

# What you should know about Aneurysms



A Patient's Guide to  
Endovascular Therapy:  
Embolization of Aneurysms

## What are “strokes” and “TIA’s”?

Like all parts of the body, the brain is composed of living cells that require a blood supply to provide oxygen and nutrients. The term **stroke** includes any disease process that kills cells in any region of the brain. A stroke can cause different symptoms, depending on which part of the brain is hurt. Some regions of the brain can die and yet the patient will have no symptoms at all. Other areas of the brain are more important and even a tiny stroke in these locations can cause severe disabilities, including difficulty with speech, blindness, paralysis of an arm or leg or even death.

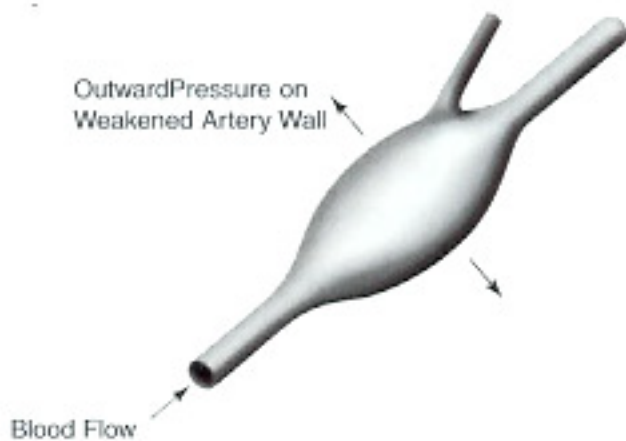
Blockage or rupture of blood vessels supplying parts of the brain cause most strokes. When a blood vessel becomes blocked, the part of the brain served by that vessel doesn't receive enough oxygen-containing blood. If the blockage lasts long enough, brain cells die and a stroke results. Doctors call this an **ischemic infarct**. However, if the blockage is temporary the blood supply may not be interrupted long enough to cause cell death. This temporary blockage causes short-term symptoms usually lasting only minutes or hours. Called mini-strokes or TIA's (short for **transient ischemic attacks**), these attacks are a sign of a serious problem that can lead to a permanent stroke if the problem isn't treated.

Even if some cells are permanently damaged in a stroke, other cells in the surrounding area sometimes take on the function of the dead cells. This is why some stroke patients eventually recover some or all of their abilities.

**Hemorrhage** is the other common cause of a stroke. Hemorrhage refers to bleeding into the brain, usually because of a problem with a blood vessel. The problem is often an aneurysm.

### What is an aneurysm?

An **aneurysm** is an abnormal bulging outward of an artery's wall. The wall may smoothly bulge outward in all directions ("fusiform" aneurysm, see figure 1) or it may



*figure 1: fusiform aneurysm*

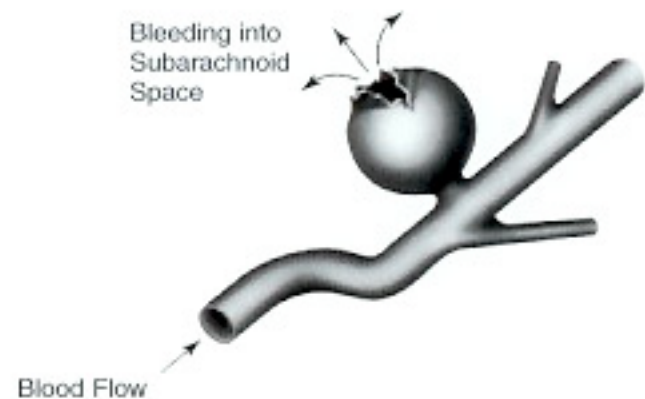
form a sac arising from one wall ("saccular" aneurysm, see figure 2). Aneurysms can occur in any artery of the body, but only those affecting the arteries supplying the brain can cause a stroke. Aneurysms cause problems in several different ways. If the aneurysm ruptures (figure 3), blood flows into the brain or into a space closely surrounding the brain called **subarachnoid space**. It has been estimated that in the U.S. between 12,000 and 28,000 people suffer such "aneurysmal subarachnoid hemorrhages" every year. A patient with a subarachnoid hemorrhage usually suffers "the worst headache of his/her life" followed by nausea and vomiting. Double vision, neck stiffness and loss of consciousness are also common.

