

# BRAIN ANEURYSM

An aneurysm is a bulge in a blood vessel caused by a weakness in the blood vessel wall, usually where it branches.

As blood passes through the weakened blood vessel, the blood pressure causes a small area to bulge outwards like a balloon.

Aneurysms can develop in any blood vessel in the body, but the two most common places are:

- The abdominal aorta the artery that transports blood away from the heart to the rest of the body the brain

## ABOUT BRAIN ANEURYSMS

The medical term for an aneurysm that develops inside the brain is an intracranial or cerebral aneurysm. Most brain aneurysms only cause noticeable symptoms if they burst (rupture).

This leads to an extremely serious condition known as a subarachnoid haemorrhage, where bleeding caused by the ruptured aneurysm can cause extensive brain damage and symptoms such as:

- a sudden agonising headache it's been described as a "thunderclap headache", similar to a sudden hit on the head, resulting in a blinding pain unlike anything experienced before
- stiff neck
- sickness and vomiting
- pain on looking at light

About three in five people who have a subarachnoid haemorrhage die within two weeks. Half of those who survive are left with severe brain damage and disability.

A ruptured brain aneurysm is a medical emergency. If you suspect someone has had a brain haemorrhage, which could be caused by a ruptured aneurysm, call 999 immediately and ask for an ambulance.

## HOW ARE BRAIN ANEURYSMS TREATED

If a brain aneurysm is detected before it ruptures, treatment may be recommended to prevent it rupturing in future. Most aneurysms won't rupture, so treatment is only carried out if the risk of a rupture is particularly high.

Factors that affect whether treatment is recommended include your age, the size and position of the aneurysm, your family medical history, and any other health conditions you have.

If treatment is recommended, this usually involves either filling the aneurysm with tiny metal coils or an open operation to seal it shut with a tiny metal clip.

If your risk of a rupture is low, you'll have regular check-ups to monitor your aneurysm. You may also be given medication to reduce your blood pressure and advice about ways you can reduce your chances of a rupture, such as stopping smoking if you smoke.

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The same techniques used to prevent ruptures are also used to treat brain aneurysms that have already ruptured.

## WHY BRAIN ANEURYSMS DEVELOP

Exactly what causes the wall of affected blood vessels to weaken is still unclear, although risk factors have been identified, including:

- smoking
- high blood pressure
- a family history of brain aneurysms

In some cases, an aneurysm may develop because there was a weakness in the walls of the blood vessels at birth.

## WHO IS AFFECTED?

It's difficult to estimate exactly how many people are affected by brain aneurysms because they usually cause no symptoms and pass undetected.

Some experts believe it could be as high as 1 in 20 people, while others think the figure is much lower at around 1 in 100 people.

The number of aneurysms that actually rupture is much smaller. Only around 1 in 12,500 people have a ruptured brain aneurysm in England each year.

Brain aneurysms can develop in anyone at any age, but are more common in people over the age of 40. Women tend to be affected more commonly than men.

## PREVENTING BRAIN ANEURYSMS

The best way to prevent getting an aneurysm, or reduce the risk of an aneurysm growing bigger and possibly rupturing, is to avoid activities that could damage your blood vessels, such as:

- smoking
- eating a high-fat diet
- not controlling high blood pressure
- being overweight or obese

## CAUSES OF A BRAIN ANEURYSM

Brain aneurysms are caused by a weakness in the walls of blood vessels in the brain. There are several reasons why this may happen, although an exact cause isn't always clear.

The brain requires a large supply of blood delivered via four main blood vessels that run up the neck and into the brain.

These blood vessels divide into smaller and smaller vessels in the same way the trunk of a tree divides into branches and twigs.

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Most aneurysms develop at the points where the blood vessels divide and branch off, as these areas are often weaker.

## INCREASED RISK

There are a number of things that can increase your risk of developing a brain aneurysm. These are discussed below.

### SMOKING

Smoking tobacco can significantly increase your risk of developing a brain aneurysm. Studies have shown the majority of people diagnosed with a brain aneurysm smoked, or had done so in the past.

The risk is particularly high in people with a family history of brain aneurysm. Exactly why smoking increases the risk of brain aneurysms is unclear. It may be that the harmful substances in tobacco smoke damage the walls of your blood vessels.

### HIGH BLOOD PRESSURE

High blood pressure can place increased pressure on the walls of the blood vessels inside the brain, increasing your chances of developing an aneurysm. You're more likely to develop high blood pressure if you:

- are overweight
- have a relative with high blood pressure
- are of African or Caribbean descent
- eat a lot of salt
- don't eat enough fruit and vegetables
- don't do enough exercise
- drink a lot of coffee or other caffeine-based drinks
- drink a lot of alcohol
- are aged over 65

### FAMILY HISTORY

Having a first-degree relative, such as a parent, brother or sister, with a history of a brain aneurysm means you're more likely to develop one than someone with no family history of the condition.

However, the increased risk is still small only around 1 in 50 people with a family history of a ruptured brain aneurysm have a rupture themselves.

### AGE

Your risk of developing a brain aneurysm increases as you get older, with most cases diagnosed in people over the age of 40. This may be because the walls of the blood vessels are weakened over time by the constant pressure of blood flowing through them.

### GENDER

Women are more likely to develop a brain aneurysm than men. This may be because levels of a hormone called oestrogen lower significantly after the menopause. Oestrogen is thought to help

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maintain the elasticity of the blood vessels.

## **PRE-EXISTING WEAKNESS IN THE BLOOD VESSELS**

In some cases, brain aneurysms are caused by weaknesses in the blood vessels present from birth.

