

## Treating Arteriovenous Malformations

### *How to prepare and what to expect*

*This handout explains an arteriovenous malformation (AVM) in the brain and how it is treated. It includes how to prepare for AVM surgery, what to expect during the procedure, and self-care at home.*

### What is an arteriovenous malformation?

*Arteriovenous* refers to arteries and veins. An *arteriovenous malformation* (AVM) is an abnormal tangle of these blood vessels. Blood cannot flow normally through an AVM. The blood that goes to an AVM flows directly from the arteries into the veins and does not go into the brain tissue.

Arteries usually have a higher blood pressure than veins. When blood flows directly into the veins from the arteries, it puts great pressure on the veins.

This pressure can cause AVMs to *rupture* (burst). About 2 to 4% of people (2 to 4 out of 100 people) who have an AVM may have a *hemorrhage* (bleeding) during any one year.

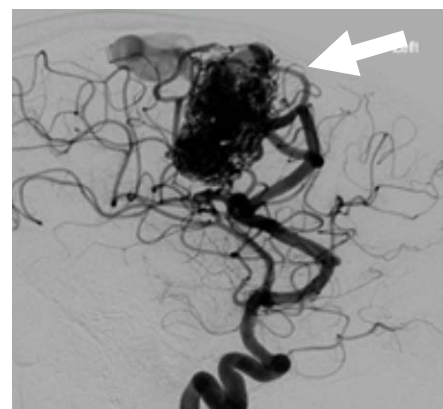
An AVM can form anywhere in the body, including in the brain. Most times, the AVM has been present since birth.

AVMs in the brain can cause headaches, stroke, seizures, and other health problems. Because of these risks, we often advise that someone with an AVM in their brain have it assessed.

### How is an AVM in the brain treated?

The type of treatment that will work best for you depends on:

- Your symptoms
- Where the AVM is
- The size and shape of the blood vessel cluster



*The arrow in this picture points to an AVM.*

Treatment for a brain AVM can include one or more of these options:

<p><b>Endovascular Embolization</b></p> <p>In this procedure, a <i>catheter</i> (thin, flexible tube) is guided through the blood vessels to the brain. When the catheter reaches the AVM, a liquid adhesive called <i>Onyx</i> is sent through the catheter to seal off parts of the AVM. This procedure reduces blood flow to the AVM. It is often done before open surgery or gamma knife radiosurgery, to lower the risk of problems.</p>	<p><b>Open Surgery</b></p> <p>In this surgery, the AVM is physically removed from the brain through an opening created in the skull. The surgeon uses a high-powered microscope and other special instruments to carefully remove the AVM.</p>	<p><b>Gamma Knife Radiosurgery</b></p> <p>In this treatment, radiation is focused directly on the AVM. On the day of treatment, new imaging studies (angiogram and MRI) are done. These studies, and a special head frame, are used to exactly target the AVM with radiation. It may take up to 2 to 3 years to see the results of this treatment. This option is often used when a patient cannot have open surgery.</p>
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## How do I prepare for treatment?

### Clinic Visit

You will come to the clinic for a visit. You will meet with:

- A **nurse**, who will give you information and instructions
- A **pre-anesthesia nurse**, who will talk with you about the medicines that will be used during your treatment
- The **Neurosurgery Team**, who will answer any questions you have about the treatment
- Your **patient care coordinator**, who will make sure you have all your follow-up visits scheduled before your treatment day

### Day Before Your Treatment

A nurse will call you to review your instructions. The nurse will:

- Review your medicines and tell you if you need to stop taking any of them before your treatment
- Ask if you have allergies to medicines, *contrast* (X-ray dye), or shellfish
- Remind you what you can and cannot eat and drink in the hours before your treatment

### Treatment Day

#### At Home

- Up until **8 hours** before you arrive at the hospital, eat a healthy, balanced diet and drink liquids as usual.
- Up until **6 hours** before you arrive at the hospital, you may eat a light meal and drink liquids as usual. Avoid heavy or fatty foods.

- **Starting 6 hours** before you arrive at the hospital, do not eat anything. We advise you to drink clear liquids such as water, plain tea or coffee (no milk or creamer), clear broth, Gatorade, soda, apple juice, or Boost Breeze liquid supplement.
  - **If you have diabetes:** Avoid juice, regular soda, and sports drinks, since they can raise your blood sugar levels. Instead, drink clear liquids such as water, plain tea or coffee (no milk or creamer), clear broth, and diet soda.
- **Starting 2 hours** before you arrive at the hospital, do not eat or drink anything, unless your doctor or nurse has told you otherwise.
- If you must take medicines, take them with **only** a small sip of water.

***At the Hospital***

- Check in at Surgery on the ground floor of the Maleng Building at Harborview Medical Center.
- A nurse will greet you and help prepare you for your treatment.
- An escort will take you on a stretcher to meet the Anesthesia Team.
- The Neurosurgery Team will review the consent forms with you. You will sign the forms if you have not already done so.
- An *intravenous* (IV) line will be placed in a vein in your arm.
- You will receive a *sedative* (medicine to help you relax) through the IV.
- You will be taken into the operating room.
- You will be given *general anesthesia*. This medicine will make you sleep during your treatment.

