

The Basics of Brain Aneurysms: A Guide for Patients

In the last six months, two prominent political figures with brain aneurysms have been featured in the news headlines. Democratic Vice-Presidential nominee Joseph Biden underwent treatment in 1988 for his aneurysm. Tragically, at the age of 58, United States Congresswoman Stephanie Tubbs Jones died in August 2008 from a ruptured brain aneurysm. Given the recent national spotlight, neurologists, neurosurgeons and nurses may find their patients have many questions about the condition. The following serves as a resource for patient-specific information regarding the basics of brain aneurysms.

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What is a brain aneurysm?

A brain aneurysm is a weak or thin spot on a blood vessel wall in the brain that balloons out and fills with blood. Often this wall is weakened by disease, injury or an abnormality present at birth. Aneurysms are not always life-threatening, but serious consequences can result if one bursts (ruptures) in the brain, spilling blood into the surrounding tissue. Rupture can cause serious complications including stroke, permanent nerve damage, or death. After rupture, an aneurysm may burst again and re-bleed into the brain, and additional aneurysms may also occur. More commonly, rupture may cause a subarachnoid hemorrhage—bleeding into the space between the skull bone and the brain. A serious complication of subarachnoid hemorrhage is hydrocephalus, in which the excessive buildup of cerebrospinal fluid in the skull ultimately leads to dangerous swelling and pressure on the brain.

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What causes brain aneurysms?

Most aneurysms are acquired. However, they are more common in people with certain genetic diseases, such as connective tissue disorders and polycystic kidney disease, and certain circulatory disorders. Other causes include trauma or injury to the head, high blood pressure, infection, tumors, atherosclerosis (a blood vessel disease in which fats build up on the inside of artery walls) and other diseases of the vascular system, cigarette smoking, and drug abuse.

Saccular



Fusiform



Fusiform aneurysms are less common. They consist of an outpouching of the arterial wall. There is no stem.

Saccular aneurysms are the most common type of aneurysm. They are also known as “berry-aneurysms” because of their shape. They consist of a neck, a stem, and a dome.

What are the symptoms?

Most cerebral aneurysms do not show symptoms until they either become very large or burst. Small, unchanging aneurysms generally will not produce symptoms, whereas a larger aneurysm that is steadily growing may press on tissues and nerves. Table 1 provides a list of symptoms that a patient may experience.

How are aneurysms detected?

Most cerebral aneurysms go unnoticed until they rupture or are detected by brain imaging that may have been obtained for another condition. Whether someone was brought to the hospital unconscious from a rupture or is waiting to undergo treatment for an unruptured aneurysm, similar detection methods are used to pinpoint the location, size, type, and any other characteristics of the aneurysm that will help the doctors make the best decisions about how to move forward. The available diagnostic methods are as follows:

- CT Scan (Computed Tomography): This scan takes a picture of the brain. A fast and painless test, a CT scan requires the patient

Table 1. Summary of common symptoms of unruptured and ruptured aneurysms.

Unruptured aneurysms	Ruptured aneurysms
Dilated pupil	Headache, typically of acute onset, maximal at onset and severe
Double or blurred vision	Nausea, vomiting
Headaches	Neck stiffness
Pain above or behind the eye	Transient loss of consciousness
Numbness or weakness of one side of the face	Sensitivity to light

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to lie still on their back while being pushed into a large, tubular machine that creates the images. This test shows whether any blood has leaked around or into the brain.

- **CTA (Computed Tomographic Angiography):** In some cases, doctors may choose to do a CT angiography. This test combines a regular CT scan with a contrast dye injected into a vein. Once the dye is injected into a vein, it travels to the brain arteries, and images are created using a CT scan. These images are more enhanced, because it will show exactly how fluid (blood or dye) is flowing into the brain arteries, alerting doctors to a potential aneurysm or rupture.
- **MRI (Magnetic Resonance Imaging):** A brain MRI is a safe, painless diagnostic scan. Through the use of a large doughnut-shaped magnet and a computer, magnetic signals are seen through a computer as radio waves. The computer is able to transform these radio waves into images. An MRI helps locate the aneurysm.
- **MRA (Magnetic Resonance Angiography):** This scan combines a regular MRI with the contrast dye, which is injected into a major vein. Like the CTA, this dye travels to the brain arteries, and images are created using an MRI. This creates a more enhanced image
- **Angiogram (Arteriogram):** This test allows doctors to see the size, shape, and location of the aneurysm, and it also reveals potential vasospasm. A small incision is made on one side, or both sides, of the groin after the skin is locally numbed and prepped. Then, a thin tube (catheter) is threaded through arteries from the groin to the neck. A contrast dye is injected and as it travels through the brain arteries, X-rays are taken, showing all the arteries and any abnormalities, such as an aneurysm.

