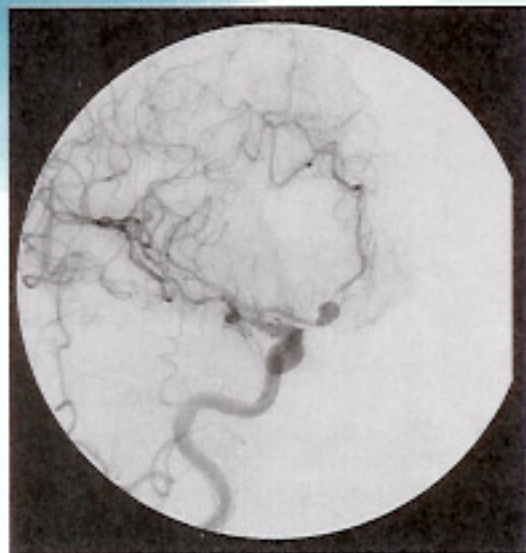


Brain Aneurysm



Understanding
Care and Recovery





A Sudden Change

What happened? Just yesterday the person you care about seemed fine. Then he or she had a sudden, explosive headache. Now you've been told that your loved one has a brain aneurysm. This is a serious, sometimes fatal, problem that needs prompt treatment. Read this booklet to learn more about a brain aneurysm and how it can be treated.

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

Prompt Treatment Can Save a Life

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. But surgery may help prevent more bleeding. Blood trapped in and around the brain may also be removed.

This booklet is not intended as a substitute for professional medical care. Only your doctor can diagnose and treat a medical problem.

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A Time of Many Questions

It's normal to have many questions about your loved one's health. His or her health care team will answer any questions they can. Special tests will be done to confirm what is causing your loved one's symptoms. Once the cause is known, specialists are called. Treatment will begin right away.

What You Can Do

Your loved one may be too ill to know what's going on. You may need to decide on his or her treatment. Choose a few family members to talk to the health care team. These family members can share what they learn with others. Doing this will make it simpler to keep everyone informed.



What's Ahead

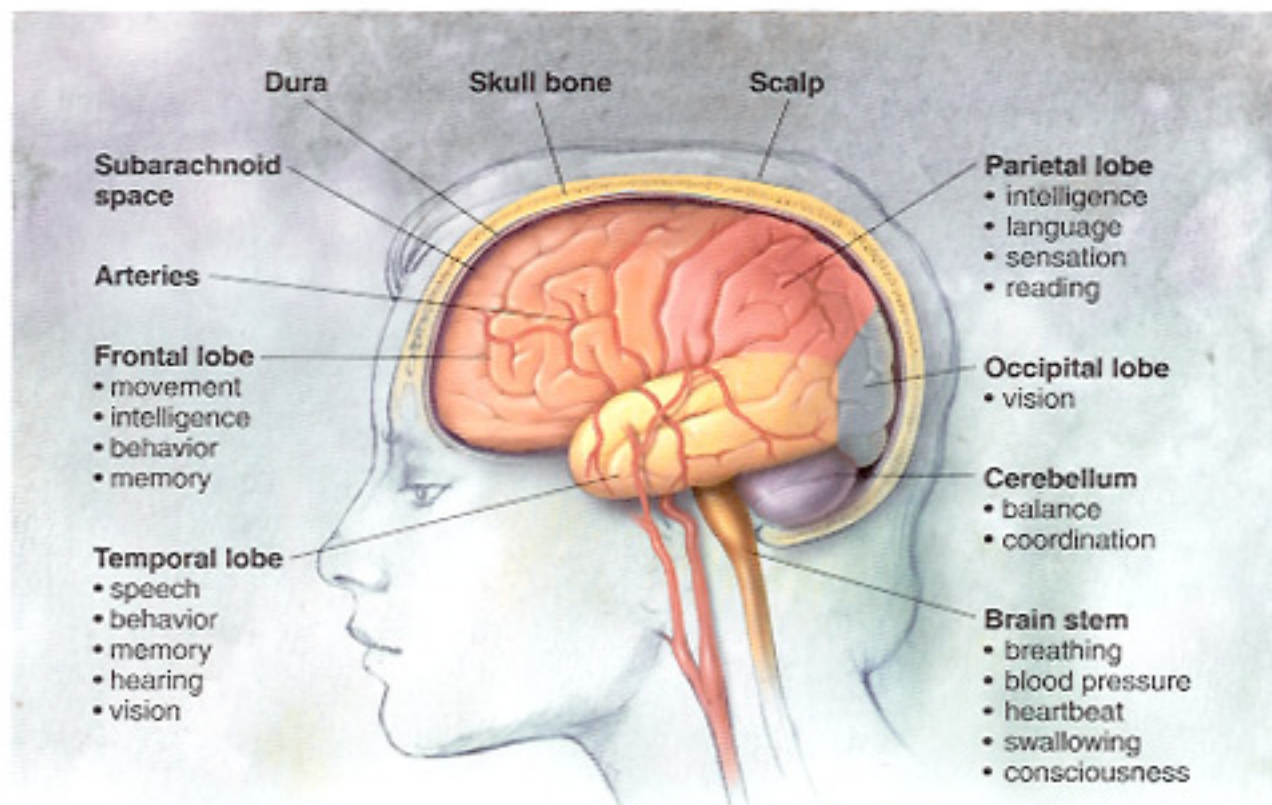
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|---------------------------------------|---|-------------------------------------|----|
| The Body's Control Center | 4 | Treating a Brain Aneurysm | 10 |
| Types of Brain Aneurysms | 5 | Hospital Recovery | 12 |
| When an Aneurysm Bleeds | 6 | Moving Forward | 14 |
| Diagnosing a Brain Aneurysm | 8 | | |

