CONDITION

Brain aneurysm

Learn what a brain aneurysm is, possible warning signs, how it is diagnosed, and how monitoring and treatment decisions are made.

WHAT IT IS
Weak, bulging area in a brain artery wall

BODY SYSTEM
Heart and circulation

MAIN SYMPTOMS
Sudden severe headache, vision changes, neck stiffness, fainting

WHAT CAUSES IT
Artery wall weakness and blood-flow stress, often unclear

HOW IT IS DIAGNOSED
CT angiography, magnetic resonance angiography, catheter cerebral angiogram

MAIN TREATMENT
Monitoring, surgical clipping, endovascular treatment

CAN IT BE CURED?
Sometimes - procedures can close the aneurysm

IS IT AN EMERGENCY?
Sometimes - sudden severe headache or rupture

LONG-TERM OUTLOOK
Variable, with serious complications possible after rupture

Overview

A brain aneurysm is a weak, bulging area in the wall of an artery that supplies the brain. It is also called an intracranial or cerebral aneurysm. Most form where arteries divide into branches, because these points receive added pressure from blood flow.

Many brain aneurysms are small and never cause symptoms. They may be found by chance during imaging for an unrelated concern. An unruptured aneurysm means the artery wall is still intact and blood has not leaked.

If an aneurysm ruptures, it usually causes bleeding into the space between the brain and the thin tissues surrounding it. This is called a subarachnoid hemorrhage. It is a medical emergency because the bleeding can injure the brain, raise pressure inside the skull, and interfere with normal blood flow.

The chance that an aneurysm will rupture is not the same for everyone. Doctors consider its size, shape, location, whether it has changed, and a person's health and family history. They also weigh the risks of treatment against the risks of continued monitoring. Some aneurysms are safest to observe, while others may be treated to reduce the chance of future bleeding.

Symptoms

Most unruptured brain aneurysms do not cause symptoms. When symptoms do occur, they may result from a larger aneurysm pressing on nearby nerves or brain tissue. Depending on its location, an unruptured aneurysm may cause:

These symptoms have many possible causes and do not necessarily mean that an aneurysm is present. New or unexplained symptoms should be assessed by a healthcare professional.

A ruptured aneurysm often causes a sudden, extremely severe headache. It may reach full intensity within seconds or a minute and is sometimes described as a "thunderclap" headache. Other symptoms can include neck stiffness, nausea, vomiting, sensitivity to light, confusion, weakness, a seizure, fainting, or reduced alertness.

Call emergency services immediately for:

A small amount of blood may occasionally leak before a major rupture. This can cause a sudden severe warning headache. It still requires emergency assessment, even if the pain improves.

- Pain above or behind one eye
- A drooping eyelid
- A larger pupil in one eye
- Double vision or another change in vision
- Numbness, weakness, or pain on one side of the face
- Less commonly, seizures or other changes in brain function
- A sudden, severe headache that is unlike a person's usual headaches
- A severe headache with fainting, confusion, seizure, weakness, or trouble speaking
- A sudden severe headache with neck stiffness or repeated vomiting
- Sudden loss of consciousness

Causes and risk factors

A brain aneurysm usually develops through a combination of weakness in an artery wall and stress from blood flow. The exact cause is often unclear. Most aneurysms are acquired over time rather than present at birth.

Smoking and high blood pressure are important risk factors that can be changed. Tobacco exposure can damage blood vessel walls, while uncontrolled blood pressure increases force against those walls. Heavy alcohol use and stimulant drugs such as cocaine or amphetamines may also increase the risk of formation or rupture.

Risk also tends to rise with age. Brain aneurysms are more often identified in women than in men. A previous aneurysm or subarachnoid hemorrhage raises the chance of having another aneurysm.

Family history can matter. A person with two or more close biological relatives who have had brain aneurysms or aneurysmal subarachnoid hemorrhage may have a higher risk. In selected families, clinicians may discuss screening even when no symptoms are present.

Certain inherited conditions are associated with aneurysms. The best established include autosomal dominant polycystic kidney disease, which causes multiple kidney cysts, and some disorders that weaken connective tissue or blood vessels. These conditions are uncommon, and most people with a brain aneurysm do not have one.

Head injury and infection can rarely contribute to particular types of aneurysms. These differ from the more common saccular aneurysms, which look like a small pouch attached to an artery.

Having a risk factor does not mean an aneurysm will develop or rupture. Likewise, some people with an aneurysm have no known risk factors.

Diagnosis

A brain aneurysm may be found after symptoms, during an emergency assessment for suspected bleeding, or by chance on a scan obtained for another reason.

For a sudden severe headache, a noncontrast CT scan of the head is commonly the first test. It can identify blood around the brain, especially when performed soon after symptoms begin. If the CT result does not explain a concerning presentation, clinicians may use additional testing. Depending on the timing and circumstances, this may include a lumbar puncture, which tests fluid taken from the lower back for signs of bleeding, or blood-vessel imaging.