## **SEVERE HEAD INJURY**

A brain aneurysm can develop after a severe brain injury if the blood vessels in the brain are damaged, although this is very rare.

## **COCAINE ABUSE**

Cocaine abuse is considered to be another risk factor for brain aneurysms. Cocaine can inflame the walls of the blood vessels and raise your blood pressure. The combination of these two factors increases your risk of developing a brain aneurysm.

## **AUTOSOMAL DOMINANT POLYCYSTIC KIDNEY DISEASE**

Autosomal dominant polycystic kidney disease (ADPKD) is a genetic condition that causes multiple cysts to develop on the kidneys. Cysts are small sacs filled with fluid.

Around 1 in every 1,000 people is born with ADPKD. Of these people, around 1 in 20 develop an aneurysm in the brain.

## **BODY TISSUE DISORDERS**

Your risk of developing a brain aneurysm can be higher if you have a condition that affects your body tissues, such as Ehlers-Danlos syndrome or Marfan syndrome.

This is because these conditions can sometimes cause weaknesses in the walls of your blood vessels.

## **COARCTATION OF THE AORTA**

People with coarctation of the aorta are also at an increased risk of developing a brain aneurysm. Coarctation of the aorta is the term used to describe narrowing of the main artery in the body (the aorta), which is present from birth (congenital). It is a common type of congenital heart disease.

## **TREATING A BRAIN ANEURYSM**

Brain aneurysms can be treated using surgery if they've burst (ruptured) or there's a risk they will.

Preventative surgery is usually only recommended if there's a high risk of a rupture. This is because surgery has its own risk of potentially serious complications, such as brain damage or stroke.

### **Assessing your risk**

If you're diagnosed with an unruptured brain aneurysm, a risk assessment will be carried out to assess whether surgery is necessary. The assessment is usually based on the following factors:

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- your age research has found the risks associated with surgery in older adults often outweigh the potential benefits (extending natural lifespan)
- the size of the aneurysm aneurysms larger than 7mm often require surgical treatment, as do aneurysms larger than 3mm in cases where there are other risk factors
  - the location of±m brain aneurysms located on larger blood vessels have a higher risk of rupture
  - family history brain aneurysms are considered to have a higher risk of rupturing if you have a history of ruptured brain aneurysm in your family
  - underlying health conditions some health conditions increase the risk of a rupture, such as autosomal dominant polycystic kidney disease (ADPKD) or poorly controlled high blood pressure.

After these factors have been taken into consideration, your surgical team should be able to tell you whether the benefits of surgery outweigh the potential risks in your case.

### SURGERY AND PROCEDURES

If preventative treatment is recommended, the two main techniques used are called neurosurgical clipping and endovascular coiling. Both techniques help prevent ruptures by stopping blood flowing into the aneurysm.

#### NEUROSURGICAL CLIPPING

Neurosurgical clipping is carried out under general anaesthetic, so you'll be asleep throughout the operation. A cut is made in your scalp or sometimes just above your eyebrow, and a small flap of bone is removed so the surgeon can access your brain.

When the aneurysm is located, the neurosurgeon will seal it shut using a tiny metal clip that stays permanently clamped on the aneurysm. After the bone flap has been replaced, the scalp is stitched together.

Over time, the blood vessel lining will heal along the line where the clip is placed, permanently sealing the aneurysm and preventing it growing or rupturing in the future.

Clipping the artery the aneurysm is formed on as opposed to clipping the aneurysm itself is rarely necessary. This is usually only carried out if the aneurysm is particularly large or complex.

When this is necessary, it's often combined with a procedure called a bypass. This is where the bloodflow is diverted around the clamped area using a blood vessel removed from another place in the body, usually the leg.

#### ENDOVASCULAR COILING

Endovascular coiling is also usually carried out under general anaesthetic. The procedure involves inserting a thin tube called a catheter into an artery in your leg or groin. The tube is guided through the network of blood vessels, up into your head and finally into the aneurysm.

Tiny platinum coils are then passed through the tube into the aneurysm. Once the aneurysm is full of coils, blood cannot enter it. This means the aneurysm is sealed off from the main artery, which prevents it growing or rupturing.

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## COILING VERSUS CLIPPING

Whether clipping or coiling is used often depends on the size, location and shape of the aneurysm. Talk to your healthcare team about your treatment options. If it's possible to have either procedure, you should discuss the risks and benefits of both procedures.

Coiling has generally been shown to have a lower risk of complications than clipping in the short term, such as seizures, although the benefits in the long term are not certain.

With coiling, there's also a small chance you'll need to have the procedure more than once to reduce your chances of the aneurysm rupturing. About one in five people who have the coiling procedure need further treatment.

However, as coiling is a less invasive procedure, you can usually leave hospital sooner after the operation. After clipping, you'll usually need to stay in hospital for around four to six days, whereas you can usually go home one or two days after coiling.

The time it takes to fully recover is also typically shorter with coiling. Many people make a recovery within a few weeks of coiling, whereas recovering from clipping may take longer.

## EMERGENCY TREATMENT

If you require emergency treatment because of a ruptured brain aneurysm, you'll initially be given a medication called nimodipine to reduce the risk of the blood supply to the brain becoming severely disrupted (cerebral ischaemia).

Either coiling or clipping can then be used to repair the ruptured brain aneurysm. The technique used will usually be determined by the expertise and experience of the surgeons available.

In such emergency cases, the differences between the techniques are less important because things like your recovery time and hospital stay depend more on the severity of the rupture than the type of surgery carried out.