

# Aortic Aneurysms and their Treatment

including Open Surgical Operations and EVAR  
(EndoVascular Aneurysm Repair or stent grafting)

## Introduction

We expect you to make a rapid recovery after your operation and to experience no serious problems. However, it is important that you should know about minor problems which are common after these operations, and also about more serious problems which can just occasionally occur. The section "*What problems can occur after the operation?*" describes these, and we would particularly ask you to read this. The headings from this section will also be included in the consent form you will be asked to sign before your operation.

## What is an aortic aneurysm?

An aneurysm means ballooning of an artery, due to weakening of its wall. Aneurysms are most often found in the aorta, which is the main blood vessel passing down from the heart, and through the back of the abdomen (in front of the spine). Aneurysms usually develop below the main branches of the aorta to the kidneys and above the main branches of the aorta to the legs. Aortic aneurysms are in the back part of the abdomen, where they are difficult to feel and where they usually cause no symptoms of any kind.

## Who may get an aortic aneurysm?

We do not know exactly why aortic aneurysms develop, although there may be some genetic reasons that the aortic wall becomes weak. They

are much more common in men than women and are found more often in smokers. High blood pressure (hypertension) may contribute. Aortic aneurysms are very uncommon in people less than 55 years of age and start to become common after 65 years of age. Occasionally there is a tendency for them to develop in male members of the same family. Male relatives of men who have developed aneurysms should consider requesting a scan to check the width of their aorta at around age 55 as there is a 1 in 3 risk they too will have an aneurysm.

## What is the risk of having an Aortic Aneurysm?

Many aortic aneurysms grow to a modest size and then stop growing: they never cause a problem and do not need treatment. Sometimes, however, aneurysms enlarge to a size at which they may leak or burst ("rupture" of the aneurysm). This often results in sudden death, and even with emergency surgery the chance of survival is modest. If an aneurysm is discovered and treated before it ruptures then the outlook is excellent. Details of operations to treat aneurysms are set out below.

The normal aorta is less than 3cm wide, and if it becomes wider than this then an aneurysm is present. There is almost no danger at all so long as the aorta is less than 5cm wide. The risk of rupture starts to become a concern when the width of the aorta reaches 5.5cm in men and 5cm in women. Even then the chance of death due to rupture of an aneurysm is no more than

about 1 in 4 (25%) after two years, so we may advise against operating on patients for whom surgery would be very dangerous, or whose life expectancy is short for other reasons. For most patients, however, aortic aneurysms are a treatable condition for which an operation offers a lasting cure and a return to their normal life.

## How can aortic aneurysms be detected?

Aneurysms can be detected by simple scanning using ultrasound (or sometimes CT or MR body scans). They may be found by chance when a doctor examines a patient's abdomen or when a person has an X-ray scan of their abdomen, for any reason. However, there is now a national screening programme, to detect aortic aneurysms by ultrasound scanning. All men are invited for a scan around their 65<sup>th</sup> birthday. If the aorta is wider than normal, then further scans are arranged, to keep a check on it. Because aortic aneurysms are much less common in women, they are not offered routine screening.

## What is the alternative to an operation?

If an aortic aneurysm is found which is less than about 5cm in diameter (women) or 5.5cm (men) then it is reasonable to keep a check on it by ultrasound scanning every few months. We would discuss the pros and cons of this approach (as opposed to an early operation) with you in detail.

An aortic aneurysm operation is never essential, and you can always choose to avoid treatment if you wish.

## What kinds of operation are possible?

There are two kinds of operation for aortic aneurysms, both of which place tube shaped grafts of material inside the aneurysm, through which the blood then flows. These are:

- An open surgical operation. This is the traditional treatment, which involves major surgery in the abdomen

- EndoVascular Aneurysm Repair (EVAR or "stent grafting"). For many aneurysms it is now possible to insert a "stent graft" through cuts or simple needle punctures in the groins, by a smaller operation in which the abdomen is not opened.

The operations and the choice between them are described in the next sections.

## Open surgical operation for aortic aneurysm

This is a major operation, done under general anaesthetic through an incision in the abdomen which may be vertical or side-to-side. Occasionally further incisions are required in the groins, but this is unusual. The aneurysm is replaced by a graft made of fabric (Dacron) either in the shape of a tube, or in the shape of a pair of trousers (taking blood to the main artery to each leg). Dacron is a material which cannot be rejected by the body. We protect it and minimise the risk from infection by giving antibiotics.

