and a fast-acting glue.

A catheter is a long, thin plastic tube that is considerably smaller than a "pencil lead." It is about 1/8 inch in diameter.

There are three types of coils:

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

Metal stents are sometimes used to keep the coils inside the aneurysm.

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).

This procedure may use other equipment, including an intravenous (http://www.radiologyinfo.org) line (IV), ultrasound machine and devices that monitor 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 AVM. For aneurysms:

- one or more coils are inserted through the catheter and placed within the aneurysm, where it is anchored
- A stent may be placed in the artery across the aneurysm

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The body responds by healing around the coil(s), which helps block the flow of blood into the aneurysm, preventing it from rupturing or leaking. For AVMs, a similar catheter is placed at the point of abnormal connection between arteries and veins. A liquid adhesive agent is then injected to plug this connection. Other connections requiring similar treatment are then treated with additional catheters placed in their locations.

How is the procedure performed?

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

Prior to your procedure, computed tomography (http://www.radiologyinfo.org) (CT) or magnetic resonance imaging (http://www.radiologyinfo.org) (MRI) may be performed.

You will lie on the procedure table.

The doctor or nurse may connect you to monitors that track your heart rate, blood pressure, oxygen level, and pulse.

A nurse or technologist (http://www.radiologyinfo.org) will insert an intravenous (http://www.radiologyinfo.org) (IV) line into a vein in your hand or arm to administer a sedative. This procedure may use moderate sedation. It does not require a breathing tube. However, some patients may require general anesthesia (http://www.radiologyinfo.org) .

The nurse will sterilize the area of your body where the catheter is to be inserted. They will sterilize and cover this area with a surgical drape.

Your doctor will numb the area with a local anesthetic (http://www.radiologyinfo.org) . This may briefly burn or sting before the area becomes numb.

The doctor will make a very small skin incision at the site.

Using image-guidance, a catheter, a long, thin, hollow plastic tube, is inserted through the skin and advanced to the site of the aneurysm or AVM. The aneurysm or AVM is treated through the techniques described above.

When the procedure is complete, the doctor will remove the catheter and apply pressure to stop any bleeding. Sometimes, your doctor may use a closure device to seal the small hole in the artery. This will allow you to move around more quickly. No stitches are visible on the skin. The nurse will cover this tiny opening in the skin with a dressing.

The doctor or nurse will remove your IV line before you go home.

If your aneurysm or AVM ruptured and resulted in a stroke, you will need to remain in the hospital until you are recovered

If you were treated for an aneurysm or AVM that had not yet caused a problem, 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 the procedure?

The doctor or nurse will attach devices to your body to monitor your heart rate and blood pressure.

If you receive a general anesthetic (http://www.radiologyinfo.org) , you will be unconscious for the entire procedure. An anesthesiologist (http://www.radiologyinfo.org) will monitor your condition.

You will feel a slight pinch when the nurse inserts the needle into your vein for the IV line and when they inject the local

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anesthetic. Most of the sensation is at the skin incision site. The doctor will numb this area using local anesthetic. You may feel pressure when the doctor inserts the catheter into the vein or artery. However, you will not feel serious discomfort.

If you were treated for an aneurysm or AVM that had not yet caused an acute problem, you should be able to resume your daily activities after 24 hours.

If you were treated for a ruptured aneurysm or AVM, you may experience mild 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 injury 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, stents and flow diverters to close off an aneurysm is effective in prolonging life and relieving symptoms.
- Embolization is a treatment for cerebral (http://www.radiologyinfo.org) aneurysms and AVMs that previously were considered inoperable. This procedure is less invasive and requires significantly less recovery time than open surgery.
- No surgical incision is necessary—only a small nick in the skin that does not need stitches.

Risks

- Any procedure that penetrates the skin carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.
- Any procedure that places 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. The doctor will take precautions to mitigate these risks.
- There is always a chance that an embolic agent (http://www.radiologyinfo.org) can lodge in the wrong place and deprive normal tissue of its oxygen supply.
- There is a slight risk of death or illness. Embolization of unruptured aneurysms and AVMs carries less risk than treatment performed on an emergency basis. Approximately seven percent of cases require additional treatment or surgery.

What are the limitations of brain embolizations?

Durable effect: Recurrence depends on the coils' success or failure in controlling the "neck" of the aneurysm. 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 (http://www.radiologyinfo.org) , stenting (http://www.radiologyinfo.org) and flow diversion are improving the success of treating brain aneurysms by embolization. AVMs can be well treated through these embolization techniques, although continued checkups are required.

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