

Brain aneurysm

Introduction

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 anywhere in the body, but the two most common places for them to form are in the abdominal aorta (the artery that transports blood away from the heart to the rest of the body) and the brain.

This topic is about brain aneurysms. Read the separate topic on abdominal aortic aneurysm.

About brain aneurysms

The medical term for an aneurysm that develops inside the brain is an intracranial or cerebral aneurysm.

Most brain aneurysms will only cause noticeable symptoms if they burst (rupture).

This will then lead 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 has 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 3 in 5 people who have a subarachnoid haemorrhage will die within two weeks and half of those who survive are left with severe brain damage and disability.

Read more about the symptoms of a brain aneurysm.

A ruptured brain aneurysm is a medical emergency. If you suspect that you or someone in your care has had a ruptured brain aneurysm, call immediately and ask for an ambulance.

How brain aneurysms are treated

If a brain aneurysm is detected before it ruptures, treatment may be recommended to prevent it from rupturing in future. Most aneurysms, however, will not 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 will usually involve 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 will 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.

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

Read more about diagnosing brain aneurysms and treating brain aneurysms.

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.

Read more about the causes of brain aneurysms.

Who is affected

It's difficult to estimate exactly how many people are affected by brain aneurysms because in most cases they 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 a 100 people. The number of aneurysms that actually rupture is much smaller. Only around 1 in 12,500 people will have a ruptured brain aneurysm in any given year in England.

Brain aneurysms can develop in anyone at any age, but are more common in people over 40 years of age and 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 exercising regularly

being overweight or obese

Read more about preventing aneurysms.

Symptoms of a brain aneurysm

A brain aneurysm rarely causes any symptoms unless it bursts (ruptures).

However, unruptured brain aneurysms occasionally cause symptoms if they are particularly large or press against tissues or nerves inside the brain.

Symptoms of an unruptured brain aneurysm can include:

visual disturbances - such as loss of vision or double vision

difficulties moving one of your eyes

pain on one side of your face or around your eye

inability to move some of your facial muscles (usually only affecting one side of your face), which may make it difficult to speak

headaches

seizures (fits)

You should see your DOCTOR as soon as possible if you experience symptoms of an unruptured brain aneurysm. Although most aneurysms won't rupture, it is important to get it checked in case treatment is necessary.

Ruptured brain aneurysm

Symptoms of a ruptured brain aneurysm usually begin with a sudden agonising headache. It's been likened to being hit on the head, resulting in a blinding pain unlike anything experienced before.

Other symptoms include:

stiff neck

feeling or being sick

sensitivity to light

enlarged (dilated) pupils

blurred or double vision

confusion

loss of consciousness

Medical emergency

A ruptured brain aneurysm is a medical emergency. If you suspect that you or someone in your care has had a ruptured brain aneurysm, call immediately and ask for an ambulance.

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 is not 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 that a trunk of a tree divides into branches and twigs.

Most aneurysms develop at the points where the blood vessels divide and branch off, because 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 cigarettes 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 in the past.

The risk is particularly high in people with a family history of brain aneurysm (see below).

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 are 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 that you're twice as likely to develop one as 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 will go on to have a rupture themselves.

Age

Your risk of developing a brain aneurysm increases as you get older, with most cases diagnosed in people over 40.

This may be because the walls of the blood vessels weaken over time due to the constant pressure from blood flowing through them.

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 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 will 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.

Diagnosing a brain aneurysm

If there are indications you may have a brain aneurysm, a scan of your brain will usually be carried out.

This may be a magnetic resonance imaging (MRI) scan or a computerised tomography (CT) scan.

An MRI scan is usually used to look for aneurysms in the brain that haven't ruptured. This type of scan uses strong magnetic fields and radio waves to produce detailed images of your brain.

A CT scan is usually preferred if it is thought that the aneurysm has ruptured and there is bleeding on the brain (subarachnoid haemorrhage). This type of scan takes a series of X-rays, which are then assembled by a computer into a detailed three-dimensional image.

In some cases, a ruptured aneurysm is not picked up by a CT scan. If a CT scan is negative, but your symptoms strongly suggest you have a ruptured aneurysm, a test called a lumbar puncture will usually be carried out.

A lumbar puncture is a procedure where a needle is inserted into the lower part of the spine to remove a sample of the fluid (cerebrospinal fluid) that surrounds and supports the brain and spinal cord. This fluid can be analysed for signs of bleeding.

Planning treatment

If the results of scans or a lumbar puncture suggest you have either had a brain haemorrhage or have an unruptured brain aneurysm, a further test called an angiogram or arteriogram may be carried out to help plan treatment.