## EVAR (EndoVascular Aneurysm Repair)

The operation is done in the X-ray Department, usually under general anaesthetic (although local anaesthetic and sedation are occasionally used). A short incision is made in each groin, the arteries are controlled, and the stent graft is inserted with the guidance of x-rays. Stent grafts are manufactured or chosen individually for each patient, pre-packed in a long tube, so that they can be introduced into the aorta through arteries in the groins. Sometimes additional procedures are required:

- In a small number of patients it is necessary to block off selected arteries in the pelvis to divert blood flow.
- If this is necessary then a bypass graft may be needed between the arteries in the right and left groins, to "shunt" blood from one leg to the other.

## The choice between an Open operation and EVAR – how do we decide?

Patients with an abdominal aortic aneurysm have to be managed very carefully prior to any operations in order to ensure the very best outcome.

Once your aorta has reached the size at which it is felt you would be safer with an operation than living with the aneurysm, we begin the process of “Working you up” for repair. There are a number of aspects to this:

1. **Anatomy.** You will have a detailed CT angiogram to establish whether or not you are suitable for an EVAR.
2. **Previous surgical history.** If you have a complex abdominal surgical history you may not be suitable for an open aneurysm repair.
3. **Fitness.** You will have an exercise test performed under the care of a vascular anaesthetist who will assess your general fitness, estimate the risk to you of surgery (EVAR and open separately) and estimate your life expectancy without surgery. They will also highlight any potential areas in which your general condition can be improved prior to surgery.
4. **MDT discussion.** Your exercise report and CT scan will be discussed at a Multidisciplinary Team Meeting by vascular surgeons, X-ray specialists and anaesthetists who will discuss in detail the best means of treating your individual case.
5. **Discussion with you.** We will then arrange to meet with you in the clinic to present you with your treatment options including a full discussion of the risks and benefits of each.

Because there are strict timelines for undertaking treatment, you will often undergo scanning and exercise testing before meeting with your vascular surgeon.

## Summary of advantages and disadvantages of EVAR and Open repair

**An open surgical operation** is possible for any aneurysm, from a technical point of view. The main consideration is the risk that this kind of major surgery poses for some patients.

Traditional open operations for aortic aneurysms pose a small risk to life (depending on the fitness of the patient and on other medical conditions, such as heart trouble). The risks are described in more detail in the section “*What problems can occur after the operation?*” Patients need to be monitored in the Intensive Care Unit for a day or two after the operation and usually stay in hospital between for 5-10 days.

However, once you have recovered from the operation and been discharged from hospital, no long-term follow-up is required.

**EVAR** - The risks to life and the chances of immediate serious complications are lower after EVAR. Patients do not need to go to the Intensive Care Unit after EVAR and recovery is quicker. Hospital stay is usually 1-2 days.

However there is a long-term risk of problems following EVAR including stent displacement, blockage and leaks around the stent (Endoleak). For this reason we ensure a further CT angiogram at 3 months and annual follow-up with ultrasound scans and plain abdominal X-Rays. Because these problems may present after a number of years, the follow-up scans and X-Rays will need to be for life.

## OPEN SURGICAL OPERATION

### What happens after you come into hospital?

You will come into hospital on the morning of your operation. You are seen by members of the surgical team and by the anaesthetist. We tell you the planned time of your operation but there is always a small risk of postponement if an intensive care bed becomes unavailable as a result of emergency admissions.

When you go to the operating theatre for an open repair several fine tubes will be inserted both for treatment and for monitoring. These include a drip into a vein, another into an artery, and a further drip into a large central vein (via the neck). A tube is inserted into your windpipe and connected to a ventilator (breathing machine). A fine tube is also passed down the nose (to keep the stomach empty) and another into the bladder (to drain your urine during and after the operation). An epidural is inserted into the back which helps with pain relief after the operation. Many of these tubes are put in when you are sedated or asleep.

## What happens after the operation?

You will wake up in the intensive care unit (or occasionally in the Recovery Unit).

There will be a lot of monitoring machinery around you: this is normal. The nurses will tell you exactly what is going on. Sometimes the tube in your windpipe is left in place to help your breathing for a few hours after the operation. You may be aware of this, although you are likely to be kept quite sleepy until the tube is removed.

You will normally spend either one or two days on the intensive care unit and then return to the ward. The nurses will start helping you out of bed to begin walking about.

During the first 24 hours you can only have small amounts to drink but you will be able to increase the amount you drink and eat depending on how you feel, over the first two or three days. Various tubes will gradually be removed and we will explain this to you day by day. The last of the tubes is generally removed about the fifth day after the operation.

You are bound to have some discomfort from the incision in your abdomen, especially on moving or coughing, but we will give you a lot of pain killers to help with this and an epidural is usual after this operation for several days (an epidural means a fine tube placed in the back which is used for pain relief). You will do no damage through moving about or coughing. It is most important to breathe deeply and to cough, as the nurses and physiotherapists will advise

you. You may be able to get home as soon as 4-5 days after the operation, but many patients find the need to stay up to about a week and sometimes recovery takes longer.

