

EndoVascular Aneurysm Repair (EVAR)

What is this operation?

An endovascular aneurysm repair (EVAR) is a minimally invasive procedure aimed at treating, and thereby preventing rupture of, an abdominal aortic aneurysm(AAA). Typically, a stentgraft is passed into the aneurysmal aorta via a puncture in the groin artery. Once in the correct position, it is deployed and fixed in position. It works like the inner tubing of a tyre that effectively takes the pressure of the aneurysmal wall, preventing its rupture. Aortic stentgrafts are usually modular devices that allow for the construction of bifurcated reconstructions so that both legs are kept in circulation. Depending on the client's anatomy aorto-uni-iliac endovascular reconstructions may be used which mostly need to be completed by a cross over bypass graft in the groin in order to keep both legs adequately perfused.

Why is this operation being offered?

Endovascular aneurysm repair is a prophylactic procedure. The aim is to prevent rupture of the aortic aneurysm which mostly leads to fatal internal bleeding. The risk of rupture of any aneurysm is related to its maximum size. Below 5 cm maximum diameter, the risk of rupture is very small (<1%). Only for aneurysms larger than 5.5cm does the rupture risk outweigh the risks of the (endovascular) aortic reconstruction procedure. However, depending on the client's health status, it may be decided to raise the threshold for treatment to a larger maximum diameter, in order to balance the (increased) risk of the procedure with the higher rupture risk associated with a larger aneurysm.

Occasionally, an EVAR is carried out in case of a ruptured abdominal aortic aneurysm. This is a dire emergency that is only treated in selected NHS trusts.

What happens before your operation?

Before you undergo an EVAR a number of essential investigations and assessments are performed to assess the suitability of your aortic anatomy for endovascular repair as well as your overall fitness to undergo major arterial surgery. These may include:

- Blood tests
- CT angiography
- Cardiac Echo
- Cardiopulmonary exercise test
- Chest X-ray
- ECG

Once the decision has been made to proceed to EVAR an admission date will be agreed between yourself and your surgeon. A pre-admission visit may be required to complete paperwork and undertake blood tests or other allied tests required prior to undergoing a general anaesthetic. Please bring all your medications to your pre-admission review.

What happens on the day of admission?

You will usually be admitted the day before surgery so as to ensure all requirements prior to surgery have been adequately completed. Your surgeon will visit you and ask you to sign a consent form for your operation. You will also be visited by your anaesthetist.

Please do not stop any of your normal medications unless specifically instructed to by your surgeon

If you smoke, we strongly encourage you to stop as soon as possible to reduce the risk of peri-operative complications.

What do I need to bring when I come into hospital?

You should bring the following items with you at the time of admission:

- All your normal medication
- Nightwear & slippers
- Toiletries
- A set of comfortable clothes for discharge
- A good book

What happens during the operation?

The majority of EVAR cases are performed under general anaesthesia (with you asleep). Occasionally the procedure may be performed under a spinal anaesthetic where an injection into your back numbs you from the waist down for the duration of the procedure or even under local anaesthetic. The majority of our clients prefer to have the procedure performed asleep (general anaesthesia). However, if medically indicated it is possible to perform this procedure under

regional block (spinal anaesthesia) or local anaesthetic. This will be decided in conjunction with the anaesthetist and in line with individual client preference.

The first part of your operation involves giving you a general anaesthetic, if the procedure is to be performed under general anaesthesia. Once you have been anaesthetised, a tube will be placed into your airpipe and connected to a mechanical ventilator which will breathe for you during the operation. Additionally, you will have a tube (catheter) inserted into your bladder to drain your urine. This facilitates accurate assessment of your hydration status during and immediately after the operation. Occasionally the anaesthetist will decide to insert a small tube into an artery in your wrist to enable accurate measurement of your blood pressure during your operation. Once the necessary monitoring equipment has been connected your surgeon will start the operation.

The circulation clinic undertakes all EVAR procedures as a joint case with two of our consultants operating together. This reduces the time taken to perform the operation and thereby the time you are under general anaesthesia. We strongly believe this improves our client's outcomes and reduces the risk of a variety of potential complications including heart attacks, kidney failure, respiratory complications and infection rates.

Through small transverse incisions the surgeons will expose the femoral artery in both groins. The femoral artery is punctured, and a wire is advanced through the puncture hole into the aorta. Over this wire the stentgraft components are manoeuvred into place and deployed under X-ray image guidance. A radiopaque contrast is injected (angiogram) to augment X-ray imaging enabling your surgeons to visualise relevant side-branches and facilitate safe positioning of the stentgraft. At the end of the procedure a completion angiogram is obtained in order to confirm correct positioning of the stentgraft system. Occasionally an adjunct procedure is required to ensure exclusion of the aneurysm e.g. for an endoleak (see below)

The wounds are repaired in layers with stitches. A drain may be inserted into the wounds to drain any excess fluid that may accumulate in the immediate post-operative period. An abdominal X-ray and ultrasound will be obtained the first post-operative day to assess the position and function of the stentgraft.

What are the risks?

All surgery is associated with risk. EVAR may be a minimally invasive (key hole) procedure, but it is associated with manipulation of the aorta, i.e., the main blood vessel in the body and is therefore associated with a risk of significant complications. Complications of surgery can broadly be categorised according to when they occur (during the hospital admission (early) or following discharge (late)) and whether or not they occur at the site of surgery (local) or affect the entire body (systemic).

