

Ruptured Aneurysms basic level

Overview

An aneurysm is a balloon-like bulge or weakening of an arterial wall. As an aneurysm enlarges it puts pressure on surrounding structures, causing headache or vision problems, and may eventually rupture. The rupturing of an aneurysm releases blood into the spaces around the brain causing a subarachnoid hemorrhage (SAH), a type of stroke and a life-threatening situation. Treatment options for ruptured aneurysms include surgical clipping, coiling, and bypass.

What is an aneurysm?

An aneurysm is a balloon-like bulge or weakening of an arterial wall. As the bulge grows it becomes thinner and weaker. It can become so thin that the blood pressure within it can cause it to burst or leak. Most aneurysms develop from a weakness or abnormal artery wall. Aneurysms usually occur on larger blood vessels where an artery branches. Approximately 80% of aneurysms form in the front (anterior circulation) of the brain, while 20% form in the back (posterior circulation) of the brain (see Anatomy of the Brain). Types of aneurysms include (Fig. 1):

- **Saccular** - (most common, also called "berry") the aneurysm bulges from one side of the artery and has a distinct neck at its base.
- **Fusiform** - the aneurysm bulges in all directions and has no distinct neck.
- **Giant** - may be saccular or fusiform and measures more than 2.5 cm in diameter; the neck is often wide and may involve more than one artery.
- **Traumatic** – caused by a closed head injury or penetrating trauma.

What are the symptoms?

Most aneurysms don't have symptoms (asymptomatic) until they rupture. Ruptured aneurysms release blood into the spaces around the brain called a subarachnoid hemorrhage (SAH). Unruptured aneurysms rarely show symptoms until they grow large or press on vital structures. Rupture usually occurs while a person is active rather than asleep. If you experience the symptoms of a SAH, call 911 immediately!

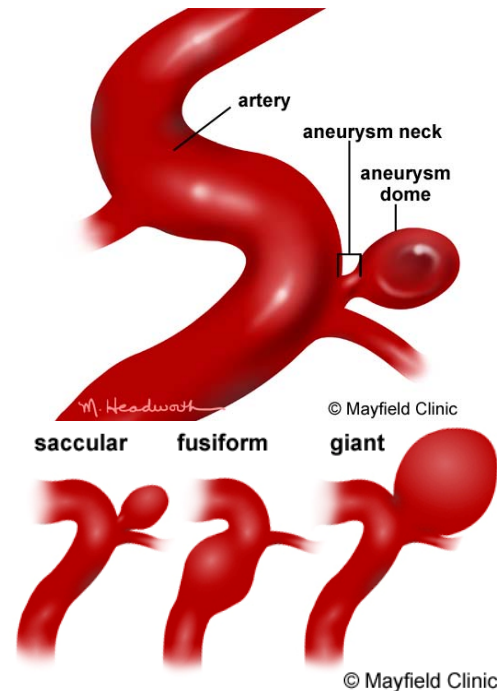


Figure 1. Anatomy of an aneurysm (above). Different types of aneurysms (below).

Symptoms of a ruptured aneurysm (SAH)

- Sudden onset of a severe headache (described as "worst headache of my life")
- Nausea and vomiting
- Stiff neck
- Transient loss of vision or consciousness

Subarachnoid hemorrhage (SAH)

Subarachnoid hemorrhage is life-threatening - with a 50% risk of death. When a ruptured aneurysm releases blood into the subarachnoid space it increases pressure on the brain making the person confused and lethargic. The area of brain that artery supplied is now deprived of blood - called a stroke. The pool of blood may form a clot (hematoma), which can irritate and damage surrounding brain cells.

Risk factors for aneurysmal SAH currently being studied are smoking, high blood pressure, alcohol, genetic (family inherited), atherosclerosis (hardening of the arteries), oral contraceptives, and lifestyle.

Who is affected?

Approximately 5% of the population may have or acquire an aneurysm; of those, 20% have multiple aneurysms. Unruptured aneurysms are more common (2.7 million per year) than ruptured (20,000 per year). However, 85% of aneurysms are not diagnosed until after they rupture. Aneurysms are usually diagnosed between ages 35 to 60 and are more common in women.

How is a diagnosis made?

Whether you or a loved one was brought to the emergency room with a ruptured aneurysm or are considering treatment options for an unruptured aneurysm, the doctors will learn as much about your symptoms, current and previous medical problems, current medications, family history, and perform a physical exam. Diagnostic tests are used to help determine the aneurysm's location, size, type, and involvement with other structures.

Computed Tomography (CT) scan is a noninvasive X-ray to review the anatomical structures within the brain to detect blood in or around the brain. A newer technology called CT angiography (CTA) involves the injection of contrast into the blood stream to view the arteries of the brain. This type of test provides the best pictures of blood vessels through angiography and soft tissues through CT.

Lumbar puncture may be performed to detect blood in the cerebrospinal fluid (CSF). A hollow needle is inserted into the subarachnoid space of your spinal canal. Your doctor will collect 5 to 20 ml of CSF in 2 to 4 tubes.

Angiogram is an invasive procedure, where a catheter is inserted into an artery and passed through the blood vessels to the brain. Once the catheter is in place, a contrast dye is injected into the bloodstream and the x-ray images are taken.

Magnetic Resonance Imaging (MRI) scan is a noninvasive test, which uses a magnetic field and radio-frequency waves to give a detailed view of the soft tissues of your brain. An MRA (Magnetic Resonance Angiogram) is the same non-invasive study, except it is also an angiogram, which means it also examines the blood vessels, as well as the structures of the brain.

What treatments are available?