## What other after effects will there be, and how quickly will you return to normal?

An open operation for an aortic aneurysm is very major surgery, and full recovery takes several weeks, although people vary a lot. You should try to do anything which you feel able, but you will get tired quickly in the early days after going home. By about a month after the operation you are likely to be doing all the things that you would like to do, but you will probably not regain your full strength and vitality for perhaps three months.

In the first week or two after going home it is not unusual for people to experience days when they feel depressed, and even tearful. Sometimes the operation can disturb your appetite, the taste of food, your ability to concentrate for any length of time, and your sleep. All these should gradually return to normal. Following a long abdominal incision aches, pains, and twinges are usual as you increase your activity, but you will not damage the wound by being active within the limits of your comfort.

Constipation is sometimes a problem during the first week after a major open operation.

## What problems can occur after an open operation?

### Wound problems

Your wound (or wounds) may initially be painful, bruised and lumpy, but all these should settle within the first few weeks.

### Infection

Infection or gaping of the outer layers of the wound is a small risk, but this usually recovers with dressings and perhaps antibiotics. Infection of the bypass graft is a very uncommon complication (less than 1 in 100 risk for

operations confined to the abdomen but a slightly higher risk if an incision is necessary in either groin). We take many precautions to guard against infection and give antibiotics at the time of operation. If infection ever does develop on an aortic graft then this is a very serious matter. Very rarely the graft can erode into a part of the gut causing bleeding. This requires further surgery.

## Organ failure

Heart problems, including heart attacks, abnormal rhythms requiring treatment, and heart failure are all possible risks of aortic surgery. Kidney failure (sometimes requiring dialysis) is another occasional complication. The kidneys usually recover. Chest problems, including pneumonia and respiratory failure (requiring prolonged artificial ventilation) are risks. Disturbance of blood flow to the gut can result in gangrene of part of the bowel, which is a very grave problem; and disturbed blood flow to the brain can result in stroke. All these problems are uncommon following planned replacement of an aneurysm: they are more common following emergency operation for aneurysms which have ruptured. There is a higher risk of all these problems after open repair than after EVAR operations. This is why EVAR is often advised particularly for people with heart, lung or kidney problems who are at special risk of organ failure.

## Impotence

In men there is a risk of about 1 in 5 (20%) of disturbed sex function (difficulty with erection, ejaculation, and having intercourse) as a result of open surgery. This is because the nerves controlling sex function cross the front of the aorta and its branches. We take great care to avoid these nerves. We know very little about the potential effect on women's sexual life. There is little risk of sexual dysfunction after EVAR.

## Risks to the legs and feet

Any kind of aortic surgery poses serious but very small risks to the legs and feet.

Very rarely small blood clots can pass from the aneurysm during surgery to the toes and feet, resulting either in a period of poor blood supply to the toes which gradually recover, or the loss

of one or more toes. If the blood supply to a leg becomes seriously disturbed by blood clots then amputation is a risk. Less serious disturbance of blood flow to a leg can result in pain in the calf or thigh on walking a certain distance. Very rarely the blood supply to the spinal cord can be damaged resulting in paralysis of the legs. All these problems are extremely uncommon (a risk of less than 1 in 100).

Passage of small blood clots to the buttock muscles is a rare side effect of EVAR. If that happens then claudication can occur: this means pain in the area of the buttocks and hips on walking.

## Deep vein thrombosis (DVT)

Deep vein thrombosis, with the risk of blood clots passing to the lung, is an occasional complication, but we take special steps to protect against this.

## Death

Aortic surgery does carry a risk of death, particularly because of the strain it can place on the heart. Overall the risk is about 5% (one in twenty), but the risk is lower in people who are relatively young and fit, and higher in those who are elderly and who have other medical problems. The risk of death after EVAR is lower – about 1%. The risks vary from person to person and we will discuss this with you. We always balance this risk against the risk posed to you by your aneurysm.

## The risks of a general anaesthetic

General anaesthetics have some risks, which may be increased if you have chronic medical conditions, but in general they are as follows:

- **Common temporary side-effects** (risk of 1 in 10 to 1 in 100) include bruising or pain in the area of injections, blurred vision and sickness (these can usually be treated and pass off quickly).
- **Infrequent complications** (risk of 1 in 100 to 1 in 10,000) include temporary breathing difficulties, muscle pains, headaches, damage to teeth, lip or tongue, sore throat and temporary difficulty speaking.

