

# What I tell my patients about renal angiogram and stenting

Renal artery stenosis is a condition characterised by a narrowing of one or both of the arteries supplying blood to the kidneys. It may cause future kidney damage and high blood pressure. It is a progressive condition and, when not diagnosed early and treated appropriately, could lead to complete blockage of the kidney arteries, leading to kidney failure and very high blood pressure. When it is diagnosed and acted on early, treatment can improve kidney function and reduce high blood pressure or the number of medications needed to treat it.

The gold standard test for diagnosing this condition is a special X-ray test of the kidney arteries called a renal artery angiogram.

## What is a renal artery angiogram?

The term 'renal' refers to the kidneys, and the renal arteries are the major blood vessels supplying blood to the kidneys. Renal artery angiogram is a type of X-ray that is performed to produce an image of the blood vessels supplying the kidneys, to determine whether the vessels are narrowed or possibly blocked altogether. This is done by threading a fine, flexible plastic tube, called a catheter, through the artery in the groin, advancing it up to the kidney arteries and then injecting a contrast dye to highlight the blood vessels when the X-rays are taken. Depending on the findings, the doctor will discuss with the patient the best way to treat any kidney artery disease.

Patients who are pregnant, allergic to contrast dye or iodine, or on blood-thinning medications like warfarin, aspirin or clopidogrel (sold as Plavix®, Bristol-Myers Squibb, Sanofi-Synthelabo, UK), should inform their doctor.

## Why do I need an angiogram?

Patients are referred to have this procedure because their doctor suspects that they could have narrowing in the arteries to the kidneys, reducing blood supply and, as a result, causing high blood pressure and kidney damage.

The aim of a renal artery angiogram is to confirm (or rule out) this suspicion and possibly take measures to improve the blood supply to the kidneys, thereby improving kidney function and

blood pressure control, if the findings from the angiogram show this to be necessary. If this procedure is not performed, the narrowed artery supplying the kidney may block completely in the future, stopping blood getting to the kidney altogether and causing significant damage.

## What is renal artery stenting?

Implantation of a stent is a procedure to treat significant narrowing in the renal artery to improve the blood supply to the kidneys. Depending on what is found during the angiogram, the doctors performing the procedure may decide that it is necessary to treat a narrowing of the kidney artery immediately after performing the kidney artery angiogram, in which case both angiogram and implantation of a stent are done at the same time.

Placement of the stent into the kidney artery will involve manipulating a balloon-tipped guide wire through any narrowing in the kidney artery to stretch open the narrowed artery (angioplasty), followed by deployment of a short metal mesh tube called a 'stent' so that the part of the artery stretched open is kept open permanently. This will improve the blood supply to the kidneys. Figure 1 shows the four-stage process of insertion of a balloon catheter and placement of a stent as an X-ray. Figure 2 shows a diagram of catheter insertion and Figure 3 is a diagram of stent insertion. Figure 4 shows a stent in place in the kidney.

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*Figure 1. Top left – stenosis of an artery; top right – balloon catheter being guided into place; bottom left – inflated balloon catheter in place; bottom right – renal stent in place.*

