



**Midland Vascular Centres  
Patient Information Sheet  
Diagnosis and Management of Peripheral Arterial Disease  
August 2010**

## **Introduction**

In the UK atherosclerosis (or hardening of the arteries) of the legs affects up to one in five men aged over 65 years and is increasingly common in women

There are four main causes:

- Smoking - this damages the 'non-stick' lining of the arteries, makes the blood extra 'sticky' and prevents the blood from carrying as much oxygen as it should.
- High blood pressure (hypertension) - this also damages the lining of the arteries.
- High blood cholesterol levels - this leads to fat furring up and eventually blocking the arteries.
- Diabetes - this condition can cause damage to arteries of all sizes

Many patients with early lower limb atherosclerosis have no symptoms. However, as the disease progresses, many will develop a condition called intermittent claudication - a cramping type pain upon walking, usually in the muscles of the calf. The pain may force the patient to stop, upon which the pain usually disappears completely after a few minutes. However, when the patient starts walking again the pain will come back. The pain tends to come on more quickly and be more severe if the patient is walking faster or up a hill.

When we exercise the muscles in the legs require much more oxygen than whilst at rest. Oxygen is carried to the muscles in the blood through the arteries. If these arteries are furred up or blocked, the blood supply cannot deliver sufficient oxygen to the muscles and so they have to work without sufficient oxygen, which causes pain. As soon as we stop exercising the demand for oxygen diminishes, the blood supply 'catches up' and the pain disappears.

If intermittent claudication is not recognised, diagnosed and treated then patients can go on to develop what is termed critical or severe limb ischaemia which manifests as pain at rest, usually in the feet and often at night. Untreated this can lead to ulceration and gangrene.

Atherosclerosis also affects the arteries of the

- Heart - leading to angina and heart attacks.
- Brain - leading to stroke and blindness.
- Kidneys - leading to high blood pressure and kidney failure.
- Bowels - leading to pain on eating and weight loss.

## Diagnosis of Peripheral Arterial Disease

Your doctor will attempt to feel pulses in your leg and foot. When the arteries in the leg are healthy it is usually possible to feel pulses in the groin, behind the knee, behind the ankle bone on the inside of the foot and on top of the foot. As atherosclerosis progresses and the arteries start to furl up, these pulses start to disappear.

Next, your doctor will record the blood pressure in the arteries of the foot using a special machine called a hand held Doppler. Blood pressure in the leg should be the same as (or slightly higher) than the blood pressure in the arm, so by recording both and dividing the leg pressure by the arm pressure we can calculate a ratio called the *ankle-brachial pressure index* (ABPI) which gives a measure of the severity of the arterial disease.

## Investigations for Peripheral Arterial Disease

All patients with suspected peripheral arterial disease should undergo blood tests to check kidney and liver function and cholesterol and sugar levels.

Patients with suspected peripheral arterial disease will often undergo a duplex ultrasound scan of the arteries to determine the extent and degree of disease.

If intervention is being considered, patients may undergo an angiogram (blood vessel x-ray) which gives very accurate pictures of the arteries to assist in the planning of further treatment.

## Treatment for Peripheral Arterial Disease

**ALL** patients diagnosed with peripheral arterial disease must be commenced on *best medical therapy* (BMT). This involves:

- Complete and permanent smoking cessation – this is by far the most important step
- Control of blood pressure (usually aiming for 140/90mmHg or below)
- Taking an anti-platelet agent (e.g. aspirin 75mg once daily) for life
- Taking cholesterol lowering therapy, usually a statin (e.g. Simvastatin 40mg at night) for life

This makes the blood less sticky and allow the arteries to heal so greatly reducing the risks of the atherosclerosis getting worse and the chances of suffering a heart attack or stroke, or losing one or both legs.

