Interventional Radiology

Catheter Embolization
What is Catheter Embolization?

Embolization, a fairly new treatment method, is a way of closing, or at least drastically reducing blood flow to one or more blood vessels that are doing more harm than good. One of a variety of materials, depending on whether vessel closing is to be temporary or permanent, is passed through a catheter, its tip lying in or near the vessel to be closed. This approach can be used to control or prevent abnormal bleeding, as well as, to shut down the vessels that support a growing tumor. Therapeutic embolization may also serve to eliminate an arteriovenous malformation (AVM), an abnormal communication between an artery and a vein. The term "embolization" derives from embolus, which can be any object that circulates in the bloodstream until it lodges in a blood vessel—in this case, a synthetic material or medication specially designed to occlude the blood vessels.

What Are Some Common Uses Of The Procedure?

Catheter embolization may be used as the sole treatment, or may be combined with another method such as surgery or radiation. In some cases it is an emergency means of controlling bleeding until it is possible to deliver the final treatment.

- The most common use of catheter embolization is to control bleeding from injury, a tumor, a stomach ulcer or some other cause on an emergency basis. Controlling bleeding into the abdomen or pelvis from injuries caused in an auto collision is especially suitable for this approach.

- Occluding the blood vessels that feed a tumor can help control symptoms when the tumor cannot be removed or might be difficult and risky to remove, such as liver cancer. All tumors need a rich supply of blood to continue growing. After embolization a tumor may shrink, or it may continue to grow but more slowly than before.

- Fibroid tumors of the uterus, though not malignant (cancerous), may cause long-lasting menstrual periods or heavy menstrual bleeding. They also may produce pain in the pelvic area, the back or the legs, as well as pressure on the bladder or bowel. Embolization may prove to be an alternative to the standard treatment: surgical removal. Because fibroids have a large blood supply they will tend to shrink or even disappear if this blood supply is interrupted. Multiple fibroids can be treated in the same session.

- Embolization is used as an alternative to surgery for treating arteriovenous malformations (AVMs). Although these lesions may occur anywhere in the body, those in the brain or spinal cord often are treated by embolization because of potentially severe complications of
surgical treatment. When an artery and vein are connected it has caused a "short circuit" that prevents blood from going to where it is needed. Instead, it is pumped through the connection (shunt) and back to the heart. An AVM is a rare abnormality that may cause pain and loss of function; embolization may control these symptoms. It also has been used to plug the artery supplying an aneurysm (ballooning out of the artery wall) within the brain if, as is often the case, it is difficult to reach surgically.

- Hemangiomas are highly vascular tumors often found on the face, where they may deform and discolor the skin. Embolization is a sensible alternative to surgical removal, which may leave an unsightly scar.

**How Should I Prepare For The Procedure?**

At least one day before the procedure you will receive instructions from the Interventional Radiology team. You will have blood drawn at the hospital or at a local clinic to learn how well your kidneys are functioning and whether your blood clots normally. Caregivers will advise you if there is to be a change in your medication schedule. If embolization is for fibroid tumors, pelvic imaging by either ultrasound or magnetic resonance imaging (MRI) is a necessary first step. Occasionally other tests may have to be done to rule out cancer before undertaking embolization. You will be admitted to the hospital the morning of the procedure and examined by the Interventional Radiologist just before it begins. Do not eat or drink after midnight the morning before the procedure, unless specifically instructed otherwise. An Interventional Radiology nurse will contact you the day before the procedure with instructions.

**What Does The Equipment Look Like?**

The x-ray equipment and catheters are the same as those used for catheter angiography. A wide variety of materials are available to plug blood vessels. Some are intended to close only very small arteries or large ones, and some to close the vessels either temporarily or permanently.

Gelfoam™, a gelatin sponge material, is cut into small pieces that are injected into an artery and float downstream until they can go no further. This can block the artery for a few days or up to two weeks. Gelfoam is used to control bleeding until the cause (such as a bone fracture) can be identified and fixed, or until it has time to heal.