The Body's Control Center

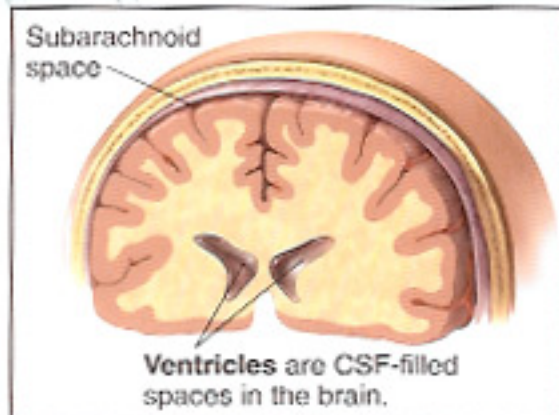
The brain controls the entire body. Some parts of the brain regulate basic functions. These include breathing, blood pressure, and heartbeat. Other parts control more complex functions, such as moving, thinking, speaking, and memory.

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.



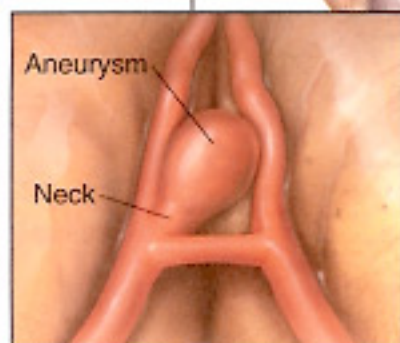
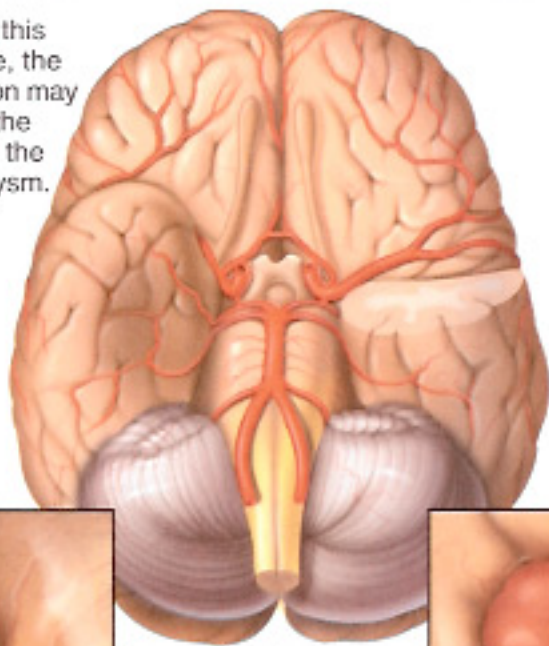
Some body functions are controlled by just one part of the brain. Other functions are controlled by more than one part.