CT angiography uses a CT scanner and contrast material to create detailed images of the brain's arteries. Magnetic resonance angiography uses a magnetic field and may be performed with or without contrast. These tests can show an aneurysm's location, size, and shape.

A catheter cerebral angiogram, also called digital subtraction angiography, provides highly detailed blood-vessel images. A clinician guides a thin tube through an artery, usually from the wrist or groin, and injects contrast material. Because it is invasive, it is generally used when greater detail is needed for diagnosis or treatment planning.

If an unruptured aneurysm is found, the healthcare team reviews the images and the person's overall situation. Important details include irregular areas or small secondary bulges, evidence of growth, the artery involved, and whether more than one aneurysm is present. A neurologist, neurosurgeon, or neurointerventional specialist may help interpret these findings.

Screening people without symptoms is not routine for the general population. It may be considered when a person's family history or an associated inherited disorder makes aneurysm risk meaningfully higher.

Treatment and management

Treatment depends on whether the aneurysm has ruptured. A ruptured aneurysm requires emergency hospital care, usually in a center experienced in treating strokes and complex blood-vessel disorders.

The immediate goals are to support breathing and circulation, manage pressure inside the skull, and prevent the aneurysm from bleeding again. The aneurysm is generally closed as soon as it is medically and technically practical.

One option is surgical clipping. A neurosurgeon temporarily opens part of the skull, locates the aneurysm, and places a small metal clip across its base. This stops blood from entering the aneurysm while preserving flow through the main artery.

Another option is endovascular treatment. A specialist guides a catheter through the blood vessels to the aneurysm. Tiny coils or other devices are then placed to block blood flow into it. Some aneurysms may be treated with stents or flow-diverting devices that redirect blood along the normal artery. Device choice depends on the aneurysm's anatomy and whether it has ruptured.

People with subarachnoid hemorrhage need close monitoring for additional problems. Treatment often includes nimodipine, a medicine used to lower the risk of poor outcomes from delayed cerebral ischemia. This complication occurs when the brain does not receive enough blood in the days after hemorrhage. Other treatment may address hydrocephalus, seizures, changes in salt levels, or problems with the heart and lungs.

An unruptured aneurysm does not always need a procedure. Observation may be reasonable when the expected risk of rupture is lower than the immediate and long-term risks of

treatment. Monitoring usually involves repeat CT angiography or magnetic resonance angiography, although the timing is individualized.

Preventive treatment may be considered when an aneurysm has features linked to greater rupture risk, has grown, is causing symptoms, or occurs in someone with important personal or family risk factors. Clipping and endovascular procedures both have benefits and risks. These may include stroke, bleeding, artery damage, infection, contrast-related problems, or the need for later procedures.

Management also includes reducing stress on blood vessels. This commonly involves:

Routine physical activity is often possible with an unruptured aneurysm, but advice may differ based on its features and a person's health. A clinician can provide guidance about strenuous lifting, work, travel, pregnancy, and other specific concerns.

- Avoiding tobacco and seeking support to quit
- Working with a clinician to control high blood pressure
- Avoiding cocaine, amphetamines, and other stimulant drugs
- Discussing alcohol use and other cardiovascular risks with a healthcare professional
- Taking prescribed medicines as directed rather than changing them because an aneurysm was found

Complications

The most serious complication is rupture and subarachnoid hemorrhage. Bleeding can directly injure the brain and may happen again if the aneurysm is not secured.

Blood can block the normal circulation of fluid around the brain, causing hydrocephalus. This raises pressure inside the skull and may require temporary or permanent drainage.

Several days after a hemorrhage, narrowing of brain arteries and other changes can reduce blood flow. This delayed cerebral ischemia may cause a stroke or new neurological symptoms. Other possible complications include seizures, low blood sodium, heart rhythm problems, lung problems, infection, and blood clots.

Recovery can involve more than physical weakness. Some people experience fatigue, headaches, sleep problems, memory or attention difficulties, mood changes, or sensitivity to noise and light. Rehabilitation and psychological support may help.

Treatment procedures also carry risks. An aneurysm may not be fully closed, or it may reopen over time, particularly after some endovascular procedures. Follow-up imaging helps identify these issues before they cause symptoms.

Follow up

Follow-up plans are tailored to the aneurysm and the treatment used. A person with an observed aneurysm may need periodic imaging to look for growth or a change in shape. There is no single imaging schedule that is right for every patient.

After clipping or endovascular treatment, imaging may be used to confirm that the aneurysm remains closed and the nearby artery stays open. Some devices require longer-term monitoring. People treated with a stent or flow diverter may also receive antiplatelet medicine to reduce clot formation; it is important not to stop this medicine without advice from the treating team.

Routine appointments may address blood pressure, smoking, recurring headaches, medication questions, and emotional health. After a hemorrhage, follow-up may also include physical, occupational, speech, or cognitive rehabilitation.

Contact the treating clinician for new but nonemergency symptoms, increasing headaches, medication side effects, or questions about activity. Sudden severe headache, seizure, fainting, new weakness, trouble speaking, or marked confusion requires emergency care rather than waiting for a routine appointment.

Sources

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