Royal College of Anaesthetists

Vascular Anaesthesia Society of Great Britain & Ireland

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Patient Information Forum

Your anaesthetic for vascular surgery

This leaflet gives information to help you prepare for surgery on one of the large blood vessels in your body. This could be your neck (carotid artery – see blue section), your abdomen (aorta – see pink section) or your legs (femoral artery – see lilac section). It provides information about the different types of anaesthetics which can be used for these operations and what choices you may have. Please ask your surgeon, anaesthetist or preassessment nurse to highlight which sections of this leaflet apply to you.

Getting fit for your operation

There are steps you can take to improve your health before your operation. The fitter you are the more likely that the surgery will be a success and you will have better recovery.

Smoking

If you smoke you are strongly advised to stop. The earlier and longer you can stop, the better. Quitting is not easy, but your GP surgery will be able to support you with this.

- If you can stop smoking for a day or two before your operation, your blood cells will be able to carry more oxygen around your body.
- If you can stop smoking for about six weeks before surgery you are less likely to get a chest infection after the operation. Infections can lead to a longer hospital stay.

Alcohol

If you regularly drink alcohol over the recommended limit of 14 units per week, it is helpful to reduce the amount that you drink. Alcohol can reduce the function of your heart and liver, which can reduce your body's ability to heal after surgery and its ability to fight infection.

Stopping high alcohol intake suddenly just before you come to hospital can cause withdrawal symptoms, so it is better to cut down gradually in the weeks before the operation.

Losing weight

If you are significantly overweight, the risks associated with both the anaesthetic and the surgery will be higher for you. Losing weight ahead of surgery can help reduce the stress on your heart and lungs during surgery and lessen the risks of blood clots and wound infections.

Exercise

Increasing your activity levels in the weeks leading up to your surgery will increase your strength and fitness and help you recover more quickly from the surgery. Exercise will also help manage your anxiety and help you sleep well. By exercising regularly you can build up your activity levels – walking or swimming will be ideal for those who are less mobile.

Eating well

A healthy, balanced diet with plenty of fruit and vegetables in the days leading up to the operation is important for your body to heal well after surgery.

You can find more information on how to prepare for an operation here:
rcoa.ac.uk/fitterbettersooner

Anaesthetic preoperative assessment

As part of getting you ready for your vascular surgery, your surgeon will ask you to attend a preoperative assessment clinic at the hospital. A preassessment nurse will assess your medical fitness for the surgical options which are being considered. You may also meet an anaesthetist at this clinic.

This appointment will include looking in detail at any existing medical conditions you might have such as heart disease, breathing problems (eg asthma or chronic bronchitis), diabetes, anaemia, high blood pressure or kidney disease. Many of these conditions can affect recovery from surgery and need to be controlled as well as possible ahead of your surgery.

If relevant, a doctor who specialises in the care of the elderly may be asked to assess your overall physical and mental wellbeing. This will also help the healthcare staff looking after you to make sure that the right care and support is available for you after you leave hospital.

Some vascular operations can stress your heart. People with vascular disease are also at higher risk of having heart disease. Therefore it is important to assess how your heart functions ahead of surgery with a heart tracing test (an electrocardiogram or ECG – see monitoring and equipment section).

You may be referred to a heart specialist, who may adjust your medication or request some additional tests (see below).

Any new medication will usually be for life and your GP will be informed. This should also have the benefit of protecting your heart long after the operation.

Additional fitness tests before vascular surgery

Depending on the type of surgery planned and your medical fitness, you may also be asked to have one or more of the following tests.

Cardiopulmonary exercise testing (CPET)

This test may be done if you are preparing for an aortic aneurysm repair (see next section) or for other procedures if you have suspected heart or lung problems. You will be asked to cycle on an exercise bicycle for approximately 10 minutes. The test shows how your heart, lungs and blood circulation cope with exercise. This helps the healthcare team to assess whether you will need extra support during the operation and immediately afterwards. For example it might suggest that after the operation you need to spend time in the high dependency unit or intensive care unit.