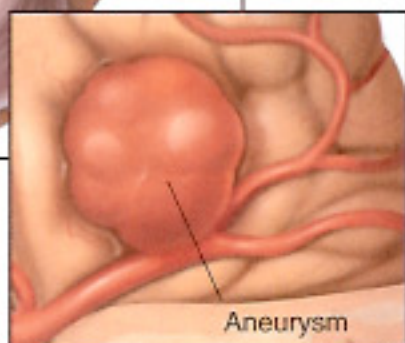
Types of Brain Aneurysms

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.

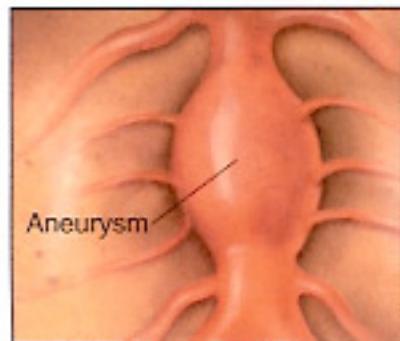
Using this picture, the surgeon may mark the site of the aneurysm.



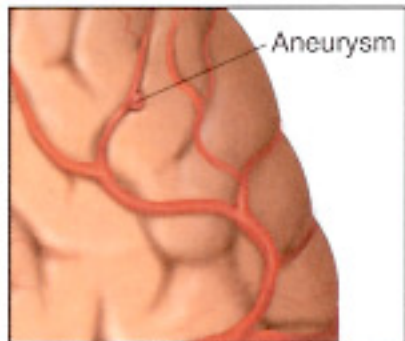
A saccular (berry) aneurysm bulges from one side of an artery. A neck leads to it.



A giant aneurysm can involve more than one artery. It is over 2.5 centimeters (cm) wide.



A fusiform aneurysm bulges from all sides of an artery. It rarely has a neck.



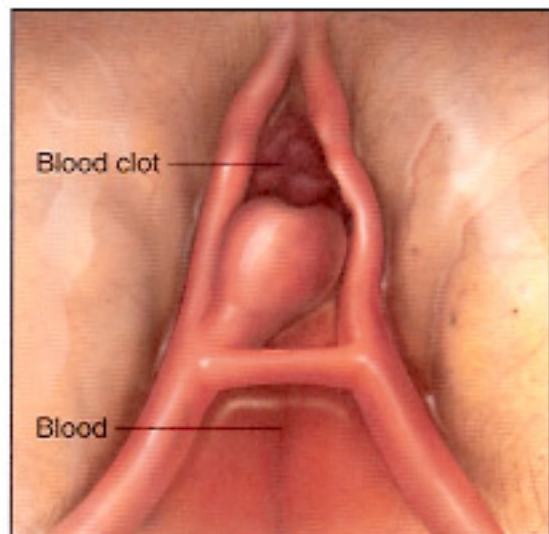
A mycotic aneurysm is caused by an infected artery wall. This type of aneurysm is fairly rare.

When an Aneurysm Bleeds

What happens to the brain when an aneurysm bleeds? In most cases, the bleeding stops quickly. But 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. This may cause these arteries to narrow.

Damage to Brain Cells

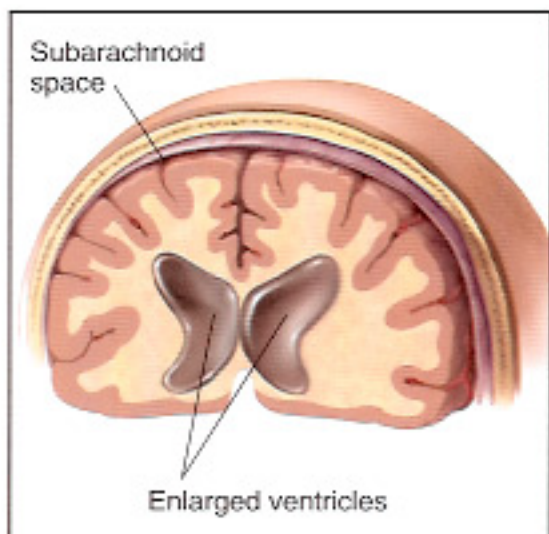
Blood from an aneurysm can leak into the CSF in the space around the brain (the **subarachnoid space**). The pool of blood forms a clot, called a **hematoma**. Blood can irritate, damage, or destroy nearby brain cells. This may cause problems with body functions or mental skills. Leaked blood may be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