Permanent particulate agents, including Polyvinyl alcohol (PVA) and gelatin-impregnated cyanoacrylate spheres, are suspended in liquid and injected into the bloodstream to block small vessels. These agents are used to close vessels permanently. They are used to stop bleeding or block
arteries to a tumor when the underlying lesion is not likely to heal. This material is used to embolize uterine fibroid tumors.

Metal coils made of stainless steel or platinum may be used to close large arteries. They can be positioned very precisely to stop bleeding from an injured artery or halt arterial blood flow into an aneurysm. The coils come in a range of sizes, allowing the Interventional Radiologist to choose one that will exactly match the size of the artery.

Liquid sclerosing agents such as alcohols are used to purposefully destroy tissue. This might be desired to treat a large malformation of veins by filling it with the liquid to induce clotting and damage the inner lining of the veins. In successful cases the veins dry up and the malformation becomes much smaller.

Glue that starts out in a liquid form to penetrate small vessels and then hardens is the most effective embolic material for treating an arteriovenous malformation (AVM) in the brain.

**How Does The Procedure Work?**

Temporary embolic agents block blood vessels long enough (days to weeks) for the body to heal the underlying health problem. For example, after a car accident, Gelfoam embolization can stop internal bleeding. After several days, the body begins to heal the injury. By the time the Gelfoam dissolves, the healing process at the site of injury is far enough along to prevent rebleeding. Permanent embolic agents physically plug up blood vessels and cause scar tissue to form in the vessel that doesn't go away. This is important in treating arteriovenous malformation and tumors; in these cases, if the embolic agent were to dissolve, the problem would just recur. In all embolization procedures, the radiologist will inject contrast material into the vessel to measure the progress of the procedure and to show when embolization is complete.

Uterine fibroids and other types of tumors, like all tissues, depend on a steady supply of oxygen and nutrients that are carried by the arteries that feed them. Once the supply is cut off by embolization, the tissue starts to break down and, in successful cases, the tumor grows smaller or occasionally is eliminated.

**How Is The Procedure Performed?**

The first step is to perform angiography to locate the exact site of bleeding or abnormality. A sedative is injected through an intravenous line to help relax you. Some times a general anesthetic is given instead. The Interventional Radiologist will numb an area of the groin with a local anesthetic. A thin catheter is introduced through a very small incision into
the femoral artery, a large groin vessel, and guided by TV monitoring as close as possible to the area of abnormality. Contrast material then is injected and a series of x-rays are taken where even tiny thread-like vessels can be seen. An appropriate embolic material then is chosen and injected through the catheter to lodge at the treatment site. Repeat angiograms are done until bleeding is controlled or there is enough embolic material in a tumor or vascular malformation. At the end of the procedure the Interventional Radiologist removes the catheter and presses on the groin area for a short time to prevent bleeding, or uses devices to stop bleeding from the site of catheter insertion. You can expect to stay in bed for one to six hours afterwards.

When uterine fibroids are treated, the arteries serving the uterus are catheterized individually and embolic material is introduced. The procedure can cause pelvic pain, which is controlled during the procedure with intravenous medication. Fibroid embolization frequently requires overnight hospitalization.

If you are treated by embolization for an intracranial arteriovenous malformation (AVM), a small test injection of embolic material is done first and neurological function is tested to make sure that no important brain area will be damaged. Each vessel feeding the AVM then is injected. Large AVMs may require multiple embolization procedures on separate days for complete treatment. For example, two or three treatments may be given at intervals of two to six weeks.

What Will I Experience During The Procedure?

