

Brain Aneurysm

Patient Information Guide



Aesculap Neurosurgery

AESCLAP.

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Indications for Use

Yasargil® Aneurysm Clips

The Aesculap Aneurysm Clips are intended for occlusion of cerebral aneurysms in either a temporary or permanent manner. They are applied with Aesculap Clip Appliers, which contain titanium alloy or phynox jaws.

Foreword

The intention of this booklet is to provide information to patients, family members, caregivers and friends on the subject of brain aneurysms. The information provided is a general overview of the diagnosis and treatment.

Maria O'Reilly

Artist, Brain Aneurysm Survivor



My symptoms began while training for my first triathlon in November 2004. I would experience a sense of déjà vu and numbness down my left arm with occasional fainting episodes. One afternoon while driving, the symptoms began and I awoke staring at the pedals on the floor of my car. I had passed out at the wheel. I awoke unharmed, it was a miracle. However, it became very clear to me that day that I needed answers.

The initial diagnosis was epilepsy. A second opinion led to a diagnosis of mononucleosis but yet the symptoms continued. I felt embarrassed and confused about what I was experiencing but I finally made the decision to have an MRI performed. The results of two MRIs found an aneurysm on the left side and another one on the right side of my brain. I had no idea what an aneurysm was or what it meant to my future.

In September of 2005, I had two craniotomies performed to clip the aneurysms within my brain. During the second surgery, three additional aneurysms were identified and clipped. Following surgery, I remember being wheeled into the ICU with a sense of relief and happiness.

I don't recall any pain post-surgery but spent a great deal of time resting. During this time, I found that my artistic flare had returned and I began to draw and sculpt my way through recovery. I also became involved in an Aneurysm support group, which provided a venue to share my story and experience with others.

Author's Note: Maria O'Reilly is the Special Events Committee Chair for The Aneurysm and AVM Foundation and participates in annual walks to raise funds to further education for this cause.

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What Is a Brain Aneurysm?

A brain aneurysm is a balloon-like bulge in the wall of a brain artery. If this bulge tears and bleeds, nearby cells may be damaged. A brain aneurysm can occur in an artery wall that is weak or has a defect. Aneurysm is often associated with hardening of the arteries. High blood pressure, heredity, or a head injury are also risk factors.

Symptoms

In most cases, a brain aneurysm has no symptoms until it bleeds or tears. Symptoms of bleeding or tearing include:

- Severe headache, nausea, and vomiting
- Neck stiffness
- Brief blackout
- Confusion or sluggishness
- Vision or speech problems
- Paralysis or weakness on one side of the body
- Clumsiness
- Jerking movements

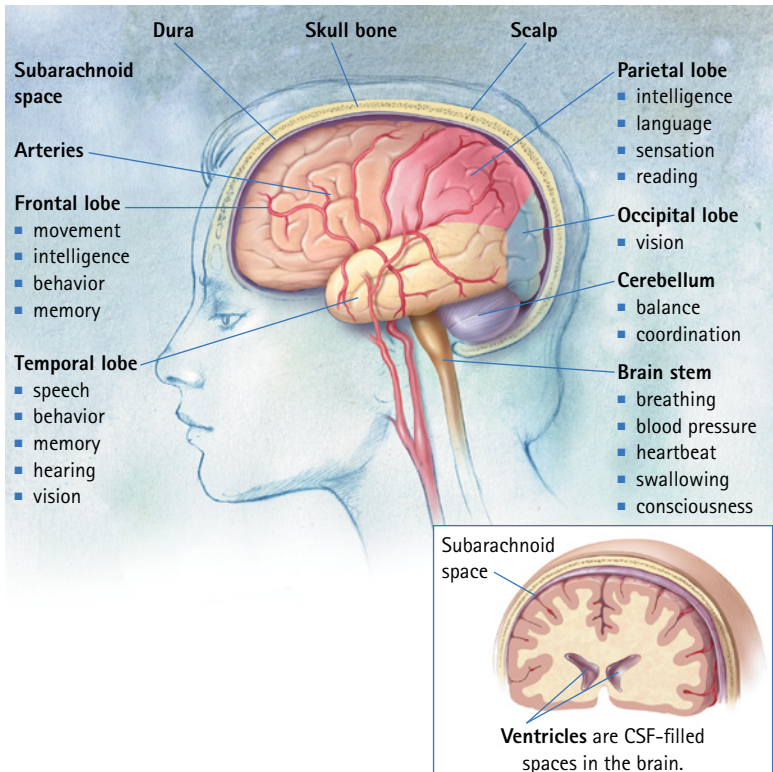
A brain aneurysm needs to be treated as soon as possible. Doing so may save a patient's life. If the aneurysm has torn and bled, treatment may not reverse the resulting damage. However, surgery may help prevent more bleeding. Blood trapped in and around the brain may also be removed.