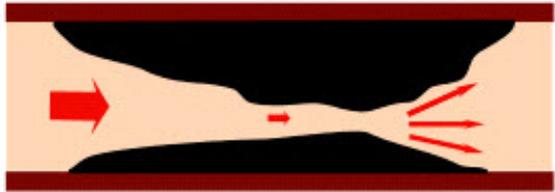
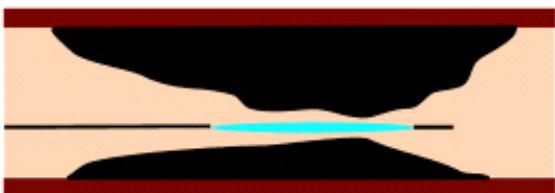
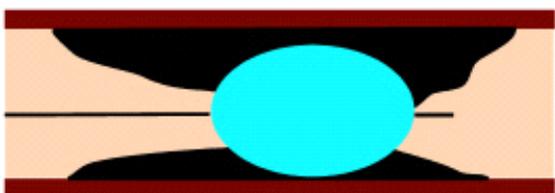
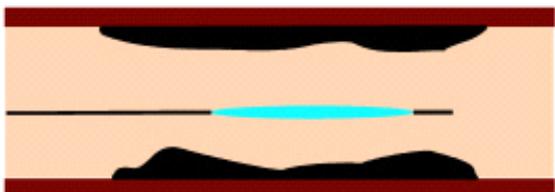
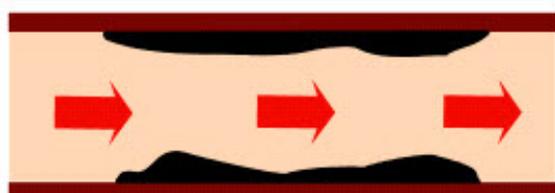
Patients with peripheral arterial disease benefit from regular exercise, especially walking, which both increases the efficiency of the heart to pump blood through the arteries and also promotes the formation of small blood vessels to carry blood around the blocked or narrowed areas, so called collateral circulation.

In about 80-90% of patients who manage to stop smoking, take regular exercise and are established on best medical therapy, symptoms of peripheral arterial disease either remain stable or improve from the time of first onset. Most patients learn to manage their symptoms and require no further investigation or treatment.

However, in a small number of patients (nearly always those that continue to smoke) the disease progresses and the symptoms deteriorate so that without an intervention to revascularise (improve the blood supply to) the leg, the leg will be lost or the patient will die.

## Angioplasty for Peripheral Arterial Disease

Here, the vascular surgeon or interventional radiologist attempts to re-open blocked or narrowed arteries using a series of wires and balloons, usually inserted under local anaesthetic through a puncture in the groin.

	<p>The diagram represents the lumen (inside) of an artery severely narrowed by an atherosclerotic plaque (black), impeding the flow of blood (in red)</p>
	<p>First a wire (black line) is passed through the blocked or narrowed portion of the artery. Then a catheter with a balloon (light blue) on the end is passed over the top of the wire</p>
	<p>When the catheter is correctly positioned the balloon is inflated.</p>
	<p>When the balloon is deflated a channel is left behind.</p>
	<p>Blood can then flow more freely through the previously narrowed lumen of the artery</p>
	<p>Sometimes the artery will not stay open by itself after a balloon angioplasty and the doctor may choose to reline the narrowed segment of the artery with a metal framework called a stent.</p>

## Potential complications of angioplasty and stenting

While angioplasty is generally a very safe procedure, as with all arterial procedures it is not without risk. Potential complications include:

- Bruising: this is inevitable with any arterial puncture and usually settles spontaneously over the course of a few weeks.
- Bleeding: very rarely significant bleeding can occur from the puncture site. This may be controlled by applying pressure, but often an operation is necessary to repair the artery.

- Allergic reaction to the x-ray dye: this is very rare and usually very mild, but occasionally severe reactions may occur which necessitate emergency medical treatment.
- Kidney damage due to x-ray dye: in some cases the dye injected during the angioplasty can adversely affect the function of the kidneys (which is always checked by a blood test before the procedure). In high risk patients special precautions can be taken to minimise this risk.
- Embolisation: occasionally small fragments of clot or debris (emboli) can break away from the angioplasty site and float down the leg in the bloodstream, lodging in and blocking a smaller artery further down the leg resulting in a worsening of symptoms. If this occurs the embolus can often be sucked out through a tube but, occasionally, an operation may be necessary to prevent limb loss.
- Blockage at the angioplasty site: occasionally a narrowed segment of artery can recoil after angioplasty causing complete blockage. If this occurs it can sometimes be treated by re-lining this segment of artery with a stent. Alternatively an operation may be necessary to prevent limb loss.
- Rupture: very rarely an artery may burst or leak following angioplasty. Again, if this occurs, it may be possible to reline the artery with a stent, or an operation may be required to repair the artery.

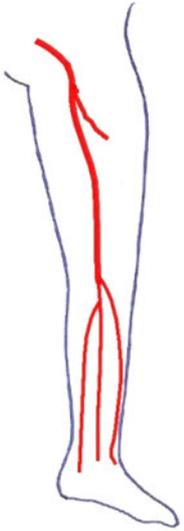
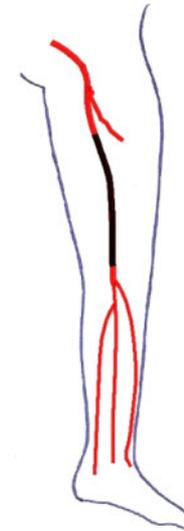
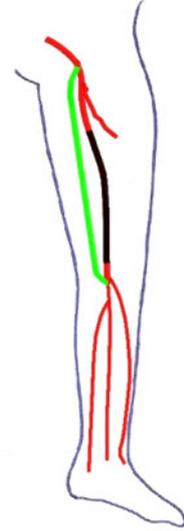
### **Limitations of angioplasty**

Angioplasty tends to work well for short narrowings or blockages in the larger arteries in the pelvis and the upper part of the leg. As blockages get longer or occur in the smaller arteries further down the leg angioplasty becomes less successful leaving *bypass surgery* as the only option to improve blood supply to the leg.