Cardiac magnetic resonance imaging (MRI) scan

This is used to check how well the muscle and valves of the heart work and the blood supply to your heart. During the test you will lie still on a bed, which moves inside an open tunnel-shaped scanner. The scan may last over an hour and can be quite noisy, but you will be able to listen to music with headphones and speak with the radiographer during the scan.

Heart 'stress' tests using medicines (dobutamine stress echo or myocardial perfusion scans)

These give more information on the blood supply to your heart and how well the heart pumps when under stress. Because they do not involve exercise, they are suitable for patients with limited mobility.

During these tests a medicine is given into a vein to put the heart under a controlled amount of stress. A scanning machine is used to see how the heart responds.

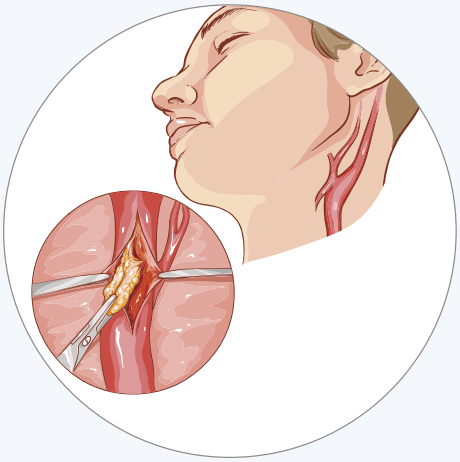
Breathing tests (pulmonary function tests)

These test your maximum breathing efforts by getting you to blow as hard as you can into a small tube. If you have a lung disease and are being treated, it may be used to assess how well your lungs are working. It may also help to diagnose chronic obstructive pulmonary disease (COPD), a progressive lung disease which is common in patients requiring vascular surgery, especially in those who smoke or have smoked heavily.

Anaesthesia for common vascular operations

In the following sections you will find information about the most common vascular surgery procedures and the types of anaesthetics used. Not all the information will be relevant to you and you can ask your healthcare team to tell you which parts you should read.

Carotid endarterectomy (carotid artery)



This surgery is performed to remove the build up of fatty deposits (plaque) from the carotid artery, which carries blood to your brain. If the flow of blood is reduced by plaque it can lead to a stroke or a mini-stroke (a transient ischaemic attack or TIA). Carotid endarterectomies can be performed either using a general anaesthetic or a local anaesthetic.

With a local anaesthetic you will be awake during the procedure. This has the advantage of the healthcare team being able to check that there is always enough blood flowing to your brain. They do this by talking to you and asking you to do simple tasks such as squeezing a hand or wriggling your toes. You may also be offered light sedation to help you relax during the procedure. The surgery will normally last between one and a half to three hours.

Your anaesthetist will be able to explain more about the advantages and disadvantages of a local or general anaesthetic. They will agree with you and your surgeon which option is better for your surgery based on the condition of your carotid artery, your medical assessment and your preferences. When you arrive for the procedure, the healthcare team will first check your details with your consent form and then put you on monitoring equipment. It is important to monitor your blood pressure accurately during the surgery, therefore an arterial line (see monitoring and equipment section) will be inserted into an artery, after numbing a small area of skin.

For an awake carotid endarterectomy, the anaesthetist or surgeon will inject the local anaesthetic into your neck to make the area numb for three or four hours. An ultrasound machine is often used (see monitoring and equipment section) so that the local anaesthetic can be placed accurately around the nerves which supply the area.

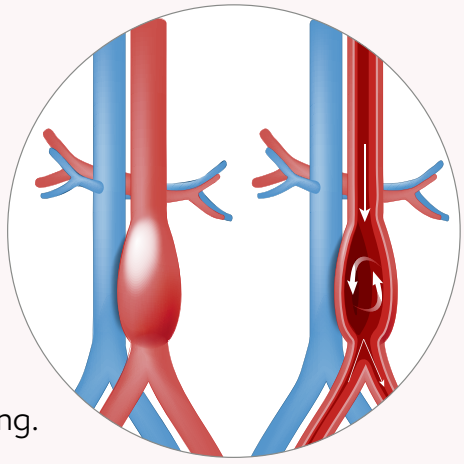
It is normal to feel some pressure once the procedure starts, but if you feel discomfort during the surgery, you should tell your surgeon and they can give you extra local anaesthetic.