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

Fluid Buildup in the Brain

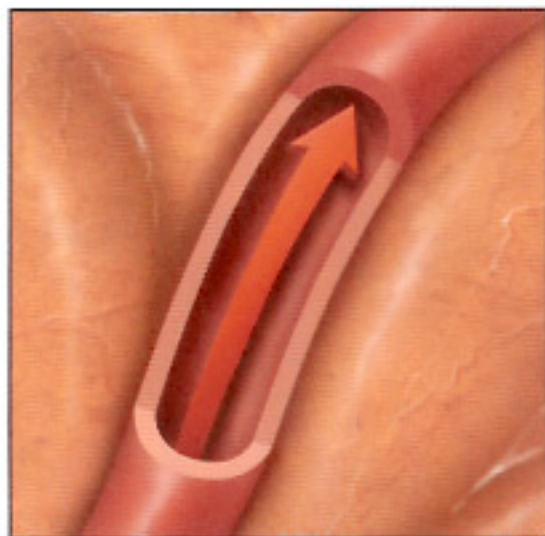
Blood from a torn aneurysm can block CSF circulation. This can lead to fluid buildup and increased pressure on the brain. The open spaces in the brain (**ventricles**) then enlarge. This problem is called **hydrocephalus**. It can make a patient lethargic, confused, or incontinent. Fluid may also build 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.



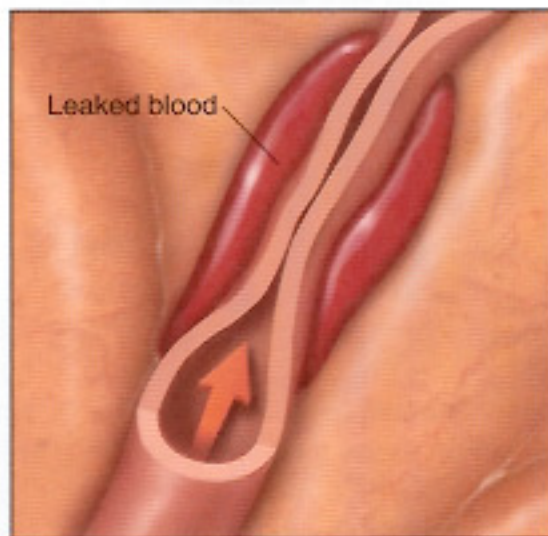
Blood in the CSF can increase pressure on the brain and enlarge the ventricles.

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.



A Note to the Family

The health care team will want to prevent further bleeding and control complications. But the timing of surgery may depend on your loved one's condition. After treatment, your loved one will be closely observed for a while. The team will want to see how well the surgery worked. Waiting for answers can be tiring. You may choose to let some people go home and rest. Then other family members can wait for news.

Diagnosing a Brain Aneurysm

Often, the first symptom of a brain aneurysm is a sudden, severe headache. Most aneurysm patients describe it as the worst headache of their lives. 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 health care 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.