How are aneurysms treated?

With important medical advances throughout the neurosurgical, neurological and endovascular fields, treatment for brain aneurysms is more promising than it was several years ago.

There are more effective and less invasive treatment options for patients, who in years past, would have been told they had inoperable aneurysms. Doctors consider several factors when deciding which treatment option is best for a particular patient. These include size, location, and type of aneurysm; ruptured versus unruptured; condition of the patient; and medical history.

Two surgical and one endovascular (within the blood vessel) options are available for treating brain aneurysms, all of which carry some risk to the patient (such as possible damage to other blood vessels, the potential for aneurysm recurrence and re-bleeding, and the risk of post-procedure stroke).

Options are described below:

Microvascular clipping involves cutting off the flow of blood to the aneurysm. Under anesthesia, a section of the skull is removed and the aneurysm is located. The neurosurgeon uses a microscope to isolate the blood vessel that feeds the aneurysm and places a small, metal, clothespin-like clip on the aneurysm's neck, halting its blood supply. The clip remains in the

patient and prevents the risk of future bleeding. The piece of the skull is then replaced and the scalp is closed. Clipping has been shown to be highly effective, depending on the location, shape, and size of the aneurysm. In general, aneurysms that are completely clipped surgically do not return.

A related procedure is **parent vessel occlusion**, in which the surgeon clamps off (occludes) the entire artery that leads to the aneurysm. This procedure is often performed when the aneurysm has damaged the artery. An occlusion is sometimes accompanied by a bypass, in which a small blood vessel is surgically grafted to the brain artery, rerouting the flow of blood away from the section of the damaged artery.

Endovascular embolization is an alternative to surgery. Once the patient has been anesthetized, the doctor inserts a hollow plastic tube (a catheter) into an artery (usually in the groin) and threads it, using angiography, through the body to the site of the aneurysm. Using a guide wire, detachable coils (spirals of platinum wire) or small latex balloons are passed through the catheter and released into the aneurysm. The coils or balloons fill the aneurysm, block it from circulation, and cause the blood to clot, which effectively obliterates the aneurysm. The procedure may need to be performed more than once during the patient's lifetime.

What is the prognosis?

An unruptured aneurysm may go unnoticed throughout a person's lifetime. A burst aneurysm, however, may be fatal or could lead to hemorrhagic stroke, vasospasm (the leading cause of disability or death following a burst aneurysm), hydrocephalus, coma, or short-term and/or permanent brain damage. The prognosis for persons whose aneurysm has burst is largely dependent on the age and general health of the individual, other preexisting neurological conditions, location of the aneurysm, extent of bleeding (and re-bleeding), and time between rupture and medical attention. It is estimated that about 40 percent of patients whose aneurysm has ruptured, do not survive the first 24 hours; up to another 25 percent die from complications within 6 months. Patients who experience subarachnoid hemorrhage may have permanent neurological damage. Other individuals may recover with little or no neurological deficit. Early diagnosis and treatment are important.

Can anything be done to prevent brain aneurysms?

There are no known ways to prevent a cerebral aneurysm from forming. People with a diagnosed brain aneurysm should carefully control high blood pressure, stop cigarette smoking, and avoid cocaine use or other stimulant drugs. Women should check with their doctors about the use of oral contraceptives. Patients should also consult with a doctor about the benefits and risks of taking aspirin or other drugs that thin the blood.

Sources:

- American Heart Association
- Brain Aneurysm Foundation
- National Institute of Neurological Disorders and Stroke