Rarely, some patients may need to be offered a general anaesthetic in addition to local anaesthetic. In this case, the operation will be stopped temporarily to give the general anaesthetic.

Recovery after a carotid endarterectomy

After carotid surgery you will usually go to either the recovery area or a high dependency unit so you can be carefully monitored for a few hours. When the anaesthetist and surgeon are happy that your blood pressure is stable, and that you have recovered from the anaesthetic and are feeling comfortable, you will be able to go to the ward.

Aortic aneurysm repair surgery (aorta)



An abdominal aortic aneurysm (AAA) is a bulge or swelling in the aorta, the main blood vessel that runs from the heart down through your abdomen (tummy) and your legs. It can get bigger over time, which can lead it to burst and cause life-threatening internal bleeding.

There are two main types of surgery for an abdominal aortic aneurysm.

- **Open aortic aneurysm repair (open AAA):** the abdomen is cut and the damaged aorta is replaced with an artificial tube graft.
- **Endovascular aortic aneurysm repair (EVAR):** this is a keyhole operation where a stent (a short wire mesh tube) is passed through an artery in your groin to strengthen the lining of your aorta.

There are benefits and risks with both types of surgery. These will be discussed with you taking into account the severity of your arterial damage and your preoperative assessment results.

Anaesthetic options for aortic aneurysm repair

A general anaesthetic is always needed for an open AAA.

For EVAR surgery, a general anaesthetic can be used, but there are also several regional anaesthetic techniques (spinals and epidurals) which can be used on their own or in combination with a local anaesthetic injection. If regional and local anaesthetic techniques are used on their own you will be awake and you may be offered sedation to help you relax.

- **Spinal:** local anaesthetic is injected through a needle placed between the bones in your lower back to numb the nerves from your waist down to your toes. The numbness usually lasts between one and two hours. A longer-acting pain relief medicine may also be injected, which may last for 12 hours or more (see: rcoa.ac.uk/patientinfo/leaflets-video-resources).
- **Epidural:** the process for this is very similar to a spinal but usually a small catheter (tube) is left in the back, through which extra local anaesthetic can be given as required.
- **Local anaesthetic injection:** a larger amount of local anaesthetic can be injected into the skin in your groin to numb the area where the stents will be inserted.

What happens on the day of open AAA or EVAR surgery?

You will meet your surgeon and anaesthetist and can discuss with them any questions or concerns you might still have. You will then be taken to the anaesthetic room or the operating theatre, where all the standard monitors will be connected and a cannula will be placed into a vein (see monitoring and equipment section).

If you are having a general anaesthetic, the anaesthetist may put in an arterial line (see monitoring and equipment section) to monitor your blood pressure accurately. Other drips or monitors will then be connected while you are asleep.