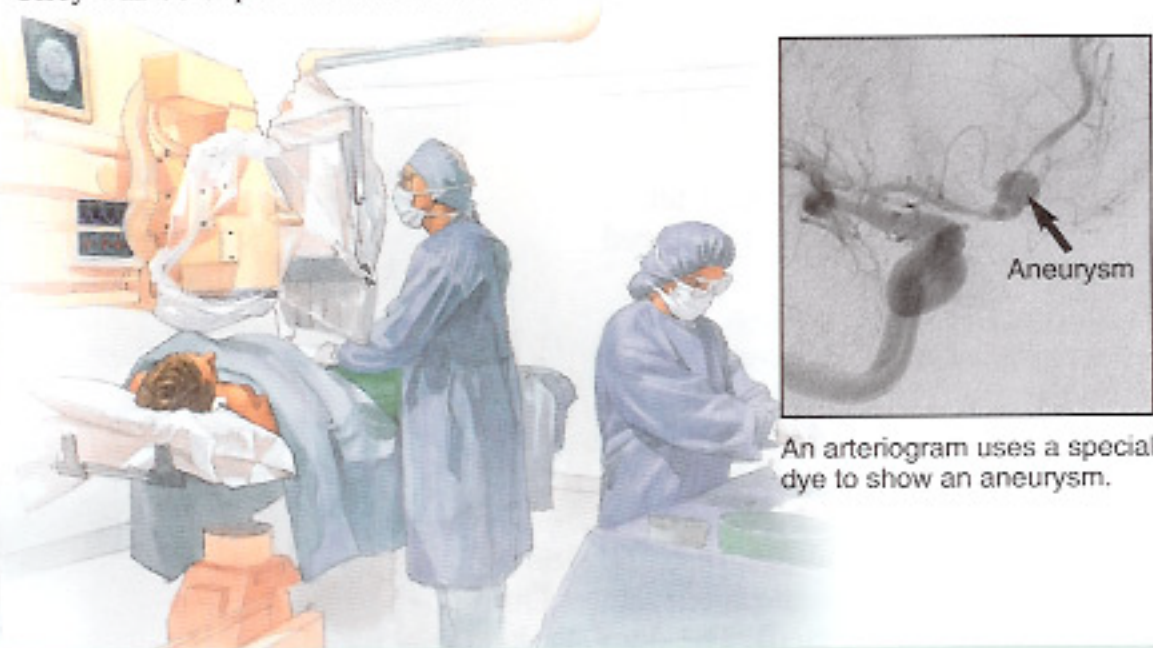
A CT scan can show blood that has leaked from a torn aneurysm.

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.

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. This test has some risks. They will be explained before the test.



An arteriogram uses a special dye to show an aneurysm.

Discussing Treatment Options

Your loved one may be unable to make decisions about treatment. So you may need to decide what's best for him or her. Your loved one's **neurosurgeon** (a surgeon who is an expert on the brain) will talk with you. He or she may refer to the Hunt-Hess scale (see below). 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	How Your Loved One May Feel
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

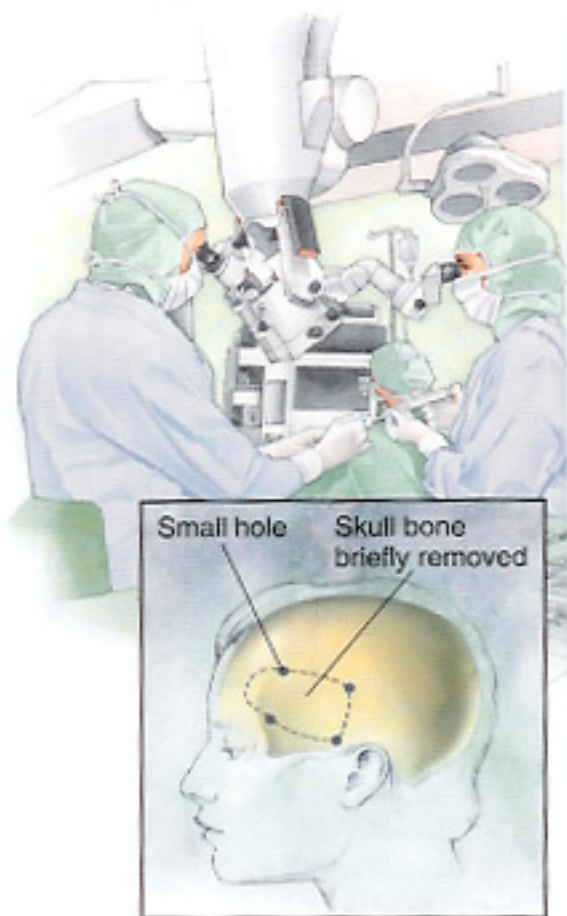
Adapted from Hunt WE, Hess RM, Surgical risk as related to time of intervention in the repair of intracranial aneurysm. *J Neurosurg* 28(1):14-20, 1968.

Treating a Brain Aneurysm

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.