Aneurysmal subarachnoid hemorrhage is a medical emergency. 10-15% of these patients will die before reaching the hospital. Over half will die within the first thirty days after the hemorrhage. Of the survivors, approximately



*figure 2: saccular aneurysm*

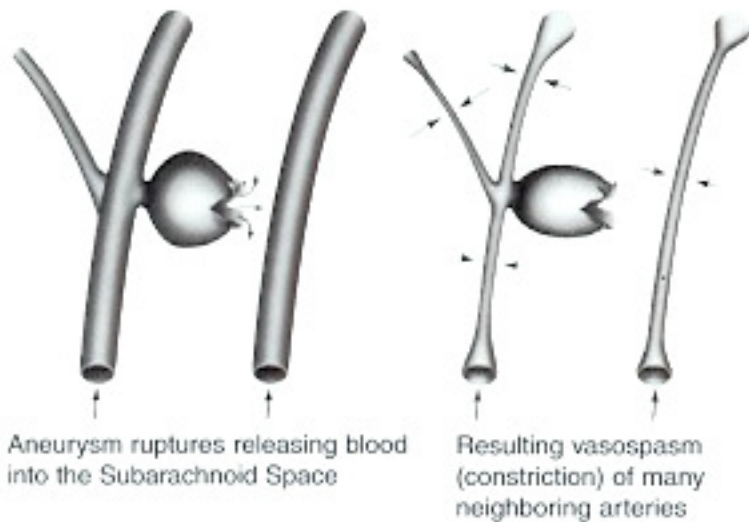
half will suffer a permanent stroke. Strokes caused by subarachnoid hemorrhage often occur one to two weeks after the hemorrhage itself. This happens because the blood from the hemorrhage irritates the blood vessels on the surface of the brain, causing them to close ("**vasospasm**", see figure 4).



*figure 3: aneurysm rupture*

Vessels in vasospasm have difficulty supplying the brain with enough blood. Treatment of patients with ruptured aneurysms usually consists of trying to prevent vasospasm, trying to help vessels in vasospasm maintain blood flow to the brain, and blocking off the aneurysm so that it will not bleed again.

Less commonly, aneurysms cause problems not related to bleeding. An aneurysm can form a blood clot within it which can break away and be carried downstream until it obstructs a small arterial branch, causing either a stroke or mini-stroke. An aneurysm can also press against nerves (resulting in paralysis or abnormal sensation of one eye or the face) or the adjacent brain (resulting in seizures). Your doctor may suggest an **arteriogram** if an aneurysm is suspected.



*figure 4: vessel in vasospasm*

## What is an arteriogram?

An arteriogram (also called an angiogram) is a diagnostic study, usually performed by a radiologist to assist in determining the cause of a stroke and the treatment alternatives. A very thin, flexible tube called a **catheter** is introduced into an artery (usually at the groin) and then steered through the blood vessels of the body to the artery involved by the aneurysm (figure 5). This is performed in an angiography suite, using x-rays to see the position of the catheter. A liquid containing water and iodine salts ("**contrast**") which can be seen on x-rays is injected through the catheter and x-ray

images are taken. This gives detailed pictures of the location, size and shape of the aneurysm as well as a map of the arterial tree from which



*figure 5: catheter introduced at the groin*

it arises. With this information, a decision will be made by you and your doctors as to how that particular aneurysm should be treated.

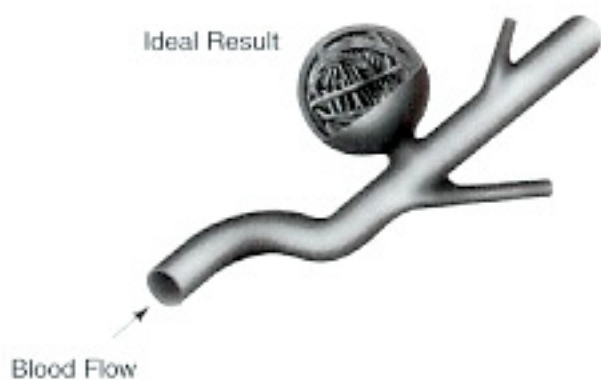
## How are aneurysms treated?

Aneurysms can be treated from outside the blood vessel using surgical techniques or from inside the vessel using endovascular techniques.

A surgical approach requires creating an opening in the skull through which the surgeon's instruments can enter. The surgeon can then place a clip across the neck of the

aneurysm, preventing arterial blood from entering it. If there is a clot in the aneurysm, the clip also prevents the clot from entering the artery and possibly causing a stroke. Surgery is the most common treatment for aneurysms.