Determining the best treatment for a ruptured aneurysm involves many factors, such as the size, location, and type of aneurysm as well as the overall health of the patient and their medical history. The neurosurgeon will discuss with you all the options and recommend a treatment that is best for your individual case.



Figure 2. A titanium clip is placed across the neck of an aneurysm. The arrow demonstrates bloodflow through the artery, but not the aneurysm.

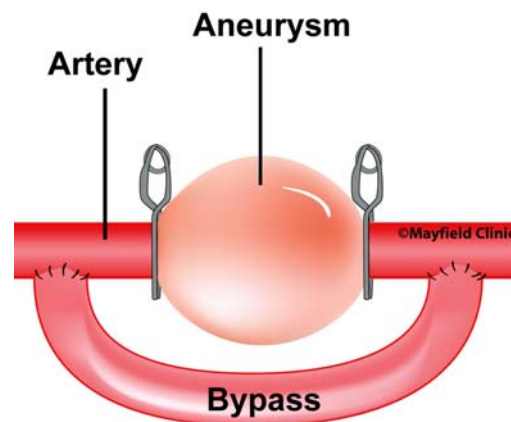


Figure 3. The aneurysm is blocked off between two clips and a bypass is sewn to detour blood flow around the aneurysm.

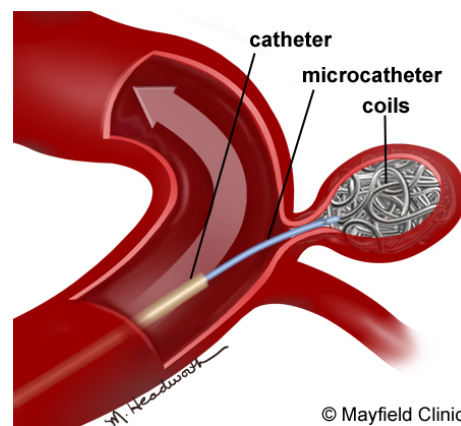


Figure 4. The aneurysm is packed with platinum coils by way of a small catheter.

Surgical clipping

The most common treatment for an aneurysm is direct surgical clipping. Under general anesthesia, an opening is made in the skull, called a craniotomy. The brain is gently retracted so that the artery with the aneurysm may be located. A small clip is placed across the base, or the "neck", of the aneurysm to block the normal blood flow

from entering the aneurysm (Fig. 2). The clip is made of titanium and remains on the artery permanently.

Artery occlusion and bypass

If surgical clipping is not possible or the artery is too damaged, the surgeon may completely block (occlude) the artery that has the aneurysm. The blood flow is detoured (bypassed) around the occluded section of artery by inserting a graft (Fig. 3). The graft is a small artery, usually taken from your leg, which is sewn into place above and below the blocked section.

A bypass graft can also be created from a different artery that is rerouted from its normal position (usually from the side of your head) passed through a hole in the skull, and sewn into place above the blocked artery. Surgeons call this procedure a Superficial Temporal Artery - Middle Cerebral Artery bypass, or STA-MCA bypass for short.

Endovascular coiling

In contrast to surgery, another form of treatment is endovascular coiling. This is performed in the angiography suites of the Radiology Department by a Neuro Interventionalist and sometimes requires general anesthesia. In a coiling procedure, a catheter is inserted into an artery in the groin and then passed through the blood vessels to the aneurysm. The doctor guides the catheter through the bloodstream while watching a fluoroscopy (a type of x-ray) monitor. Through the catheter, the aneurysm is packed with material, either platinum coils or acrylic glue, that prevents blood flow into the aneurysm (Fig. 4). Since coiling is a relatively new procedure, follow-up angiograms are performed periodically to confirm the aneurysm is still occluded and not growing larger.

Recovery

The possibility of having a second bleed is 35% within the first 14 days after the first bleed. This is why neurosurgeons prefer to do direct surgical or endovascular treatment as soon as the aneurysm is diagnosed, so that the risk of a rebleed is lessened.

A common complication of SAH is vasospasm, which is a narrowing (spasm) of an artery that may occur 3-14 days following a SAH. In the ICU you will be monitored every hour or so for signs of vasospasm which include arm or leg weakness, confusion, sleepiness, or restlessness (see SAH).

Aneurysm patients may suffer short-term and/or long-term deficits as a result of a rupture or treatment. Some of these deficits may disappear over time with healing and therapy. The recovery process is long and may take months, or years to understand the deficits you incurred and regain function.

Clinical trials

Clinical trials are research studies in which new treatments—drugs, diagnostics, procedures, vaccines, and other therapies— are tested in people to see if they are safe and effective. Research is always being conducted to improve the standard of medical care and explore new drug and surgical treatments. You can find information about current clinical investigations, including their eligibility requirements, protocol, and participating locations on the web: the National Institutes of Health (NIH) at clinicaltrials.gov, sponsors many trials; private industry and pharmaceutical companies also sponsor trials <http://www.centerwatch.com/>

Sources & Links

If you have more questions, please contact the Mayfield Clinic at 800-325-7787 or 513-221-1100. Additional information is available on the web.

The Brain Aneurysm Foundation
www.bafound.org or 617-723-3870

www.brainaneurysm.com

Tri-State Brain Aneurysm Support Group
www.tsbaconnex.org

Glossary

aneurysm: a bulge or weakening of an arterial wall.

coiling: a procedure to insert platinum coils into an aneurysm; performed during an angiogram.

craniotomy: surgical opening in the skull.

embolization: inserting material, coil or glue, into an aneurysm so blood can no longer flow through it.

subarachnoid hemorrhage: bleeding in the space surrounding the brain; may cause a stroke.

vasospasm: abnormal narrowing or constriction of arteries due to irritation by blood in the subarachnoid space.

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