Angioplasty is not as durable a procedure as bypass surgery and so may have to be repeated from time to time. Alternatively patients initially treated with angioplasty may end up requiring a bypass operation at a later stage.

## Bypass Surgery for Peripheral Arterial Disease

Bypass surgery is a much greater undertaking than angioplasty involving a stay in hospital of 7 to 10 days and is generally only performed for limb salvage (i.e. to prevent amputation). It may be performed under general anaesthetic (with the patient asleep) or regional anaesthetic (where the patient has an injection into their spine to make them numb from the waist down).

	<p>This diagram represents a leg with the major arteries shown in red.</p>
	<p>Here the main artery in the thigh, the superficial femoral artery, is blocked (shown in black).</p>
	<p>Here a vascular graft has been inserted (shown in green) to enable blood to flow around the blocked artery and continue down the leg towards the foot. A vertical incision about 4 inches (10cm) long is made in the groin to expose the artery above the blockage and a similar length incision is made further down the leg to expose healthy artery below the blockage. The graft is then tunnelled through the leg and stitched into place. Finally the incisions are closed.</p>

The operation can take between 1½ and 5 hours depending on the complexity of the procedure. Before the surgery the anaesthetist will site a drip in a vein in the arm to give intravenous drugs and fluids. A blood transfusion is also sometimes necessary. A further drip may be placed in an artery at the wrist to monitor blood pressure during the procedure. A small tube (catheter) will be passed into the bladder to monitor urine output during the operation and for a day or two afterwards.

The best results from bypass surgery occur when the patient's own vein is used for the graft. Ideally this will come from the same leg but, if no suitable vein is available here, may be taken from the opposite leg or from one or both arms. If no suitable vein is available a 'plastic' graft may be used instead, but this is a last resort as the results are not as good as when vein is used.

## **Complications of bypass surgery**

Bypass surgery is a major undertaking and is associated with a number of potential problems or complications:

- Death or major complication: there is probably around a 5% (1 in 20) chance of dying or suffering a major complication such as heart attack or stroke during or immediately after this type of surgery. The risk is increased if the patient has pre-existing medical conditions such as kidney failure, ischaemic heart disease or breathing problems.
- Bypass blockage: Blood thinning drugs are given during a bypass operation, but occasionally blood may still clot within the bypass graft causing it to block. If this occurs further surgery is usually necessary to clear the blockage.
- Limb loss: Occasionally when the bypass graft blocks it is not possible to restore the circulation and it may be necessary to amputate the leg.
- Leg swelling: this is very common after bypass surgery and usually resolves over a period of a few months, but occasionally can be permanent.
- Wound infection: Antibiotics are given during the operation to minimise the risk of infection but the surgical wounds can still become infected and require a course of antibiotics.
- Graft infection: this is a rare but potentially serious complication (especially if a 'plastic' graft has been used). If this is suspected a course of intravenous antibiotics is generally given and it may be necessary to undergo further surgery to remove the infected graft.
- Numbness: it is not uncommon to experience patches of numbness on the leg after surgery, particularly around the wounds. This usually resolves spontaneously over a few months but may occasionally be permanent.
- Deep Vein Thrombosis (DVT): blood thinning injections will be given on a daily basis throughout a patient's stay in hospital to minimise the risk of DVT but this may still occur due to the enforced immobility after surgery. If DVT does occur it will be necessary to thin the blood with warfarin tablets, possibly for three to six months.
- Chest infection: this can occur after bypass surgery, particularly in smokers, and may require treatment with antibiotics and physiotherapy.
- Urine infection. This may occur due to the catheter and can be treated with a course of antibiotics.
- Limited graft patency: even if a bypass graft works well it has a limited life expectancy of around 5 years for a vein graft (much less for a 'plastic' graft).

This is shortened considerably if patients continue to smoke. Following bypass surgery patients are often required to attend regularly for 'graft surveillance' ultrasound scans to detect and correct any problems with the graft in an attempt to keep it running.



For further information, or to book an appointment, please contact us:

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