

### What is aortic aneurysm repair?

Aortic aneurysm repair is a procedure used to prevent an [aortic aneurysm](#) from bursting. An aortic aneurysm is a bulging out of the wall of the aorta, the largest artery in the body, which runs from the heart through the chest and abdomen. Over time these bulges grow in size, and without treatment they may eventually rupture, causing massive internal bleeding that usually results in death. <sup>1</sup>

While not all aneurysms will burst, if you have a large or fast-growing aortic aneurysm you may need a procedure to repair it. Aortic aneurysm repair reinforces or replaces the aorta wall, preventing a potentially deadly rupture.

See also: [Aortic Disease](#)

### Who might have an aneurysm repair procedure?

Large or fast-growing aneurysms are the most likely to rupture. If you have an aortic aneurysm that is large, growing quickly, or causing [symptoms](#) (such as pain, discomfort or a pulsing feeling in the abdomen) you should have an aneurysm repair procedure to prevent it from bursting.

A repair will usually be necessary if your aneurysm is larger than 2.2 inches (5.5 cm) or expanding more than 0.4 inches (1 cm) a year.<sup>1</sup> Because women tend to have smaller aortas than men, a procedure may be considered if your aneurysm is 1.8 inches (4.5 cm) or larger. <sup>2</sup>

### Who should not have an aneurysm repair?

Small aortic aneurysms are unlikely to burst, so the risks of a repair procedure are likely to outweigh the benefits for women with small or slow-growing aneurysms. Your doctor may recommend regular monitoring, instead of a repair procedure, if your aneurysm is smaller than 1.8 inches (4.5 cm). For men, the cutoff is 2.2 inches (5.5 cm).

Aneurysms that do not require immediate treatment are monitored using imaging tests (such as [ultrasound](#)) every 6 to 12 months. You will also need to make heart-healthy lifestyle changes and take medication to slow the growth of the aneurysm. See [Aortic Disease Treatment Overview](#) to learn more.

### What is the prognosis after aneurysm repair?

Aneurysm repair procedures are an important tool to prevent a deadly rupture in women and men with large aneurysms, and they are becoming safer each year. In one study of 8,663 patients (17% were women) who had an aneurysm repair procedure, 69% survived for 5 years. The risk of problems is highest just after the procedure: 90% of those who survive the first few months live for at least 5 years.<sup>3</sup>

As with all procedures, aneurysm repair does carry risks. However, you will only have an aneurysm repair if your doctors decide that the risk of the aneurysm bursting is greater than the risk of the procedure. Approximately 20% of aneurysms larger than 5 cm, and 40% larger than 6 cm, will eventually burst. If your aneurysm does burst, your chances of survival are less than 1 in 10.<sup>1</sup>