The Body's Control Center

The brain controls the entire body. Some parts of the brain regulate basic functions. These include breathing, blood pressure, and heartbeat. Other parts control more complex functions, such as moving, thinking, speaking, and memory.

Inside the Skull

Under the scalp and the skull, a tough membrane (called the **dura**) surrounds the brain. Beneath the dura, cerebrospinal fluid (**CSF**) cushions the brain. Arteries carry nutrients and oxygen-rich blood throughout the brain. Without this blood, brain tissue quickly dies.

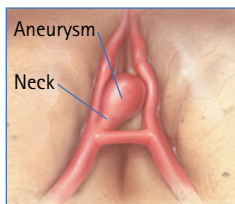


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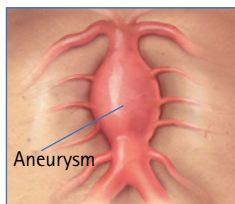
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Types of Brain Aneurysms

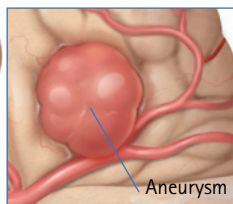
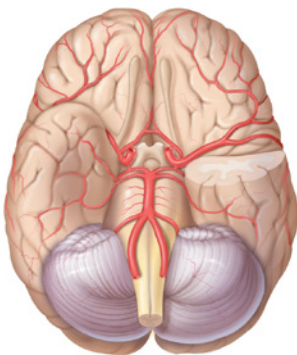
There are four main types of brain aneurysms. Most aneurysms occur where an artery branches, often at the base of the brain. The treatment options vary, depending on the type of aneurysm, its size, and its location.



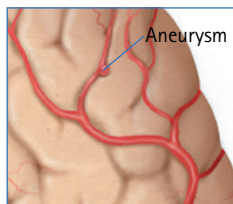
A **saccular (berry) aneurysm** bulges from one side of an artery.



A **fusiform aneurysm** bulges from all sides of an artery.



A **giant aneurysm** can involve more than one artery and can be over 2.5 centimeters (cm) wide.



A **mycotic aneurysm** is caused by an infected artery wall. This type of aneurysm is fairly rare.

When an Aneurysm Bleeds

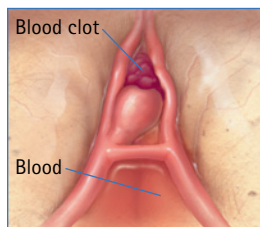
What happens to the brain when an aneurysm bleeds? In most cases, the bleeding stops quickly. However, if blood that has leaked touches brain cells, the cells may be damaged. Blood in the cerebrospinal fluid increases pressure on the brain. Leaked blood may also touch nearby arteries, which may cause these arteries to narrow.

Damage to Brain Cells

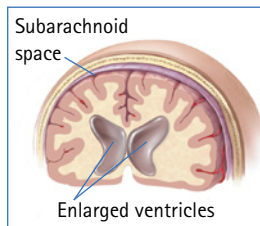
Blood from an aneurysm can leak into the CSF in the space around the brain (the **subarachnoid space**). The pool of blood forms a clot, called a **hematoma**. Blood can irritate, damage, or destroy nearby brain cells. This may cause problems with body functions or mental skills.

Fluid Buildup in the Brain

Blood from a torn aneurysm can block CSF circulation. This can lead to fluid buildup and increased pressure on the brain. The open spaces in the brain (**ventricles**) then enlarge. This problem is called **hydrocephalus**. It can make a patient lethargic, confused, or incontinent. Fluid may also build up in the brain after surgery. To stop fluid buildup, a drain may be placed in the ventricles. This removes leaked blood and trapped CSF.



Blood that has leaked from a torn aneurysm can damage or destroy brain cells.



Blood in the CSF can increase pressure on the brain and enlarge the ventricles.