The intravenous (IV) sedative/analgesic will make you feel relaxed and sleepy and you may nod off for brief periods, but generally will remain awake throughout the procedure. You may feel slight pressure when the catheter is inserted, but no serious discomfort. Most patients experience some side effects after embolization. Pain is the most common, and can readily be controlled by oral or intravenous medication. It occurs because the oxygen supply to the treated area is cut off. Women who have embolization of fibroid tumors may have severe pain or cramps, not during the procedure but for eight to 12 hours afterward. Occasionally pain continues for as long as three or four days and may require IV treatment in the hospital. Mild headache may follow embolization of an intracranial arteriovenous malformation (AVM). Most patients leave the hospital within 24 hours of the procedure, but those who have considerable pain may have to stay for up to 48 hours. A majority of patients can resume their normal activities within a week. You may or may not remember some things about the procedure. Your Interventional Radiologist will want to check your condition six weeks after embolization and again after three months and six months.
About one in five patients treated for fibroids will develop what is called post-embolization syndrome, which consists of fever (up to 102° F) that may be accompanied by loss of appetite and nausea or vomiting. The syndrome may occur after any embolization procedure, but is more prone to develop when a solid tumor is embolized. The symptoms usually resolve within three days, though they sometimes last longer and require medication. These symptoms are the body's reaction to breakdown products from the fibroid tumors, and are most common when very large tumors are embolized.

**Who Interprets The Results And How Do I Get Them?**

The Interventional Radiologist can advise you as to whether embolization was a technical success when the procedure is completed. In cases of bleeding, it may take 24 hours to know whether it has stopped. After embolization of a tumor, uterine fibroids, or arteriovenous malformation (AVM), one to three months may have to pass before it is clear whether symptoms have been controlled or eliminated.

**What Are The Benefits vs. Risks?**

**Benefits**
- Embolization is a highly effective way of controlling bleeding, especially in an emergency situation.
- Embolization is much less invasive than conventional open surgery. As a result, there are fewer complications and the hospital stay is relatively brief—often only the night after the procedure. Blood loss is less than with traditional surgical treatment, and there is no obvious surgical incision.
- This method can be used to treat tumors and vascular malformations that either cannot be removed surgically, or would involve great risk if surgery was attempted.
- When embolization is used to treat an intracranial arteriovenous malformation (AVM), it is possible to be sure that permanent treatment, by injecting a small amount of material, will not cause serious brain dysfunction.

**Risks**
- There is always a chance that an embolus can lodge in the wrong place and deprive normal tissue of its oxygen supply. If this happens when treating an arteriovenous malformation (AVM) in the brain, a stroke may result.
There is a risk of infection after embolization, even if an antibiotic has been given.

Because angiography is part of the procedure, there is a risk of an allergic reaction to contrast material.

Because angiography is part of the procedure, there is a risk of kidney damage in patients with diabetes or other pre-existing kidney disease.

**What Are The Limitations Of Catheter Embolization?**

Technically successful embolization without injuring normal tissue requires that the catheter be placed in a stable position. This means that the catheter tip is situated so that embolic material can be deposited only in vessels serving the abnormal area. In a small percentage of cases, the procedure is not technically possible. Whether clinical success is achieved depends on many factors, including the size of a tumor, the location of an arteriovenous malformation (AVM), and how the patient views the outcome. Several sessions of embolization may be needed to reduce symptoms from an AVM.

**What Is An Interventional Radiologist?**

Interventional Radiologists are physicians who specialize in minimally invasive, targeted treatments performed using imaging guidance. They use their expertise in reading X-rays, ultrasound, MRI and other diagnostic imaging equipment to guide tiny instruments such as catheters, through blood vessels or through the skin to treat diseases without surgery. Interventional Radiologists are board-certified and fellowship trained in nonsurgical invasive interventions using imaging guidance. The American Board of Medical Specialties certifies their specialized training. Your Interventional Radiologist will work closely with your primary caregiver or other physicians to be sure you receive the best possible care.
Your (test/procedure)________________________________________________

is scheduled on (date)_______________________________________________

at (time)_____________________, (location) __________________________

Helpful tips:

■ Wear comfortable clothes.

■ Bring someone with you to drive you home after the procedure if you
  are not going to be admitted to the hospital.

■ Leave all items such as cash, jewelry, credit cards and other valuables
  at home.

■ Bring all your medications.

■ Bring all necessary insurance information.

Notes: __________________________________________________________

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If unable to keep this appointment, kindly give 24 hours notice by calling
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