- **Extremely rare and serious complications** (risk of less than 1 in 10,000). These include severe allergic reactions and death, brain damage, kidney and liver failure, lung damage, permanent nerve or blood vessel damage, eye injury, and damage to the voice-box. These are very rare and may depend on whether you have other serious medical conditions.

## **STENT GRAFTING (EVAR)**

### **What happens after you come into hospital?**

You will come into hospital on the morning of your operation. You are seen by members of the surgical team and by the anaesthetist. We tell you the planned time of your operation, which takes place in a special suite in the X-ray Department.

### **How is stent grafting (EVAR) done?**

When you go to the X-ray Department for an EVAR operation, a fine tube will be inserted into a vein (a "drip"). If you are having a general anaesthetic, a tube is inserted into your windpipe and connected to a ventilator (breathing machine). Another tube is passed into your bladder (to drain your urine during and after the operation).

A stent graft (EVAR) operation is done through incisions in the groins - usually about 10cm long on each side. The stent graft is inserted into the aorta and its branches through these incisions. Sometimes extra stents are required for the main branches of the aorta to the legs and occasionally it is necessary to block off one of those arteries to seal off the aneurysm completely. If this is done, then a bypass graft is taken under the skin from the main artery in one groin to the main artery in the other. The artery to one leg then "lends" blood to the other - it has plenty of blood flow to do that without a problem.

## **After an EVAR operation**

You will wake up in X-ray Department or in the Recovery Unit. You will usually stay in the Recovery Unit for an hour or two before returning to the ward. You are bound to have some discomfort from the incisions in your groins, especially on moving, but we will give you pain killers to help with this. You will do no damage through moving about. You can start to drink again soon after the operation and may be able to eat the same evening. Your drip and catheter will usually be removed within 24 hours of the operation. You will usually be able to leave hospital within 48 hours of EVAR if you feel well enough.

### **What other after effects will there be, and how quickly will you return to normal?**

An EVAR operation is less major and recovery is much quicker than after an open surgical operation, but you may still experience some of the problems and side effects described for an open operation (above). Most people feel they have made a good recovery within about a month.

### **What problems can occur after EVAR (stent grafting)?**

Wound problems, infection and risks to the legs and feet are similar to those described above for open operations. In particular, the groin wounds often feel hard and lumpy for the first few weeks – but they will gradually settle. Deep vein thrombosis, organ failure and death are also possible complications after EVAR but the risks are significantly lower than after open operation. The risks of a general anaesthetic are described above.

#### **Particular risks of EVAR are:**

### **Conversion to an open operation**

This may be needed if there is a problem inserting a stent graft but is very uncommon.

## Endoleaks

An endoleak occurs when blood continues to leak past the join between the stent and the aorta (or other artery). Endoleaks can also occur if blood continues to flow into the aneurysm around the stent through a small branch of the aorta which has not sealed off after the operation. Endoleaks may be discovered by x-rays done at the time of insertion of the stent graft or by one of the regular scans done yearly after the procedure. Endoleaks occur in less than 10% of patients. If they do occur they can usually be treated by further procedures in the X-ray Department, but uncommonly an open surgical operation is needed.

## Dislodgement or breakage of the stent graft

This is very rare with modern stent grafts. If it does occur a further operation is needed.

## Nerve damage

Nerves in the groin can occasionally be bruised or permanently damaged during the operation. The most usual result is an area of numbness or "pins and needles" in the front of the thigh. Normally this recovers over weeks or months.

## Disturbance to blood supply

Disturbance to the blood supply of the spinal cord, causing paralysis of the legs, is also possible after EVAR but is very rare indeed (risk one in many hundreds).

## Impaired kidney function

If you are known to have reduced kidney function, we take precautions to minimise the risk of the contrast (dye) used by keeping you well hydrated in addition to giving extra medication during the operation. If your kidney function is of particular concern, this will be discussed in detail with you.

## What should you do if you develop problems?

We will not let you leave hospital until you have settled fairly well after the operation. If after that time you develop any problems which cause you concern, it is usually best to approach your General Practitioner first who will know all about what has happened to you. If you develop any acute problem, such as trouble with the blood flow to a leg or infection, we are always prepared to see you urgently in the hospital.

Most people who have grafts for aortic aneurysms recover well and have no serious complications. The whole aim is to get you back to a normal life with a normal life expectancy.

## The National Vascular Register

Vascular surgeons are required to submit details of all major operations to the National Vascular Register, as a public record of their practice and to provide information about vascular surgery for the UK. All these records are anonymous: at no stage is any patient's name put on record. If you have any arterial operation we would like to submit information about it to the National Vascular Register and will do so unless you express a clear wish not to have your details submitted. It is very important both for us and for national statistics that information is gathered about all operations so that there is a complete record, and none are missed out.

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