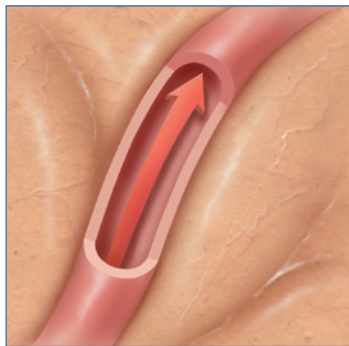
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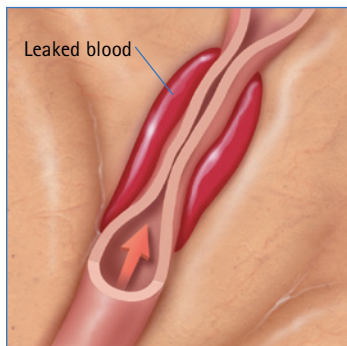
Narrowing of Nearby Arteries

An artery may narrow if leaked blood touches it. This response, called **vasospasm**, may happen up to 14 days after an aneurysm bleeds.

Vasospasm can decrease blood needed in other parts of the brain. It can be fatal. To treat vasospasm, the patient's blood pressure and fluid intake are increased. This increases the force of the blood and widens the artery.



A healthy artery lets blood through easily.



Vasospasm decreases blood flow.

Diagnosis

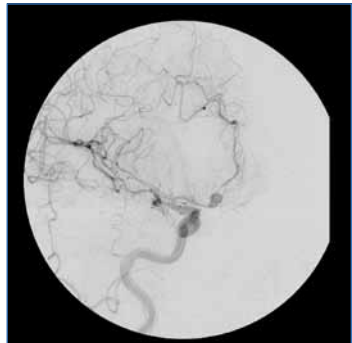
Often, the first symptom of a brain aneurysm is a sudden, severe headache. A physical exam and a health history help to pinpoint the problem. If a brain aneurysm is suspected, special tests can confirm it. Test results can also help the healthcare team plan treatment.

A CT Scan

A **CT** (computerized tomography) scan is a fast and painless test that creates an image of the brain. It shows whether any blood has leaked around or into the brain. In some cases, **CT angiography** may be done. This test produces an enhanced image that can show a brain aneurysm. For the test, a contrast dye is injected into a vein. This dye travels to the brain arteries. Then the CT scan is done to locate bleeding or other problems.

A Spinal Tap

Cerebrospinal fluid flows in and around the brain. It also flows around the spinal cord. A **spinal tap** (lumbar puncture) can be done to show if blood has leaked into the CSF. The lower back is numbed with a local anesthetic (pain medicine). Then a needle is inserted in the lower spine. Fluid is removed through the needle and examined to rule out other problems, such as infection.



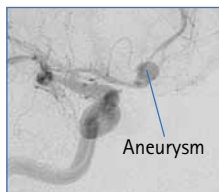
A CT scan can show blood that has leaked from a torn aneurysm.

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An Arteriogram

An **arteriogram** shows the size, shape, and location of an aneurysm. It can also reveal any vasospasm. After local anesthesia, a thin tube (called a **catheter**) is guided through the arteries from the groin to the neck. Contrast dye is released. It travels to the brain. Then x-rays are taken, showing the arteries and any aneurysms.



An arteriogram uses a special dye to show an aneurysm.

Discussing Treatment Options

Your surgeon may refer to the Hunt-Hess scale (see below) in discussing treatment options with you. This scale helps the surgeon assess a patient's condition. Test results and the grade of aneurysm can affect treatment options.

Hunt-Hess Grades of Brain Aneurysms

Grade	Condition of patient
I	Alert, aware of surroundings, showing no symptoms
II	Alert, aware of surroundings, has headache, has stiff neck
III	Sluggish or confused, has weakness or partial paralysis on one side of the body
IV	Dazed, has total paralysis on one side of the body
V	Comatose

Adapted from Hunt WE, Hess RM, Surgical risk as related to time of intervention in the repair of intracranial aneurysm.

J Neurosurg 28(1):14-20, 1968.

Treatment

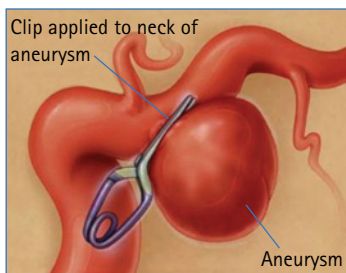
Treatment for an aneurysm begins as soon as possible. This is often within 72 hours of the diagnosis. Either open surgery or an endovascular procedure may be best. Treatment may not reverse any damage already done. The goal is to prevent further bleeding.

Craniotomy

The surgeon reaches the brain through the skull. The patient receives anesthesia to sleep during the surgery. Then, after a scalp incision, small holes are made in the skull. The bone between the holes is cut and lifted away. The dura is peeled back. Trapped blood and CSF may be removed. The surgeon closes off (clips) the aneurysm. Or the artery leading to the aneurysm is sealed off (occluded). The dura and the piece of skull are put back in place.