### How do doctors decide what type of procedure is best for me?

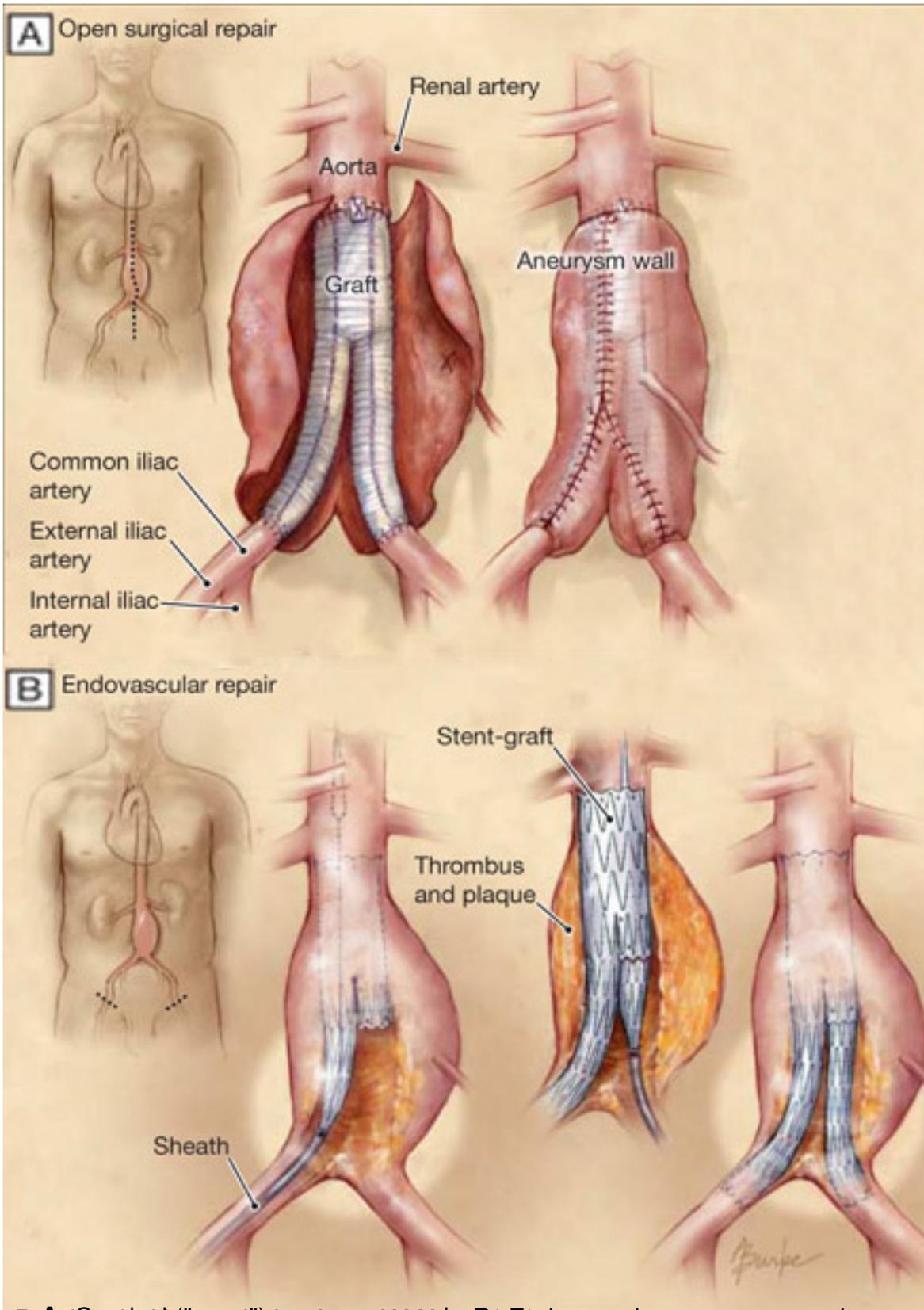
There are two main types of procedures used to repair an aortic aneurysm:

- [Surgical \("open"\) aneurysm repair](#) – a surgical procedure performed through an incision in your chest or abdomen
- [Endovascular aneurysm repair](#) – a newer, less-invasive procedure that repairs the

aneurysm from the inside using a long, thin tube inserted through a blood vessel in your groin

A vascular surgeon can help you decide which type of procedure is best for you. Surgical aneurysm repair may be preferred in women who are healthy enough to have a low risk of problems during a surgical procedure, or whose aneurysms cannot be repaired with an endovascular technique. Endovascular repair may be the treatment of choice for women who have other medical conditions that make surgery too risky, or who simply want to avoid the pain and long recovery time associated with surgery.

Before having a procedure, you will undergo a [CT angiogram](#) or [MR angiogram](#) to examine the location, size, and shape of the aneurysm, and to help determine the best treatment.



A. Stent-graft repair. B. Endovascular repair.

### What is surgical aneurysm repair?

Surgical aneurysm repair (also called "open" aneurysm repair) has long been the standard treatment to prevent aneurysms from bursting. During the procedure, an incision is made in your chest or abdomen to reach the aneurysm. The diseased part of the aorta is removed and replaced with an artificial device (called a *graft*) that is the same size and shape as your healthy artery. Alternatively, fabric patches may be used to strengthen the artery wall, preventing the aneurysm from growing or bursting.

