Aorto-Bifemoral Bypass

What is the aorta and femoral arteries?

The aorta is the largest artery in the body. It begins at the aortic valve in the heart and runs initially towards the head. In the upper chest it turns backwards and downwards and courses in front of the spine towards the abdomen. At the level of the umbilicus (belly button) it splits into two arteries (Iliac arteries) to provide blood supply to both legs (external iliac arteries) and the pelvis (internal iliac arteries). The external iliac artery (EIA) becomes the femoral artery in the groin.

What is an Aorto-Bifemoral bypass?

Aorto-Bifemoral (ABF) bypass is a type of open surgical arterial reconstruction for the management of clients with symptomatic aorto-iliac occlusive disease (AIOD). (See Aorto-iliac disease in conditions).

During an ABF bypass a lapartotomy (abdominal incision) is performed through a midline incision. After exposure of the aorta and iliac arteries, the aorta is clamped above the disease and opened (aortotomy) to expose the lumen. Once the lumen has been cleared of any disease (endarterectomy) a synthetic graft is sewn to the aorta; the graft is shaped like a pair of trousers with the waist sewn to the aorta. The femoral arteries are then opened and cleared of disease (femoral endarterectomy). One limb of the trouser graft is then attached to each femoral artery thereby creating a bypass around the diseased aorto-iliac segment.

There are various variants of this procedure depending on the location and extent of the AIOD; the most widely used open surgical reconstructions are: aorto-bifemoral (may be to one (uni-femoral) groin artery if only one leg is affected), aorto-iliac (uni- or bi-iliac), and ilio-femoral bypass. All these operations involve an incision in the abdomen to expose the artery (aorta) above the disease and incisions in the groin if exposure of the femoral arteries are required.

Why is this operation being offered?

For the majority of clients an ABF bypass is offered to treat symptomatic aorto-iliac occlusive disease that is not amenable to minimally invasive, e.g. CERAB, techniques, or for whom the durability of minimally invasive techniques is inadequate. (See aortoiliac disease in Conditions)

What happens before your operation?

Before you undergo your operation a number of essential investigations and assessments are performed to assess your overall fitness to undergo major arterial surgery and to decide the extent of aortic/iliac/femoral reconstruction depending on the extent of AOID. These may include:

- Blood tests
- CT angiography
- Cardiac Echo
- Chest X-ray
- ECG

Once the decision has been made to proceed with your operation an admission date will be agreed between yourself and your surgeon. A pre-admission visit will 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 or anaesthetist.

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 you normal medication
- Nightwear & slippers
- Toiletries

- A set of comfortable clothes for discharge
- A good book

What happens during the operation?

Aorto-bifemoral bypass is a major operation performed under general anaesthesia (with you asleep). The first part of your operation involves giving you the anaesthetic. A tube will be placed into your air pipe once you have been anaesthetised 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. The anaesthetist will furthermore insert a small tube into an artery in your wrist to enable accurate measurement of your blood pressure during your operation. In order to minimise pain after the operation as much as possible, the anaesthetist may place a catheter in the epidural space of your spinal cord - epidural. This catheter will be connected to a pump for continuous administration of pain busting drugs during the first 4-5 days after surgery that numb the nerves supplying the area of the abdominal incision. In case of contra-indications for epidural catheter placement, your surgeon may opt to place a catheter for pain relief in your abdominal wall at the end of the procedure. Once the necessary monitoring equipment has been connected your surgeon will start the operation.

The circulation clinic undertakes all open aortic surgical procedures as a joint case with two of our experienced 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 a midline laparotomy (occasionally a transverse incision may be used) the surgeons will gain access to your abdominal cavity. After a brief inspection of the abdominal cavity (to ensure that nothing untoward is found that was not evident on pre-operative investigations/imaging), they will proceed to expose the aorta and both common iliac arteries. Depending on the extent of the AOID they may have to expose the renal arteries proximally. Once adequate exposure has been achieved an aortic clamp will be placed proximally. All efforts are taken to place this clamp below the renal arteries, so that the kidneys remain perfused during the operation; however in selected extensive AOID cases your surgeons may deem it necessary to temporarily clamp the aorta above the renal arteries, thereby, temporarily, interrupting the blood flow to your kidneys. The aorta is then opened. Often the aorta has significant disease even above the area of blockage; your surgeons may need to clear this disease (endarterectomy) to create a suitable site to anastomose (join) the synthetic graft to. The waist of a trouser shaped graft is then

anastomosed to the aortic opening with non-absorbable sutures. The limbs of the trouser graft are then tunnelled through the pelvis into the groin.

