

## Coronary angioplasty and stent insertion

### Introduction

A coronary angioplasty is a procedure used to widen blocked or narrowed coronary arteries.

The term angioplasty means using a balloon to stretch open a narrowed or blocked artery. However, most modern angioplasty procedures also involve inserting a short wire-mesh tube, called a stent, into the artery during the procedure. The stent is left in place permanently to allow blood to flow more freely.

Coronary angioplasty is sometimes known as percutaneous transluminal coronary angioplasty (PTCA). The combination of coronary angioplasty with stenting is usually referred to as percutaneous coronary intervention (PCI).

Like all organs in the body, the heart needs a constant supply of blood. This is supplied by blood vessels called the coronary arteries.

In older people, these arteries can become narrowed and hardened (known as atherosclerosis), which can cause coronary heart disease.

If the flow of blood to the heart becomes restricted, it can lead to chest pain known as angina, which is usually triggered by physical activity or stress.

While angina can often be treated with medication, a coronary angioplasty may be required to restore the blood supply to the heart in severe cases where medication is ineffective.

Coronary angioplasties are also often used as an emergency treatment after a heart attack.

What are the benefits of a coronary angioplasty?

In most cases, the blood flow through the coronary arteries improves after an angioplasty. Many people find that any symptoms they had get significantly better and they're able to do more than they could before the procedure.

If you've had a heart attack, an angioplasty can increase your chances of surviving more than clot-busting medication (thrombolysis) can and the procedure can also reduce your chances of having another heart attack in the future.

## How a coronary angioplasty is performed

A coronary angioplasty is performed using local anaesthetic, which means you will be awake while the procedure is carried out.

During an angioplasty, a thin, flexible tube called a catheter will be inserted into one of your arteries through an incision in your groin, wrist or arm. This will be guided to the affected coronary artery using a continuous X-ray video.

When the catheter is in place, a thin wire is guided down the length of the affected coronary artery, over which a small balloon will be delivered to the affected section of artery. This is then inflated to widen the artery, squashing fatty deposits against the artery wall so that blood can flow through it more freely when the deflated balloon is removed.

If a stent is being used, this will be provided ready-prepared around a balloon before it's inserted. The stent will expand when the balloon is inflated and it will remain in place when the balloon is deflated and removed.

A coronary angioplasty usually takes between 30 minutes and two hours. If you are being treated for angina, you will normally be able to go home later the same day or the day after you have the procedure, but you will need to avoid heavy lifting, strenuous activities and driving for at least a week.

If you have been admitted to hospital following a heart attack you may need to stay in hospital for several days after the angioplasty procedure to recover from the heart attack before going home.

Read more about what happens during a coronary angioplasty and recovering from a coronary angioplasty.

## How safe is a coronary angioplasty?

A coronary angioplasty is one of the most common types of treatment for the heart.

Coronary angioplasties are most commonly performed in people who are 65 years of age or older as they are more likely to have heart disease.

As the procedure does not involve making major incisions in the body, it is usually carried out safely in most people. Doctors refer to this as a minimally invasive form of treatment.

The risk of serious complications from a coronary angioplasty is generally small, but this depends on factors such as your age, your general health and whether you have suffered a heart attack. Serious problems that can occur as a result of the procedure include excessive bleeding, a heart attack and a stroke.

Are there any alternatives?

If multiple coronary arteries have become blocked and narrowed, or the structure of your arteries is abnormal, an alternative procedure called a coronary artery bypass graft may be considered.

This is a type of invasive surgery where sections of healthy blood vessel are taken from other parts of the body and attached to the coronary arteries. This creates a new channel through which blood can flow into the heart.

How a coronary angioplasty and stent insertion are carried out

You will usually have an appointment to assess your health a few days before having a coronary angioplasty. This will give you an opportunity to discuss any concerns with your cardiologist (heart specialist).

Before the procedure is carried out, the arteries near your heart need to be examined to make sure the operation is technically possible. This is done using a test called coronary angiography.

During coronary angiography, a long, flexible plastic tube called a catheter (about the width of the lead in a pencil) is inserted into a blood vessel, either in your groin or arm.

The tip of the catheter is guided to your heart, or the arteries supplying your heart, using an X-ray. A special fluid that shows up on X-rays, known as contrast medium, is injected through the catheter. The resulting pictures are called angiograms.

During your pre-operative assessment, you may also have blood tests and a general health check to ensure you are suitable for surgery.

You will be asked not to eat or drink anything for four to six hours before a coronary angioplasty.

You will usually be able to take most medications as normal up to the day of the procedure, with the exception of blood-thinning medication (anticoagulants), such as warfarin, dabigatran, rivaroxaban and apixaban. You may also need to alter the timing of any diabetes medication you take. Your medical team can give you more information about this.

## The operation

A coronary angioplasty usually takes place in a room called a catheterisation laboratory, rather than in an operating theatre. This is a room fitted with X-ray video to allow the doctor to monitor the procedure on a screen.

Coronary angioplasty usually takes between 30 minutes and two hours, although it can take longer.

You will be asked to lie on your back on an X-ray table. You will be linked up to a heart monitor and given a local anaesthetic to numb your skin. An intravenous (IV) line will also be inserted into a vein, in case you need to have painkillers or a sedative.

The cardiologist (heart specialist) will make a small incision in the skin of your groin, wrist or arm – over an artery where your pulse can be felt. They will then insert a small tube called a sheath into the artery to keep it open during the procedure.