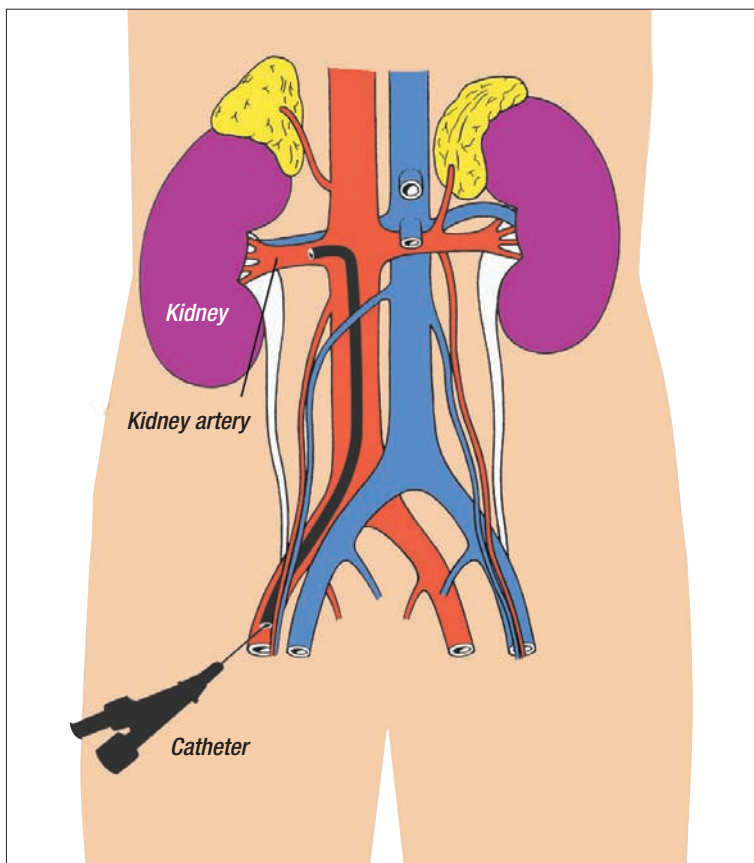


### What are the possible complications?

Complications are generally rare, but may occur when a stent is inserted and include the following.

- Allergy to the contrast dye injected into the arteries happens in fewer than one in 1,000 patients and may lead to a skin reaction, a drop in blood pressure and difficulty in breathing, all of which are treatable.
- Bruising or swelling caused by a collection of blood around the artery puncture site in the groin may occur, but this common side-effect is self-limiting. A bruise requiring further intervention or hospital stay occurs in fewer than two in 100 cases.
- Infections around the site of groin puncture can occur, but are very rare.
- Manoeuvring the guide wire inside the narrowed arteries during this procedure can potentially knock off tiny accumulations of cholesterol deposited in the inner walls of these arteries, which may enter the bloodstream and block smaller arteries in the kidneys and elsewhere, leading to deterioration in kidney function and damage to other organs, such as the skin, and to the toes.
- The dye that is injected into the arteries can cause further damage to the kidneys. The risk of damage is higher in patients who already have poor kidney function. The kidney damage

*Figure 2. Running a catheter through the renal artery*



caused by the dye may be temporary, but if it is bad enough, it may occasionally have to be treated by dialysis. However, protective measures are taken to reduce the risk of this damage occurring, by giving the patient intravenous fluid through a drip and some other protective medications (for example, a drug called N-acetyl cysteine) before and after the procedure.

In addition, angioplasty and stent placement may be associated with the following further risks.

- Kidney artery rupture could happen during the procedure and may be treated by blood transfusion or emergency surgery; it could very occasionally result in the kidney being removed. This is exceptionally rare.
- Blockage of the kidney artery (1% of patients) due to splitting of the artery or blood clot formation may lead to permanent kidney failure requiring dialysis. The risk of this varies with each patient, depending on the level of kidney function at the time of the procedure.
- Worsening of the kidney function (occurring in 4–6% of patients) is usually temporary, but is potentially, although rarely, permanent (in under 2% of patients) and may require treatment by dialysis. This may be caused by the blockage of the main kidney artery or may be due to the effects of the dye. This can also be caused by the blockage of smaller branches of the main renal artery due to small fragments of blood clot or fat deposit passing into these branches during the procedure.
- Occasionally, the procedure may not be successful due to technical reasons.
- Extremely rarely, death may result from a complication of the procedure, such as bleeding. The risk of this occurring will vary with each patient. There is greater risk if they have other serious illnesses, such as heart disease, but death during renal stenting remains exceptionally rare. The doctor will discuss the potential benefits versus the risks of the procedure for each individual.

Infrequently, the implantation of a stent may be desirable but impossible to implement due to technical factors, such as tight bends in the kidney artery. In these cases, the procedure may be attempted at a later date using an artery in the arm to gain access.

### How do I prepare ?

Patients should be fully informed before angiogram and stenting. It can be helpful to share

the information about the procedure with a partner and/or family (if the patient wishes), so that they can be of help and support. There may be information they need, especially if they are providing care for the patient after the procedure.