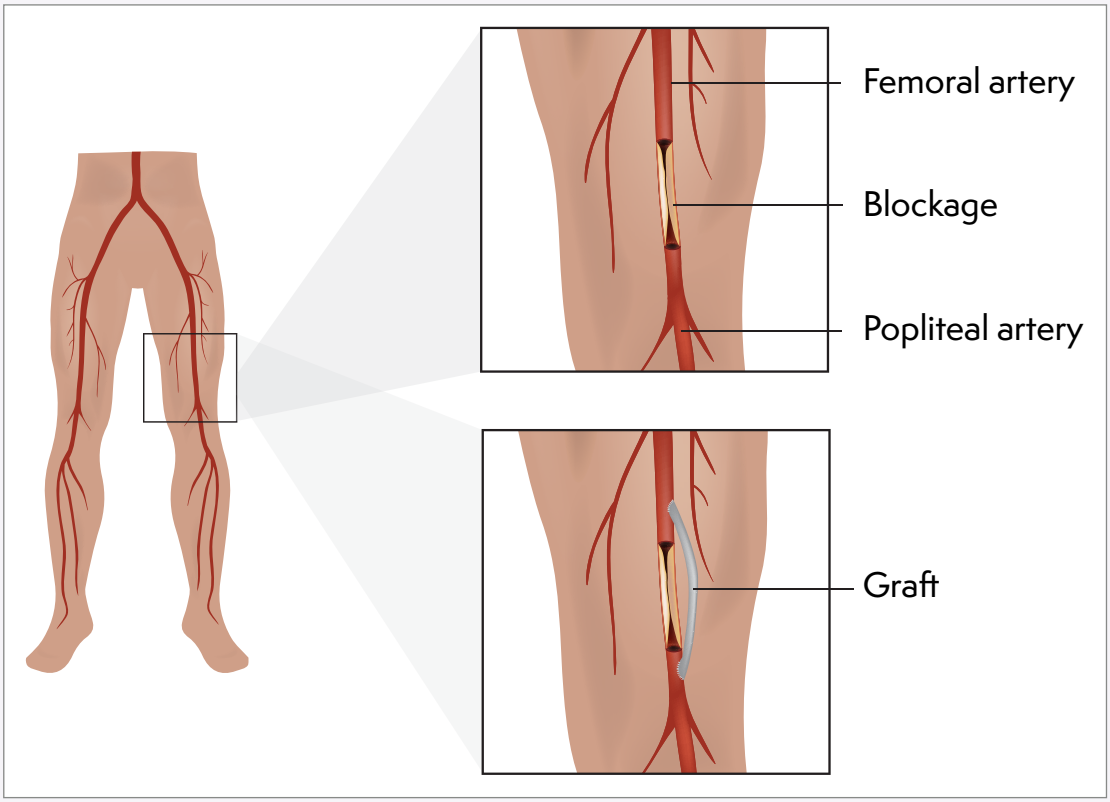
Recovery after open AAA surgery

You will usually go to the intensive care unit (ICU) or the high dependency unit (HDU). Here your nurse and medical team will make sure you have enough fluids, that your heart, lungs and kidneys are working well and that you are comfortable. If all is well, you will usually go back to the surgical ward after one or two days.

Recovery after EVAR surgery

Most patients who have had a standard EVAR procedure recover on the surgical ward. Patients who have had a more complex EVAR procedure may be looked after in the HDU or ICU.

Arterial bypass surgery in your legs (femoral artery)



This type of surgery is used to improve the flow of blood through the arteries to the legs and feet in patients suffering from peripheral arterial disease (PAD). This is known as 'revascularisation'.

There are two main types of revascularisation treatment for PAD:

- **angioplasty:** where a blocked or narrowed part of the artery is widened by inflating a tiny balloon placed inside it.
- **artery bypass graft:** where a blocked artery is bypassed using either one of your own blood vessels (usually a vein) or using an artificial graft.

These procedures can be carried out using either a general anaesthetic or a regional anaesthetic technique, such as a spinal or an epidural anaesthetic.

The decision over which technique is best will be made after discussions between you and your anaesthetist and the surgeon and will take into consideration your medical history and fitness. Lower limb operations can take a long time and you may need to lie flat on your back for several hours. If you are unable to lie flat for long, then a general anaesthetic may be the better option. If a regional technique is used then sedation can be used to help you relax during the procedure.

Following surgery, you will go to a special recovery area where you can be closely monitored. The nurses will be checking that the blood is flowing well to the feet and legs and they will make sure that your breathing, kidney function and blood pressure are good.

Equipment and monitoring used during vascular surgery

During vascular surgery your heart and breathing must be monitored carefully. Below are some of the most common monitors and equipment which most patients will experience:

- **ECG (electrocardiogram):** a trace of the electrical activity of your heart. Sticky pads with wires attached are put on your chest. This takes five to ten minutes
- **blood pressure cuff:** monitors your blood pressure by squeezing your arm every three to five minutes throughout the operation
- **oxygen saturation monitor:** a small peg or clip is put on your finger, toe or earlobe and measures the oxygen levels in your blood
- **intravenous cannula (IV line):** a small plastic tube (cannula) is inserted in the back of your hand to deliver the drugs and fluids you will need throughout the operation
- **arterial line:** similar to an IV line but inserted into an artery (usually in the wrist, where you can feel the pulse) to continuously monitor your blood pressure in real time. It can also be used to take blood samples for testing.