Open Surgery

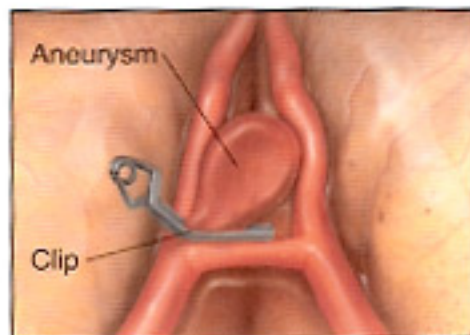
The surgeon reaches the brain through the skull. First your loved one receives anesthesia to sleep during the surgery. Then, after a scalp incision, small holes are made in the skull. The bone between the holes is cut and lifted away. The dura is peeled back. Trapped blood and CSF may be removed. The 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. A device may be left in one of the small holes. This device measures pressure inside the skull.



The smallest possible piece of skull bone is lifted away.

Clipping the Aneurysm

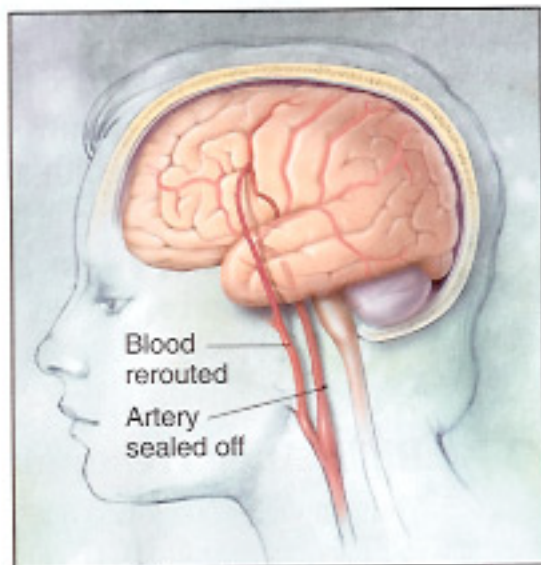
The surgeon may put a clip on the aneurysm where it bulges from the artery. This keeps blood from entering the aneurysm. As a result, future bleeding is prevented and nearby brain tissue is protected from further damage. The surgeon makes sure that the clip is secure before finishing the surgery.



Clipping an aneurysm can keep it from bleeding again.

Occlusion and Bypass

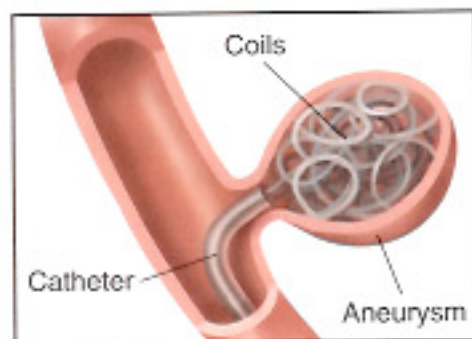
It may be best to stop blood flow through the artery leading to the aneurysm. This is called **occlusion**. In most cases, it is done as open surgery. Sometimes occlusion is combined with a **bypass**. A bypass reroutes blood around the occlusion. It brings the blood to the part of the brain that had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



Placing special coils in an aneurysm can keep it from bleeding again.

Risks and Complications

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

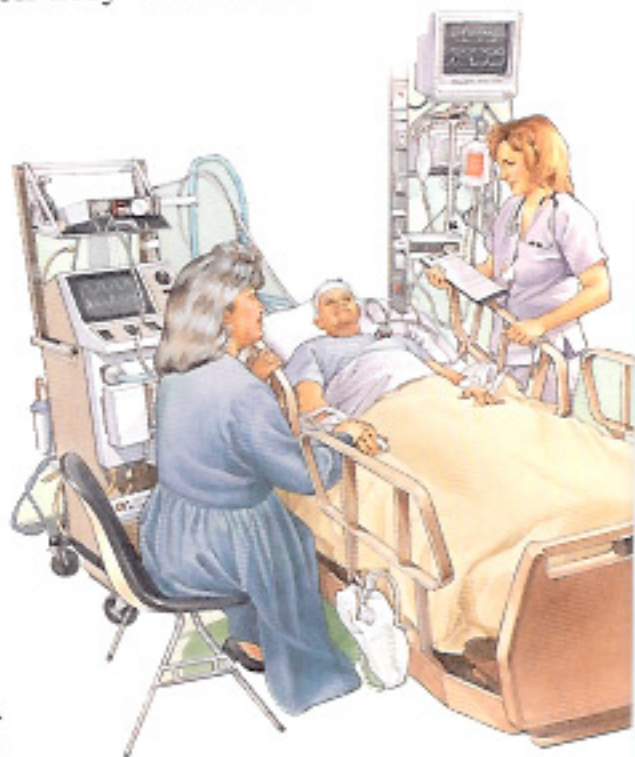
- Blood clots
- Swelling or bleeding in the brain
- Weakness, paralysis, or loss of sensation, including vision
- Confusion, loss of speech, loss of memory
- Infection
- Vasospasm
- Seizures (jerking movements)
- Hydrocephalus
- Death