The patient will normally be admitted to a bed in the kidney ward the day before, or on the morning of, the renal angiogram. A member of the consultant's team will see the patient before the angiogram to explain the procedure, including the possibility that, if necessary, the doctor performing the X-ray may proceed to the stenting of the kidney artery at the same time as the angiogram. The doctor will also explain the possible complications and, if the patient is happy to continue, they will be asked to sign a consent form. Patients should be encouraged to ask the doctor or nursing staff any questions that they may have.

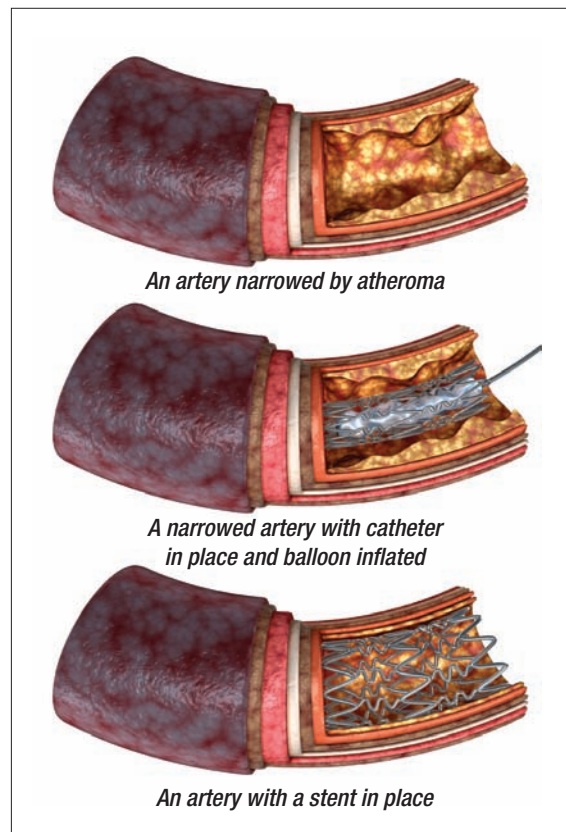
It is not necessary for patients to fast before the procedure and they will be able to eat a light breakfast or lunch at the appropriate times. Diabetic patients should continue with their normal routine of medications and diet, but should always inform the doctor if they are on a diabetes medication called metformin, which is sold as Glucophage® and Glucophage® SR (Merck, UK) and Bolamyn SR® (TEVA UK) as a standalone formulation, and as Eucreas® (Novartis, UK), Avandamet® (GSK, UK) and Competact® (Takeda, UK) in combination with other drugs.

### What is the procedure?

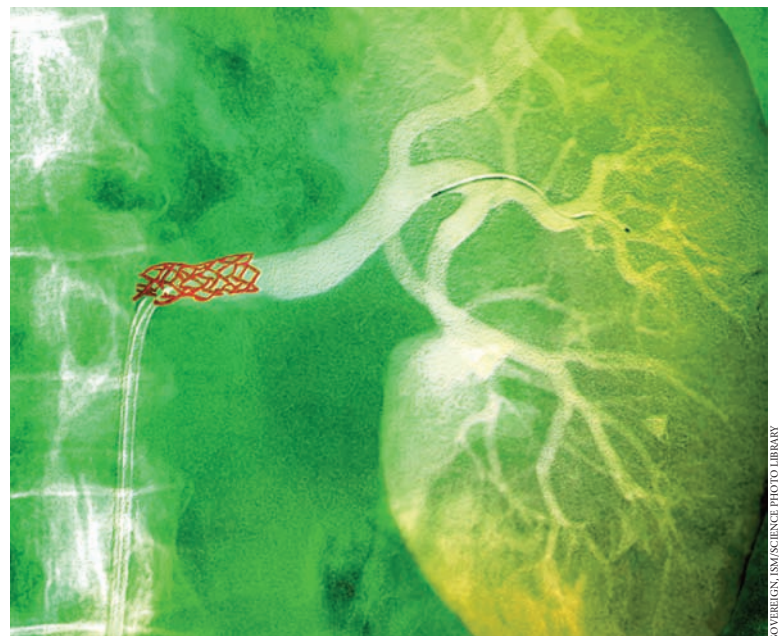
Once the patient has consented to the procedure, they will be taken to the X-ray department where they will be asked to lie flat on the treatment table throughout the procedure. If the patient is unable to lie flat because of back problems or breathlessness, this should be discussed with the doctor before signing the consent form.