Once you are anaesthetised, the following equipment may also be used depending on which surgery you are having and your medical condition:

- **breathing tube:** only for a general anaesthetic. This is put in through your mouth into your trachea (wind pipe) to help your breathing during the operation. It is put in once you are anaesthetised
- **central venous catheter (CVC):** a larger intravenous (IV) cannula which is put into one of your neck veins. It allows the anaesthetist to give many different drugs and fluids at the same time. Occasionally this is put in while you are awake, but your anaesthetist will inject some local anaesthetic to numb the skin and minimise any discomfort. The CVC can often be kept in for a day or more after your surgery if you need it

- **ultrasound probe:** this is put in after you are anaesthetised and is removed before you wake up. The probe is inserted into your oesophagus (the tube that connects your mouth to your stomach) through your nose or mouth to monitor your circulation and to show how much fluid you need during surgery
- **urinary catheter:** a tube inserted into your bladder to collect urine. You may be awake when this is put in, but local anaesthetic gel will be used to minimise discomfort
- **lumbar drain:** this is a small flexible tube that is placed in the lower spine to drain some of the cerebrospinal fluid (CSF), which surrounds your spinal cord and brain to protect them from injury. This can improve the blood flow to your spinal cord after complex aortic aneurysm repairs where a very long section of the aorta is affected. If you need this, your anaesthetist and surgeon will discuss it in more detail.

Cell salvage machine and blood transfusion

Although anaemia (iron deficiency) is common, it is associated with worse outcomes after major surgery. You will be tested for anaemia at your preoperative assessment. If you are anaemic before surgery and time allows, the cause of your anaemia will be investigated and treated.

Blood transfusion may be needed in all major surgery, but donated blood will only be given if absolutely necessary. Blood transfusion is most common in those having lower limb and aortic surgery. Whenever possible a cell salvage machine will be used; this collects your own blood, washes it and then returns it to you, avoiding the need for transfusions.

Pain relief after surgery

Some people need more pain relief than others, or respond differently to pain-relieving drugs. Occasionally, pain is a warning sign that all is not well, so you should tell the staff looking after you if your pain increases.

Your anaesthetist will discuss with you different options to help manage your pain after surgery.

You will normally be given regular pain relief by mouth or into your IV line. For surgery on your aorta or blood supply to your legs your anaesthetist may also discuss with you the following options:

Continuous epidural

If you have an epidural, the epidural catheter will be left in place at the end of the operation and connected to a pump to inject anaesthetic and painkillers as required after surgery. You may have some numbness over your abdomen and legs, and your limbs may feel heavier than normal until the pump is stopped. The epidural can stay in for several days after the operation.

Patient-controlled analgesia (PCA)

This is a pain relief pump connected to your cannula which you control yourself by pressing a button. The pump has safety settings to stop you accidentally getting too much medication.

Wound catheters

Local anaesthetic is injected into your wound along one or more small plastic tubes to numb the area of the surgery. The surgeon or anaesthetist will place the tubes during the operation. Wound catheters can stay in for several days after your operation.

Risks and consent in vascular surgery

The risk of complications during or after your operation depends on the type of surgery you have, how well your heart is working and your general health before surgery.

The anaesthetist and surgeon will use the results of your assessments and tests to plan your care. They can then guide the discussion with you about the potential risks and benefits to you of undergoing vascular surgery, and specifically:

- if surgery is a good option for you
- what operation will be best for you
- planning of the anaesthetic care you will receive during the operation
- planning of the care you will receive immediately after the operation, eg recovery ward, high dependency unit or intensive care unit.