In contrast to surgery, **endovascular** treatment of an aneurysm is performed in the angiography suite with a catheter similar to that used during the arteriogram. Through the catheter, the aneurysm is packed with material that doesn't allow arterial blood to flow into it. This technique is called **embolization**. Materials used for aneurysm embolization include platinum coils (figure 6).



**figure 6: aneurysm embolization with coils**

Sometimes the size, shape or location of an aneurysm make both surgical clipping and endovascular embolization impossible. In these cases your doctor may choose to block off (occlude) the artery itself. This can be performed by either surgical or endovascular methods. In either approach, this would be done after a preliminary test **occlusion** determines that permanent occlusion of the artery won't cause other problems.

## Who performs endovascular embolization procedures?

The endovascular treatment of aneurysms is a relatively new procedure and requires specialized training. Most endovascular therapists are neuroradiologists or neurosurgeons who have completed additional training, ranging from one to three years, in endovascular techniques.

## What is the endovascular embolization procedure like?

The patient may either already be in the hospital or may arrive the night before or morning of the embolization. The patient will be asked not to eat anything after midnight the night before the procedure. Aneurysm embolization procedures can be performed under general anesthesia or under light sedation. The procedure may last only a few hours, or it may last the greater part of a day. This is often not predictable, and family members should not be frightened simply because a case takes longer than expected.

After the procedure is completed the patient will need to remain still, lying flat on his/her back for up to eight hours. This rest period allows the needle hole in the groin artery to heal. The patient usually remains under observation in the hospital for at least one more day before returning home. Longer stays are common, depending on the patient's condition.

## **Will all symptoms go away after the aneurysm is embolized? Will any other visits to the doctor be necessary?**

It is important to understand that the embolization procedure does not repair areas of brain already injured by a stroke. It is performed to prevent the aneurysm from causing injury to other areas in the future. A patient who has had a severe stroke may continue to need intensive medical care even after the aneurysm has been embolized.

Most patients will also need to return for a follow-up arteriogram, usually performed several months after the embolization procedure. This is to make sure that the aneurysm is completely embolized and has not grown larger. Occasionally these follow-up studies show that a second or third embolization procedure is needed to completely cure the aneurysm.

## **How do you get an aneurysm? Are they hereditary? Should family members be tested?**

Aneurysms are usually the result of abnormal blood flow patterns within an artery. As the blood pulsates against an area of the vessel wall, the wall begins to bulge outwards. This process usually takes years, and aneurysms in children are extremely rare. High blood pressure can contribute to the formation of some aneurysms. Diseases which weaken arterial walls are uncommon causes of aneurysms. The majority of aneurysms, however, are isolated problems. They are not due to any disease, they are not hereditary and family members are not at increased risk.

**aneurysm:** *abnormal bulging of an artery's wall*

**arteriogram:** *(also called an angiogram) is a diagnostic study that gives detailed pictures of the body's blood vessels*

**catheter:** *a thin, flexible tube that is injected with a contrast material so vessels can be visualized on an x-ray image*

**contrast:** *water and iodine salts that can be injected into vessels and seen on x-ray*

**embolization:** *blockage of an aneurysm or a blood vessel so blood no longer flows through it*

**endovascular:** *occurring within blood vessels*

**hemorrhage:** *bleeding in the brain*

**ischemic infarct:** *one type of stroke, it is caused by blockage of a vessel supplying oxygen-rich blood to a region of the brain*

**occlusion:** *blockage of a vessel*

**stroke:** *any disease process which results in the death of cells in any region of the brain*

**subarachnoid space:** *the space closely surrounding the brain*

**TIA- transient ischemic attack:** *(also known as a mini-stroke) a temporary interruption of the blood supply which does not cause death of brain cells*

**vasospasm:** *abnormal narrowing of arteries due to irritation by blood in the subarachnoid space. Vasospasm often develops one to two weeks after an aneurysm ruptures*

## **Is it possible for brain aneurysm patients to obtain support contacts and more information?**

Yes, the Brain Aneurysm Foundation, a nonprofit organization, offers a support network, educational materials and information on the Internet for brain aneurysm patients. For more information, contact:

The Brain Aneurysm Foundation, Inc.  
66 Canal Street  
Boston, MA 02114

Telephone (617) 723-3870  
Fax (617) 723-8672

Internet information can be accessed on  
Netscape/Worldwide Web by way of the M.G.H.  
Neurosurgical Homepages.  
<http://neurosurgery.mgh.harvard.edu/vaschome.htm>

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