**What happens during treatment?**

*If you are having gamma knife radiation, you will receive other handouts that explain your treatment.*

<p><b>Endovascular Embolization</b></p> <ul style="list-style-type: none"> <li>• A catheter will be inserted into your <i>femoral artery</i> (blood vessel in your thigh). Your doctor will use X-ray images to safely guide the catheter to the AVM.</li> <li>• Through this tube, smaller catheters will be placed into the arteries that supply blood to the AVM. Onyx will be sent through the catheters to seal off the AVM.</li> <li>• Your procedure will last about 4 to 6 hours.</li> </ul>	<p><b>Open Surgery</b></p> <ul style="list-style-type: none"> <li>• An incision will be made in your scalp.</li> <li>• Your neurosurgeon will drill a small hole in your skull and use a special drill to remove a bone flap. This will allow access to the brain and the blood vessels in the area.</li> <li>• A high-powered microscope will be used to magnify and light the area. Special instruments will be used to remove the AVM.</li> <li>• The bone flap will then be replaced using a small titanium metal clip and brackets. The clip and brackets will stay in your body. They are safe for MRI scans and do not set off metal detectors.</li> <li>• Your surgery will last about 4 to 6 hours.</li> </ul>
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## What happens after treatment?

- After your treatment, you will be taken to Recovery. You will spend about 1 to 2 hours in Recovery while waking up from the anesthesia.
- You will then be taken to the Neuro Intensive Care Unit (ICU). Your friends and family can visit you there.
- If you had:
  - Only an **endovascular embolization**, you will stay overnight in the hospital and go home the next day.
  - **Open surgery**, you will have a follow-up *angiogram* (an X-ray of your blood vessels) the next day. This exam will show if all of the AVM has been removed. You will most likely stay in the hospital 3 to 5 days.
- When you are ready to leave the hospital, you must have a responsible adult with you. This adult may drive you, or ride with you in a bus or taxi.

## What can I do to recover quickly?

### Follow-up Call

We want to help you recover quickly after your treatment. A nurse will call you after you leave the hospital to ask how you are doing and answer your questions.

### How to Speed Your Recovery

- Walk often. It is OK to walk up and down stairs.
- For mild to moderate pain, you may take *non-steroidal anti-inflammatory drugs* (NSAIDs) such as ibuprofen (Advil, Motrin) or naproxen (Aleve, Naprosyn). Follow dose instructions on the bottle.
- If you had **open surgery**:
  - Do **not** shower for 4 to 5 days after your surgery.
  - Do **not** take a bath until your incision is fully healed.

## What can I expect after my treatment?

If you are having gamma knife radiation, you will receive other handouts that tell what you can expect.

### Endovascular Embolization

#### Normal symptoms:

- Bruising and tenderness in your groin area. This should go away after a few days.
- Short-term hair loss. Your hair will grow back.
- A dull headache for 1 to 2 weeks.

#### For 7 days:

- Do **not** do any deep knee bending.
- Do **not** do strenuous exercise (anything that increases your heart rate or makes you breathe hard).
- Do **not** lift anything that weighs more than 10 pounds. (A gallon of milk weighs almost 9 pounds).

### Open Surgery

#### Normal symptoms:

- Numbness at the incision site. This can last up to 1 year
- Tenderness around your incision for several weeks.
- A dull headache for 1 to 2 weeks.
- A small bald spot where your hair was shaved for the surgery. Your hair will grow back.

#### For 2 weeks:

- Do **not** bend over at the waist. This avoids putting pressure on your head.
- Do **not** strain when having a bowel movement.
- Do **not** do heavy exercise (anything that increases your heart rate or makes you breathe hard).
- Do **not** lift anything that weighs more than 10 pounds. (A gallon of milk weighs almost 9 pounds.)

#### Follow-up visits:

- Your incision will be closed with staples or sutures. These will need to be removed 14 days after surgery. This can be done by your primary care provider (PCP) or at the Neurosurgery clinic.
- You will have a follow-up visit with your surgeon 6 weeks after surgery. You will have a *computed tomography* (CT) scan right before your appointment.
- You will have another follow-up visit 1 year after surgery. You will have an angiogram and *magnetic resonance imaging* (MRI) scan before this visit. These scans will show how your treatment is working.

## When to Call 911

- If you had an embolization, **call 911 right away** if you:
  - Start to bleed at the incision site. Apply constant pressure while you wait for help to arrive.
  - Develop a lump at the groin area.
- If you had either an embolization or open surgery, **call 911 right away** if you have any stroke-like symptoms such as:
  - Weakness or loss of feeling
  - Problems talking
  - Problems walking
  - Problems seeing
  - Severe headache that starts suddenly

### Questions?

Your questions are important. Call your healthcare provider if you have questions or concerns.

Weekdays from 8 a.m. to 4 p.m., call 206.744.9340 and press 2 to talk with a clinic nurse.

After hours and on holidays and weekends, call the Community Care Line (24-hour nurse): 206.744.2500 or toll-free 800.607.5501.