Hospital Recovery

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

Right After Treatment

You can visit your loved one in the intensive care unit (ICU). Don't be surprised if he or she is attached to many devices. Pressure on the brain, any new bleeding, vasospasm, and body functions all need to be monitored. Also, special devices may be used to help maintain blood flow in the legs. After open surgery, a patient's head may be bandaged. After an endovascular procedure, a patient needs to lie still for several hours. In any case, once stable, your loved one will be moved to a regular hospital room.



Your loved one's health is carefully monitored in the ICU after treatment.

As Healing Begins

At first, a patient may be on a liquid diet. As the body recovers, he or she can start eating solid foods. Your loved one's ability to swallow, move about, and perform other functions will be checked. Patients also learn breathing exercises. This helps the body recover from surgery.



Skills such as eating and getting dressed will be checked as your loved one heals.

Evaluating the Outcome

Follow-up tests may be done 3 to 5 days after treatment. These tests show how well the treatment worked. They may also reveal new problems. An arteriogram provides an image of a treated aneurysm. A **Doppler** test may be done daily to check for vasospasm. A CT scan shows any bleeding or swelling in the brain that may occur after treatment. In some cases, an **MRI** (magnetic resonance imaging) **scan** may be ordered. This is another type of scan that can image brain tissue.



A Doppler test uses sound waves to measure the speed of blood flowing through an artery.

Working Toward Recovery

Sometimes, a patient has trouble moving his or her arms or legs. In such cases, rehabilitation may be needed. Special therapists will work with the patient to help improve balance and strength. They can also help him or her improve speech and daily living skills. A therapist may suggest equipment that can help a patient move about at home.



The patient will be asked to walk as soon as he or she safely can. Walking helps speed recovery.

Moving Forward

An aneurysm may have affected your loved one's body functions, skills, and emotions. He or she may move on to a skilled nursing facility or to a rehabilitation center. Or your loved one may go home and return for therapy as an outpatient. You, too, can help him or her recover.

Regaining Strength and Skills

Depending on the site of an aneurysm, certain abilities may have been affected. This is because each part of the brain controls certain functions (see page 4). With special help, many patients regain strength and some skills. A physical therapist helps strengthen muscles. An occupational therapist teaches daily skills, such as getting dressed and bathing. A speech therapist helps improve swallowing as well as speech.



A physical therapist can help rebuild muscle strength.

Taking Medications

Your loved one may have to take a number of medications. These may be prescribed to control pain, blood pressure, and other problems. It's very important that your loved one take all medications as directed. Medications work best if they are taken on time.

Changes in Emotions

The aneurysm may have affected your loved one's emotions. He or she may be depressed, worried, or mentally tired. These feelings should go away with time. Some patients also have trouble controlling their emotions. They have sudden mood shifts. The shifts may be out of context with what is going on. This is called **lability**. For instance, your loved one may cry after telling a joke. In many cases, lability lessens over time.

How You Can Help

You can help your loved one in many ways. Make sure he or she returns for all follow-up visits as requested. And check that your loved one takes all medications as directed. Be patient with mood swings, pain, or fatigue that your loved one may feel. Talk to the doctor if any sadness does not pass with time. When your loved one is ready, find ways to help him or her get back into life. You might take a daily walk together.



Taking walks together can help your loved one build strength and confidence.

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.

Focus on the Future

Once the aneurysm has been treated, you have a second chance to spend time with your loved one. Focus on the skills he or she has and those that may still be regained. Enjoy your future together.



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