Approximately 50,000 aneurysm repair surgeries are performed each year in the United States (20% to 25% of them in women).<sup>4</sup>

### How do I prepare for the procedure?

Be sure your doctor knows about all medications you are taking, including prescription medication, over-the-counter drugs, and any dietary or herbal supplements. Some medications, such as the blood thinning drugs [warfarin](#) (Coumadin), [clopidogrel](#) (Plavix), and [aspirin](#) can increase your risk of bleeding during surgery, so you may be told to stop taking them a few days before the procedure.

If you smoke, get the help you need to [quit smoking](#) at least 2 weeks before surgery. Quitting smoking will reduce the risk of breathing and blood clot problems during and after the surgery, and protect your long-term health.

You will have standard tests including blood and urine tests, an [electrocardiogram \(ECG\)](#), and a [chest X-ray](#) to give your surgeon the latest information about your health. These may be done a few days before the procedure or after you are admitted to the hospital.

You should not eat or drink after midnight the night before surgery. If you have [diabetes](#), ask your doctor how to keep your blood sugar under control before and after the procedure. Your

doctor may give you other special instructions.

### **What happens during the procedure?**

Surgical aneurysm repair takes place in an operating room at the hospital. You will be placed on a stretcher and given a mild sedative to help you relax. A nurse will insert an intravenous (IV) line into a vein in your arm so that medications can be given during the procedure. The area where the incision is to be made will be washed, disinfected, and shaved if necessary. Surgical aneurysm repair is performed using general anesthesia, so you will not be awake during the procedure.

Once you are asleep, a tube will be passed down your windpipe and connected to a machine called a ventilator to ensure you are breathing properly. Depending on the location of the aneurysm, you may also be connected to a heart-lung machine that takes over for your heart to pump blood through your body. Another tube will be passed into your nose and down your throat to stop liquid and air from collecting in your stomach, preventing you from feeling sick and bloated when you wake up. A tube called a catheter will also be inserted into your bladder to collect urine during the operation.

The surgeon will make an incision in your chest, abdomen, or on the left side of your body to access the aneurysm. She or he will move muscle and other tissue out of the way to expose the aneurysm. Metal clamps will then be used to cut off blood flow through the aorta. The aneurysm will be cut open and any blood clots or fatty deposits will be cleaned out. An artificial replacement for your artery, called a graft, will be sewn to your aorta above and below the aneurysm. After the graft is in place, the original aorta is usually sewn up around the graft, but it may also be removed completely. The surgeon will make sure blood is flowing smoothly through the aorta and not leaking or pressing on the aneurysm. The incision will be closed with stitches or staples.

Aneurysm repair surgery usually takes between 2 and 4 hours, depending on the location of your aneurysm. Your surgeon will tell you before the operation how long you can expect the procedure to take.

### **What happens after the procedure?**

You will be transferred to a recovery area after the procedure, where your breathing, blood pressure, and other vital signs will be continuously monitored. The incision will be checked for bleeding, swelling, or infection. When the anesthesia wears off, you will be transferred to the intensive care unit (ICU). After a few days you will move to a regular hospital room. You should expect to stay in the hospital for 7 to 10 days after surgery to repair an aortic aneurysm.

Your breathing tube will be removed when you are able to breathe on your own. Your throat and lips may be sore because of the ventilator tube. You will be encouraged to cough frequently to remove fluid from your lungs. You may be given [compression stockings](#) to wear after the surgery to prevent blood clots in your legs. Your doctor may order additional blood tests and imaging tests (such as [ultrasound](#)) to monitor your health and make sure blood is flowing properly through your new aorta.