Clipping the Aneurysm

The surgeon may put a clip on the neck of the aneurysm where it bulges from the artery. This keeps blood from entering the aneurysm. As a result, future bleeding is prevented and nearby brain tissue is protected from further damage. The surgeon makes sure that the clip is secure before finishing the surgery.



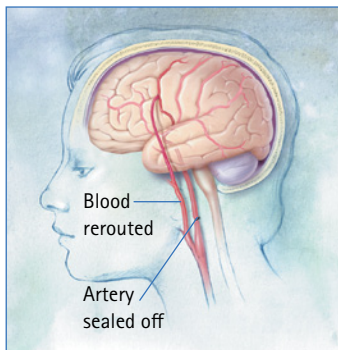
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Occlusion and Bypass

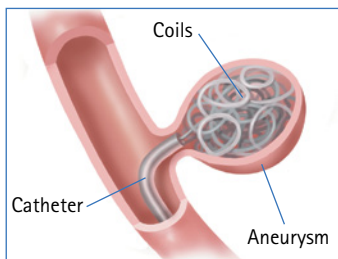
It may be best to stop blood flow through the artery leading to the aneurysm. This is called **occlusion**. In most cases, it is done as open surgery. Sometimes occlusion is combined with a **bypass**. A bypass reroutes blood around the occlusion. It brings the blood to the part of the brain that had been fed by the damaged artery. A small blood vessel is used for the bypass.



The artery that leads to the aneurysm is sealed off. Blood may be rerouted with a bypass.

Endovascular Procedure

An endovascular procedure is an alternative option for some aneurysms. This is done in an x-ray lab by a specially trained doctor (**interventional neuroradiologist**). Anesthesia is given to block pain. Then a catheter is guided through the arteries from the groin to the brain. Platinum coils are released into the aneurysm. The coils cause a blood clot to form in the aneurysm, which seals it off.



Recovery

A patient may spend 1 to 4 weeks in the hospital. The stay depends on the amount of damage caused by the aneurysm. The patient's health and response to treatment also affect the length of the stay. The healthcare team will monitor how well treatment has worked. Then they will decide whether rehabilitation is needed.

Evaluating the Outcome

Follow-up tests may be done 3 to 5 days after treatment. These tests show how well the treatment worked.



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When to Call the Surgeon

Call the surgeon right away if you notice any of the following in your loved one:

- A seizure
- A severe headache
- Any loss of function
- A high or long-lasting fever
- Drainage, redness, or pain at the incision site
- Fainting or falling. Either of these may signal changes in brain function.

Risks and Complications

Both open surgery and an endovascular procedure have certain risks. The surgeon can tell you more about them. The risks include:

- Blood clots
- Swelling or bleeding in the brain
- Weakness, paralysis, or loss of sensation, including vision
- Confusion, loss of speech, loss of memory
- Infection
- Vasospasm
- Seizures (jerking movements)
- Hydrocephalus
- Death

Next Steps

For more information surrounding the Yasargil® aneurysm clip, aneurysm recovery or support groups, please visit:

Aesculap: www.aesculapusa.com/neurosurgery

The Aneurysm and AVM Foundation: www.aaafonline.org

The Brain Aneurysm Foundation: www.bafound.org/

The Epilepsy Foundation: www.epilepsyfoundation.org/

Aesculap

Our Vision

Through collaborative excellence we will improve the quality of a patient's life and meet the needs of the changing healthcare environment.

Our Mission

We are committed to achieving collaborative excellence, through a culture of "Sharing Expertise" among our employees, partners, providers and patients. We take responsibility as an organization and as individuals to create a climate of trust, ethics and accountability.

We are part of a global, family owned organization with a proud heritage that is passionately committed to providing high quality, innovative products and services to all surgical disciplines, with particular focus in the fields of General, Neuro, Spine and Orthopaedics.

We are committed to a long term perspective of sustainable growth. Our growth is financed by our internal resources and innovative strength, and our commitment is to uphold this directive for the future generations of our employees, healthcare partners and through them, our patients.

Our Values

Our values are the foundation upon which our culture is built. They are the standard that every employee is held to, regardless of title, job function or responsibility. Embodying these values, in our everyday work lives, is the key to fostering a culture of collaboration and ensuring our long term success as a company.

- Integrity and Honesty
- Quality and Efficiency
- Responsibility to Our Employees
- Accountability
- Innovation
- Sustainability

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