A nurse, a radiographer and an X-ray doctor will be with the patient at all times in the X-ray room to provide any help the patient requires. The patient will be awake throughout the procedure. The groin will be cleaned to make it sterile and the skin of the groin will be numbed with a local anaesthetic injection. The injection may sting briefly and subsequently the area becomes numb; the rest of the procedure should be pain-free.

A catheter will then be inserted into the artery in the groin and advanced up to the kidney arteries. Contrast dye will be injected to highlight the vessels while X-rays are taken. The patient will not feel the catheter in the artery, but, when the contrast dye is injected, there may be a feeling of



**Figure 3.** A diagram showing insertion and positioning of a stent in a narrowed artery



**Figure 4.** A coloured X-ray showing a renal stent in place in the kidney

warmth or, occasionally, a slight burning sensation. Patients who are feeling anxious should mention it to the doctors, and a sedating medication can be given.

The renal angiogram will take about 40–60 minutes. If the doctors decide to proceed to the implantation of a stent, this will take approximately another 45 minutes. At the end of the procedure, the catheter will be removed from the groin and pressure applied at the puncture site for around ten minutes to stop any bleeding.



Alternatively, a special device to seal the arterial puncture site (an angioseal device) may be used.

### What happens after the procedure?

The patient will be taken back to the ward, where they will need to lie flat for at least four hours after the procedure before getting out of the bed. The patient will have a tight dressing to reduce the risk of bleeding from the groin where the artery was punctured. This may be an Elastoplast® dressing, and patients should let their doctor know if they are allergic to Elastoplast®. If the groin is painful, analgesic drugs (painkillers) can and should be provided.

In the ward, pulse, blood pressure, temperature and the amount of urine the patient passes will be monitored carefully and more frequently following the procedure. Blood tests will be done to assess the kidney functions before discharge. The ward staff will inform the patient when they will be allowed to go home and when their next clinic appointment will be.

The result of the procedure will be interpreted by the X-ray doctors and forwarded to the

patient's referring doctor in due course, and will usually be discussed with the patient at their next clinic appointment. If there are any worrying findings or complications that need further intervention, then it will be discussed with the patient as soon as the details are available.

The overall effects of the procedure on the kidney function usually become clear after five to seven days.

### Aftercare

At home, the patient may bathe as normal, but should avoid strenuous exercise and driving for 48 hours. The patient should monitor the injection site for re-bleeding and drink plenty of fluid to help flush the contrast dye out of the body. Patients generally may go back to work 48 hours after returning home from the procedure, but may need to take painkillers for a day or two if the groin is still painful.

### An overview

Kidney artery angiogram and stent implantation are safe procedures. They are performed by X-ray doctors who are experts in the procedure and skilled in managing any possible complications. Angiogram and stent insertion are designed to obtain sufficient information about the vessels supplying the kidneys to help the patient and their doctor to make an informed decision about future treatment.

There are some risks and possible complications involved. It is difficult to say exactly how often these complications occur; however, generally, they are minor and occur very rarely. Those who have already diseased arteries are at more risk of these complications than other patients.

The major points about renal angiogram and stenting have been covered here, and this should provide you with general information about the procedure. However, this is only a starting point for discussion between patient and doctor, and is not meant to replace this consultation. If patients have any concerns or require further explanation, they should discuss this with a member of the healthcare team that is caring for them. Patients will be asked to sign a consent form before the procedure and should be fully satisfied that they have received enough information before going ahead with the procedure ■

### Key points

- **Narrowing of the arteries that supply blood to the kidneys – renal artery stenosis – can cause kidney damage and high blood pressure, and blockage of the arteries can even lead to complete kidney failure.**
- **Renal artery angiogram involves threading a fine, flexible tube called a catheter through the arteries and using a special dye to show them on an X-ray, to find out if narrowing of the renal arteries has occurred.**
- **If renal artery stenosis is confirmed, a small device called a stent may be inserted to keep the artery open and restore blood flow.**
- **There are some risks and complications associated with renal angiogram and insertion of a stent, but these are very rare and the procedures are generally straightforward and safe.**



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