When you are discharged from the hospital, you will be given instructions on how to take care of your incisions and receive medication (such as [aspirin](#)) to prevent blood clots. Contact your doctor immediately if you notice:

- Signs of infection of the incision, such as fever, chills, redness, swelling, or increasing pain
- Cough, chest pain, or shortness of breath
- Pain or swelling in your abdomen
- Any kind of pain that you cannot control with the pain medication you have been given
- Nausea or vomiting more than two days after you leave the hospital
- Pain, burning, or urgency when you urinate, or blood in your urine
- Signs of blood clots in the legs, such as pain or swelling

A few weeks after the surgery, you will return to the hospital for removal of the stitches and staples that closed your incision. You may also need follow-up imaging tests to make sure the aneurysm repair was successful and you are not developing another aneurysm.

Recovery after surgical aneurysm repair takes about 6 to 8 weeks. If you have an office job, you can usually return to work within a month. You will have to wait longer if you have a physically demanding job.

### What are the risks of the procedure?

As with all surgical procedures, aneurysm repair does have risks. However, your doctor has concluded that the risks of the procedure are lower than the risk of the aneurysm bursting, which is usually fatal. The risk of dying during surgery to repair an aneurysm is between 2% and 8%, with a higher risk in older patients and those with other medical conditions.<sup>1</sup>

Although women are slightly more likely than men to die during the surgery (8% of women compared with 5% of men in one large database), most studies find that the procedure is just as safe in women after the patient's age and other medical conditions are taken into account.<sup>3,5-7</sup>

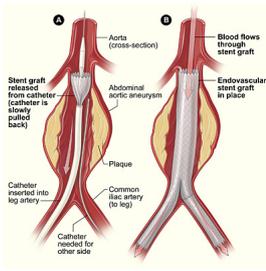
Possible complications after surgical aneurysm repair include:

- Infection of the incision site, or lung or urinary infections
- Excessive bleeding during or after the surgery, requiring a blood transfusion
- Blood clots that can cause a heart attack, stroke, or pulmonary embolism. You will be given medication to prevent blood clots after the surgery.
- Nerve damage that causes pain, numbness, or loss of feeling in your legs (more common in surgery for aneurysms in the upper ( *thoracic*) aorta)
- Kidney failure

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### What is endovascular aneurysm repair?

Endovascular aneurysm repair is a newer alternative to surgical aneurysm repair to prevent an [aortic aneurysm](#) from bursting. During endovascular aneurysm repair, a fabric and wire mesh tube (called a *stent graft*) is used to strengthen the aorta wall from the inside. The stent graft absorbs the pressure of blood flowing through the aorta, preventing it from pressing on the aneurysm and causing it to enlarge or burst. With time, the aneurysm usually shrinks.



Placement of a stent graft in an abdominal aortic aneurysm.

**A:** a catheter is inserted into an artery in the groin and guided to the abdominal aorta, and the stent graft is released. **B:** the stent reinforces the artery walls and allows blood to flow through the aneurysm, preventing it from rupturing.

Because the procedure is *endovascular* ("inside the blood vessels"), it does not require opening the body. Instead, the stent graft is carried on a long thin tube called a catheter that is inserted into your arteries through a small incision in the groin. Once it reaches the aorta, the stent graft is expanded and the catheter is removed.

Endovascular repair is becoming increasingly common because it is safer than surgical repair for both women and men, and allows you to recover faster with less pain. In some states, endovascular aneurysm repair accounts for more than half of aneurysm repair procedures.<sup>8</sup> However, endovascular repair is not right for everyone, and some aneurysms can only be treated with surgery because of their size or location.

### How do I prepare for the procedure?

Be sure your doctor knows about all medications you are taking, including prescription medication, over-the-counter drugs, and any dietary or herbal supplements. Some medications, such as the blood-thinning drugs [warfarin](#) (Coumadin), [clopidogrel](#) (Plavix), and [aspirin](#) can increase your risk of bleeding, and you may be told to stop taking them a few days before the procedure.