Everyone varies in the risks they are willing to take. Your doctors (anaesthetist and surgeon) will explain the risks to you, but only you can decide whether to go ahead and have the operation. Nothing will happen until you understand and agree with what has been planned for you. You always have the right to refuse if you do not want the operation. This is particularly important as many vascular operations, such an aortic aneurysm repair, are carried out to help prevent problems occurring in the future, even though you may not be experiencing any major symptoms at the time of discussing the options.

All the common events and risks from general anaesthesia apply to vascular operations:

- feeling sick and having a sore throat afterwards is very common
- uncommon risks include damage to teeth, nerves and eyes
- allergic reactions to anaesthetic drugs are rare.

You can find out more information on the risks and common events associated with having an anaesthetic on our website: rcoa.ac.uk/patientinfo/risks/risk-at-a-glance

Specific risks from your anaesthetic for vascular surgery

Bleeding and infection

There are risks with putting in lines, drips and monitoring. These include bruising, bleeding and infection. These risks are common – 1 in 100 cases. Less commonly this equipment may cause damage to other parts of your body they are close to.

Damage to the heart

Most patients who have vascular disease in their legs or aorta are also likely to have disease affecting their heart, even if it is not causing symptoms. As a result, patients having vascular surgery usually have an increased risk of having heart complications during and after surgery.

The preoperative fitness tests show who might be more at risk of these complications. These patients are more likely to need a higher level of support and monitoring during and after their surgery. The overall risk of a heart attack is around 1–3 in 100.

Damage to the kidneys

During aortic surgery there are risks to your kidneys as the blood supply to your kidneys comes from the aorta. The risks depend on how complicated the surgery is and how well your kidneys are working before the operation.

During EVAR, a dye is used to show where the graft needs to be placed. The dye could damage the kidneys, so the anaesthetist carefully controls the amount of fluid you are given and monitors the amount of urine you produce. Uncommonly a dialysis machine may be used to clean your blood of waste products while your kidneys recover.

To find out more about the risks from general, spinal and epidural techniques you can read the information on our website: rcoa.ac.uk/patientinfo/risks

People vary in how they interpret words and numbers. This scale is provided to help.

Where can I get further information?

Most hospitals produce their own information leaflets about vascular and heart surgery and many of these contain information about anaesthesia.

You can find more information leaflets on the College website: rcoa.ac.uk/patientinfo
The leaflets may also be available from the anaesthetic department or preassessment clinic in your hospital.

Additional sources of information:

- Anaesthesia and risk (rcoa.ac.uk/patientinfo/risks).
- Preparing for surgery: Fitter Better Sooner (rcoa.ac.uk/fitterbettersooner).
- Information leaflets and video resources (rcoa.ac.uk/patientinfo/leaflets-video-resources)
- The Vascular Society for Great Britain and Ireland (vasgbi.com).
- Royal College of Surgeons of England (http://bit.ly/2LNAY52)
- NHS Choices (nhs.uk).
- Your GP.

Disclaimer

We try very hard to keep the information in this leaflet accurate and up-to-date, but we cannot guarantee this. We don't expect this general information to cover all the questions you might have or to deal with everything that might be important to you. You should discuss your choices and any worries you have with your medical team, using this leaflet as a guide. This leaflet on its own should not be treated as advice. It cannot be used for any commercial or business purpose.

For full details, please see our website: rcoa.ac.uk/patientinfo/resources#disclaimer

Information for healthcare professionals on printing this leaflet

Please consider the visual impairments of patients when printing or photocopying this leaflet. Photocopies of photocopies are discouraged as these tend to be low quality prints and can be very difficult for patients to read. Please also make sure that you use the latest version of this leaflet, which is available on the RCoA website: rcoa.ac.uk/patientinfo/leaflets-video-resources

Tell us what you think

We welcome suggestions to improve this leaflet. Please complete this short survey at: surveymonkey.co.uk/r/testmain. Or by scanning this QR code with your mobile:

If you have any general comments, please email them to: patientinformation@rcoa.ac.uk

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This leaflet will be reviewed within three years of the date of publication.