Some possible complications of EVAR include:

- Early complications:
 - Local
 - Wound related
 - Bleeding
 - Infection
 - Wound breakdown
 - Fluid collection
 - Injury to surrounding structures
 - Nerve damage causing numbness, pain or weakness in the leg
 - Lymphatic leak causing leakage from the wound, collection or leg swelling
 - Graft complications:
 - Bleeding or blockage requiring re-operation.
 - Graft infection (rare)
 - Blood clot in leg (deep vein thrombosis)
 - Limb loss (very rare)
 - Systemic
 - Implantation Syndrome: Stentgrafts are essentially metallic structures covered in waterproof material e.g. Gore-Tex. Occasionally the body surmounts an inflammatory response to this foreign material much in the same way which a thumb would go red, swell and become hot at the site of a splinter. This when following an EVAR is on a larger scale and the client will appreciate this as flu like symptoms; high temperature, night sweats, fatigue etc. This is invariably self-resolving within a couple of weeks; the symptoms treated with over the counter medication e.g. paracetamol. On very rare occasions the symptoms can last for a couple of months.
 - Heart related
 - Heart attack
 - Irregular heart rhythm
 - Lung related
 - Pneumonia
 - Fluid on the lungs
 - Clot on the lung (pulmonary embolus)
 - Kidney related
 - Kidney failure that may require temporary dialysis
 - Brain related
 - stroke

- Late complications
 - Stentgraft blockage:
 - Blockage of (a limb of) the stentgraft is a rare occurrence. It is seen in 0-5% of EVAR cases. This may be precipitated by stentgraft kinking or narrowing/blockages of blood vessels upstream or downstream of the stentgraft. The indication for treatment depends on the severity of associated symptoms, the physical condition of the patient and the vascular anatomy. If possible, endovascular (key hole) procedures are used to restore blood flow through the graft e.g. angioplasty, although occasionally a surgical bypass operation may have to be carried out.
 - Endoleak
 - Persistent blood flow in the aneurysm sack after endovascular repair is defined as an endoleak and is considered a complication of the procedure as the primary objective of endovascular aneurysm repair is to exclude the aneurysm sack from the circulation. Depending on the nature of the endoleak, the persistent blood flow in the aneurysm sack means that the sack may still be pressurised and therefore continues to be at risk of rupture. Endoleaks caused by holes in the graft material, insufficient apposition of the stent graft against the aortic wall or disconnection of overlapping stent graft components require intervention in order to depressurize the aneurysm sack and mitigate the risk of rupture. These endoleaks may be related to, stentgraft material failure, graft migration or progression of aneurysmal disease. Lifelong surveillance is necessary to mitigate the risk associated with these endoleaks, which develop in as many as 20-40% of patients during long term follow up. Alternatively, retrograde flow of blood through aortic side branches such as the lumbar arteries or the inferior mesenteric artery, into the aneurysm sack are innocuous and do not require any treatment in the majority of cases.

All these potential complications are understandably concerning to our clients. Rest assured our surgeons make every effort to ensure your risk is reduced to the lowest level possible through our expertise and experience. The overall risk of you suffering from a major complication that either threatens your life or leg is about 2% i.e. for every 100 clients we perform an endovascular aneurysm repair on 98 will make a full recovery from the operation and be discharged home. When complications do occur, we pride ourselves in dealing with them rapidly and appropriately.

What happens after the operation?

The majority of clients remain in hospital for one day for monitoring and recuperation. Patients are encouraged to mobilise as soon as possible after the procedure. On the day after the operation an abdominal X-ray and duplex Doppler ultrasound scan will be performed to assess the position of the stent graft and the possible presence of an endoleak. Patients should be fully mobile directly after the operation. Throughout the early period of recuperation there will be discomfort at the site of the operation which we treat with pain medication.

What happens when I go home?

Although at the time of discharge we ensure you are safe to go home we ask that there is a responsible adult with you for the first few days following discharge.

You will be able to have a shower at 48 hours post-surgery, but we ask you to refrain from bathing until the wounds are fully dry.

For the first few weeks post-surgery there is often wound pain and discomfort. You may feel physically exhausted doing relatively minor activity, rest assured this is entirely normal and improves with time.

The majority of clients are able to return to work within 2 weeks of discharge, but this does depend on the nature of your employment, the type of EVAR operation you have had and how well you recuperate from your surgery. If in any doubt please wait until you have been reviewed in clinic by your surgeon.

When Will I be able to drive?

You are able to drive when you are able to perform an emergency stop and are able to concentrate fully on driving. Overall, we advise you to not drive a car for the first 4 weeks post-surgery or until you have pain free movement of your foot and knee, and are able to stamp your foot on the ground. Different rules apply for different 'Group' license holders and we recommend contacting the DVLA and your car insurance company for further advice.

Will I need to see the surgeon again?

We review all EVAR patients in clinic approximately 6 weeks following discharge.

All clients who have undergone EVAR surgery are entered into a surveillance programme to help prevent stent graft related complications through early identification of graft migration, stent kinking or endoleak development. The surveillance programme involves annual duplex Doppler ultrasound and X-ray examination of the stentgraft after one year post-surgery. During the first-year surveillance will occur more frequently.



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