The femoral arteries are exposed through vertical groin incisions in each groin. The femoral arteries are clamped and then opened (arteriotomy). In our experience femoral endarterectomy is almost always required to improve the patency of the femoral arteries and allow for adequate outflow for the aortic graft limbs. Once the endarterectomy has been completed a limb of the trouser graft is then anastomosed to the femoral artery creating the ABF bypass.

Following the bypass reconstruction all wounds are repaired in layers with stitches. If you have not been given an epidural catheter, your surgeon will now place catheters in your abdominal wall for post-operative pain relief. Drains may be inserted into the groin wounds to drain any excess fluid that may accumulate in the immediate post-operative period.

After the operation you will be transported to Intensive Care Unit (ICU). Depending on how well you are at the end of the operation, the ICU team will try to wake you up as soon as possible after the operation. However, they may deem it necessary to keep you sedated for one day (or longer) following the operation. One or two days after the operation you should be well enough to be transferred to the ward where you will stay 4-5 more days until you are fit for discharge.

What are the risks?

All surgery is associated with risk. ABF bypass is a major procedure associated with significant risks. It poses a major stress for your heart and lungs, while manipulating the aorta, i.e., the main blood vessel in the body. Therefore, this operation is associated with a small risk of potentially catastrophic complications including death.

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 Aorto-bifemoral bypass include;

- Early complications:
    - Local
        - Wound related
            - Bleeding
            - Infection

        - Wound breakdown
        - Fluid collection requiring drainage or further surgery
    - 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
        - Aortic, iliac and/or femoral dissection and occlusion
        - Iatrogenic trauma to small bowel
    - Graft complications (3-5%):
        - Bleeding or blockage requiring re-operation.
        - Graft infection (rare)
    - Blood clot in leg (deep vein thrombosis)

- Systemic
    - 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
    - Urogenital
        - Impotence
        - Retrograde ejaculation
    - Gastrointestinal
        - Gastroparesis and pseudo-obstruction
        - Large and/or small bowel ischemia requiring bowel resection.
    - Death (<5%)

- Late complications

    - Graft related:
        - Blockage of (a limb of) the graft is a rare occurrence. At 5 years 90% of grafts will be functional (patent) without having required further intervention e.g. angioplasty. A further 5% will be patent having required a further procedure; typically an angioplasty.

- Anastomotic pseudoaneurysms are very rare late complications of ABF surgery. They represent disruption of the anastomotic suture line and as such require ideally re-intervention particularly when associated with graft infection.
- Graft infection (<1%)
- Aorto-enteric fistula (<1%)

- Non-vascular
  - Incisional hernia (30-90%)
  - Small bowel obstruction
  - Sexual dysfunction: the majority of men with AOID suffer with vascular impotence (inadequate blood supply to the penis to allow an erection). ABF will often increase the blood supply particularly if combined with reconstruction of the internal iliac artery system. However the nerves to the genitalia are closely associated to this area of the arterial system and may be inadvertently damaged during pelvic dissection resulting in retrograde ejaculation/ impotence and/or failure to climax.

All these potential complications are understandably concerning to our clients. Rest assured our surgeons are very experienced in this field of surgery and make every effort to ensure your risk is reduced to the lowest level possible. When complications do occur we pride ourselves in dealing with them rapidly and appropriately.

What happens after the operation?

After the operation you will be transferred to ITU. Depending on your condition, the ITU team will either try to wake you up and extubate you as quick as possible or may choose to keep you sedated and intubated for one or two days. Once you are awake and extubated and under the provision that you do not require any cardiovascular or other support you will be transferred from ITU to the vascular ward for further recuperation.

The majority of clients remain in hospital for 7-10 days following aortic surgery, but this does vary on an individual basis.

Patients are encouraged to mobilise as soon as possible after the procedure. With the help of a physiotherapist, patients are encouraged to get out of bed as soon as possible, to minimise the risk associated with prolonged immobility, such as chest infection, muscle wasting, and bed sores.

Throughout the early period of recuperation there will be discomfort at the site of the operation which we address with a multi-targeted approach including; epidural pain relief, local abdominal wall infusion of pain medication, oral or intravenous analgesia.

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.
Your wounds will have sufficiently healed within a few days of surgery to allow you to have a shower. Your ability to have a shower within this time frame is primarily dictated by your overall physical recovery with many clients preferring a sponge wash during the immediate post-operative period. We ask you to refrain from submersive bathing until the wounds are fully dry; normally 1-2weeks post-surgery.

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 not able to return to physical activity within 8 weeks of discharge, but this does depend on the nature of the activity and how well you recuperate from your surgery. If in any doubt please wait until you have been reviewed in clinic by your surgeon. Patients may require anything between 3 months and one year to return to pre-operative levels of fitness.

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 6 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 aortic surgery patients in clinic approximately 6 weeks following discharge.