An angiogram or arteriogram involves inserting a needle (usually in the groin), through which a narrow tube called a catheter can be guided into one of your blood vessels. Local anaesthetic is used where the needle is inserted, so you won't feel any pain.

Using a series of X-rays displayed on a monitor, the catheter is guided into the blood vessels in the neck that supply the brain with blood. Once in place, special dye is injected into the arteries of the brain through the catheter. This dye casts a shadow on an X-ray, so the outline of the blood vessels can be seen and if an aneurysm is present it can be recognised.

Screening

There's no routine screening programme for a brain aneurysms and unlikely that one will be introduced in future. This is because researchers have calculated that routine screening would do little to prevent deaths but would place a significant drain on NHS resources.

Screening is only recommended for people thought to have a significant risk of having a brain aneurysm that could rupture at some point in future.

This would usually only apply to you if you had two or more first-degree relatives (father, mother, sister or brother) who had experienced a subarachnoid haemorrhage (bleeding inside the brain due to a ruptured aneurysm).

If this applies to you then you should contact your DOCTOR. They will be able to refer you to a specialist clinic for further assessment.

Discovering you have an aneurysm unsuitable for surgical treatment can cause worry and distress, even though the risk of it rupturing is small. Some people have reported regret at getting screened. There are no right or wrong answers but it's important you discuss the potential implications of screening with the staff of the clinic.

Screening may also be recommended if you have a condition that increases your chances of developing a brain aneurysm, such as autosomal dominant polycystic kidney disease.

Treating a brain aneurysm

Brain aneurysms can be treated using surgery if they have burst (ruptured) or if there is a risk that they will.

However, preventative surgery is usually only recommended if it's thought the risk of a rupture is significant. This is because surgery has

it's own risk of potentially serious complications, such as brain damage or stroke.

Assessing your risk

If you are diagnosed with an unruptured brain aneurysm, a risk assessment will be carried out to assess whether surgery is necessary.

The assessment process is usually based on the following factors:

your age – research has found that in older adults, potential benefit of surgery in terms of extending natural lifespan is often outweighed by the risks associated with surgery

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 the aneurysm – brain aneurysms located on larger blood vessels have a higher risk of a rupture

family history – brain aneurysms are considered to be at 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 individual case.

Active observation

If the risk of rupture is considered low then a policy of active observation is normally recommended. This means you won't receive immediate surgery, but be given regular check-ups so your aneurysm can be carefully monitored.

You may also be given medication to lower your blood pressure and your doctor may discuss lifestyle changes that can help reduce the risk of a rupture, such as losing weight and reducing the amount of fat in your diet.

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 from flowing into the aneurysm.

Neurosurgical clipping

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

When the aneurysm is located, the neurosurgeon (an expert in surgery of the brain and nervous system) 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 from growing or rupturing in the future.

Clipping the artery on which the aneurysm formed - 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 is often combined with a procedure called a bypass. This is where the blood flow 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 using 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 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 from growing or rupturing.

Coiling versus clipping

Whether clipping or coiling is used will often depend on things such as 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 benefits and risks of coiling and clipping with your care team.

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

With coiling, there is also a small chance you will need to have the procedure more than once to best reduce your chances of the aneurysm rupturing. About 1 in 5 people who have the coiling procedure will need further treatment.

However, as coiling is a less invasive procedure, you can usually leave hospital sooner after the operation than with clipping. After clipping you will 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 can take several weeks or months.

Emergency treatment

If you require emergency treatment because of a ruptured brain aneurysm, you will 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 such as your recovery time and hospital stay depend more on the severity of the rupture than the type of surgery carried out.

Preventing a brain aneurysm

You cannot always prevent brain aneurysms, but you can reduce your risk.

Most importantly, you should avoid two of the main things that increase your chances of developing a brain aneurysm - smoking and high blood pressure.

Smoking

If you smoke, stopping can significantly reduce your risk of developing a brain aneurysm.

If you're committed to giving up smoking but don't want to be referred to a stop-smoking service, your DOCTOR should be able to prescribe medical treatment to help with any withdrawal symptoms you may have after quitting.

See treatments to help you stop smoking and stop smoking advice for more information..

High blood pressure

Having high blood pressure can also significantly increase your chance of developing a brain aneurysm.

You can help reduce high blood pressure by:

eating a healthy diet - in particular, cutting down on salt and eating plenty of fruit and vegetables

moderating your alcohol intake - it's recommended men shouldn't regularly drink more than 3-4 units a day and women shouldn't regularly drink more than 2-3 units a day

maintaining a healthy weight - even losing just a few pounds will make a big difference to your blood pressure and overall health

exercising regularly - being active and taking regular exercise lowers blood pressure by keeping your heart and blood vessels in good condition.