You will have standard tests including blood and urine tests, an [electrocardiogram \(ECG\)](#), and a [chest-X-ray](#)

to give your surgeon the latest information about your health. These may be done a few days before the procedure or after you are admitted to the hospital.

You should not eat or drink after midnight the night before the procedure. If you have diabetes, ask your doctor how to keep your blood sugar under control before and after the procedure. Your doctor may give you other special instructions.

### **What happens during the procedure?**

Endovascular aneurysm repair takes place in special operating room called a catheterization lab. You will be placed on a stretcher and given a mild sedative to help you relax. A nurse will insert an intravenous (IV) line into a vein in your arm so that medications can be given during the procedure. The area near your groin where the catheter is inserted will be washed, disinfected, and shaved if necessary. Endovascular aneurysm repair is usually performed using regional or local anesthesia, so you will be awake but will not feel pain.

The operator will make a small incision above the femoral artery in your groin, near the crease where your leg meets your abdomen. A thin metal wire called a guide wire will be inserted into the artery and guided up to your aorta using X-ray images. The doctor will then use a long, thin tube called a catheter, which follows the guide wire, to carry a stent graft up to your aorta. The stent graft is a fabric tube inside a wire mesh cylinder that is shaped like your aorta and designed to reinforce the aorta's walls. As the catheter is pulled back, the stent graft expands like a spring to fit tightly against the aorta wall above and below the aneurysm.

Blood passing through the aorta flows inside the stent graft, instead of pressing on the aneurysm and causing it to expand or burst. With time, the aneurysm usually shrinks because the pressure of blood pumped from the heart is no longer forcing it to balloon outwards.

After taking X-rays to make sure the stent graft is in place and no blood is leaking around the edges, the guide wire will be removed and the incision in your groin will be closed.

### **What happens after the procedure?**

After the procedure you will be transferred to a recovery room where your breathing, blood pressure, and other vital signs will be continuously monitored. The incision where the catheter was inserted will be checked for bleeding, swelling, or infection. You should expect to stay in the hospital for 3 to 4 days after endovascular aneurysm repair, compared with 7 to 10 days after surgical repair.<sup>8</sup>

When you leave the hospital, you will be given instructions about how to care for the incision wound and you may have to take blood-thinning medications (such as [aspirin](#) ) to prevent clots. You should avoid taking baths until your incision is fully healed, and avoid heavy lifting and strenuous activity for 4 to 6 weeks. Contact your doctor immediately if you notice:

- Signs of infection such as fever or chills, or redness, swelling, or increasing pain where the catheter was inserted
- Cough, chest pain, or shortness of breath
- Pain or swelling in your abdomen
- [Signs of blood clots](#) in the legs, such as pain and swelling

You will return for a follow-up visit about a month after the procedure. You will need to have imaging tests (such as [ultrasound](#) or a CT scan) at one and six months after the procedure to make sure your stent graft is in the proper position and blood is not leaking into the aneurysm. If these initial tests are normal, your doctor will probably want to check the graft once a year to watch for any long-term changes.

### **What are the risks of the procedure?**

As with all procedures, endovascular aneurysm repair carries some risks. However, it is generally safer than surgical repair, and less than 3% of patients die in the hospital following the endovascular procedure.<sup>8</sup> Perhaps because of their smaller arteries, women are more likely to experience complications during the procedure than men are (31% of women versus 13% of men), but they are no more likely to die or need additional procedures to treat their aneurysm.

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For both women and men, endovascular aneurysm repair carries a lower risk of complications than surgical aneurysm repair.

Potential complications after endovascular aneurysm repair include:

- Leaking of blood around the graft and into the aneurysm, known as "endoleak"
- Failure of the graft to close off the aneurysm, requiring a [surgical aneurysm repair](#) (less than 1% of patients)
  
- Movement of the graft away from where it was placed
- Splitting or breaking of the stent graft
- Blood clots that can cause a [heart attack](#) , [stroke](#) , or [DVT](#)
- Infection of the incision - Heart where the catheter was inserted

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