A catheter will then be passed through the sheath and guided along the artery into the opening of your left or right coronary artery.

A thin, flexible wire is then passed down the inside of the catheter to beyond the narrowed area. A small, sausage-shaped balloon is passed over the wire to the narrowed area and inflated for about 20-30 seconds. This squashes the fatty material on the inside walls of the artery to widen it. This may be done several times.

While the balloon is inflated, the artery will be completely blocked and you may have some chest pain. However, this is normal and is nothing to worry about. The pain should go away when the balloon is deflated. Ask your cardiologist for pain medication if you find it uncomfortable.

You should not feel anything else as the catheter moves through the artery, but you may feel an occasional missed or extra heartbeat. This is nothing to worry about and is completely normal.

If you are having a stent inserted (see below), it will be delivered already fitted onto a balloon and will open up as the balloon is inflated. The stent will be left inside your artery after the balloon is deflated and removed.

When the operation is finished, the cardiologist will check that your artery is wide enough to allow blood to flow through more easily. This is done by monitoring a small amount of contrast dye as it flows through the artery.

The balloon, wire, catheter and sheath are then removed and any bleeding is stopped with a dissolvable plug or firm pressure. In some cases, the sheath is left in place for a few hours or overnight before being removed.

## Going home

A coronary angioplasty often involves an overnight stay in hospital, but many people can go home on the same day if the procedure is straightforward.

After the operation, you will not be able to drive for one week, so you will need to arrange for someone to drive you home from hospital.

## Stents

A stent is a short, wire-mesh tube that acts like a scaffold to help keep your artery open. There are two main types of stent:

bare metal (uncoated) stent

drug-eluting stent – which is coated with medication that reduces the risk of the artery becoming blocked again

The biggest drawback of using bare metal stents is that, in around a third of cases, the arteries begin to narrow again. This is because the immune system sees the stent as a foreign body and attacks it, causing swelling and excessive tissue growth around the stent.

It is possible to avoid this problem by using drug-eluting stents. These are coated with medication that reduces the body's abnormal response and tissue growth. However, this also delays the healing of the coronary artery around the stent and means it is vitally important to keep taking blood thinning treatment (see below) for up to one year after the procedure to help reduce the risk of a blood clot blocking the stent suddenly and causing a heart attack.

Once a drug-eluting stent is in place, the medication is released over time into the area most likely to become blocked again. The two most researched types of medication are:

"-limus" medications (such as sirolimus, everolimus and zotarolimus) – which have previously been used to prevent rejection in organ transplants

paclitaxel – which inhibits cell growth and is commonly used in chemotherapy

The use of drug-eluting stents has reduced the rate of arteries re-narrowing from around one third to less than one in 10 and they are now used in more than 70% of stent procedures.

The National Institute for Health and Care Excellence (NICE) recommends that drug-eluting stents should be considered if the artery being treated is less than 3mm in diameter or the affected section of the artery is longer than 15mm, because evidence suggests the risk of re-narrowing is highest in these cases.

Before your procedure, discuss the benefits and risks of each type of stent with your cardiologist.

If you have a stent, you'll also need to take certain medications to help reduce the risk of blood clots forming around the stent. These include:

aspirin, taken every morning for life

clopidogrel, taken for one to 12 months depending on whether you have had a bare metal or drug-eluting stent, or whether you have had a heart attack

prasugrel or ticagrelor, which are used as alternatives to clopidogrel in some hospitals

## Recovering from a coronary angioplasty and stent insertion

You will normally be able to leave hospital the same day, or the following day after a planned (elective) coronary angioplasty. Arrange for a friend or family member to take you home.

Before you leave hospital, you should be told about any medication you need to take (see below). You may also be given advice on improving your diet and lifestyle, as well as wound care and hygiene advice during your recovery. You will usually be given (or sent later) a date for a follow-up appointment to check on your progress.

If the small tube (sheath) inserted into one of your arteries in your groin at the start of the procedure is left in place, this will usually be removed after a few hours or during the next morning. While it's in place, you will need to remain in bed with your legs kept straight until it is removed.

You may have a bruise under the skin where the catheter was inserted. This is not serious, but it may be sore for a few days. Occasionally, the wound can become infected. Keep an eye on it to check that it's healing properly.

Your chest may also feel tender after the procedure, but this is normal and will usually pass in a few days. If necessary, you can take paracetamol to relieve any pain.

## Activities

After having a coronary angioplasty, the team caring for you in hospital will usually be able to advise you about how long it will take to recover and if there are any activities you need to avoid in the meantime.

In most cases, you will be advised to avoid heavy lifting and strenuous activities for about a week, or until the wound has healed.

## Driving

You should not drive a car for a week after having a coronary angioplasty.

If you drive a heavy vehicle for a living, such as a lorry or a bus, you must inform the relevant authorities that you have had a coronary angioplasty. They will arrange further testing before you can return to work.

You should be able to drive again as long as you meet the requirements of an exercise/function test and you do not have another disqualifying health condition.

## Work

If you have had a planned (non-emergency) coronary angioplasty, you should be able to return to work after a week.

However, if you have had an emergency angioplasty following a heart attack, it may be several weeks or months before you recover fully and are able to return to work.

## Sex

If your sex life was previously affected by angina, you may be able to have a more active sex life as soon as you feel ready after a coronary angioplasty.

If you have any concerns, speak to your DOCTOR. According to experts, having sex is the equivalent of climbing a couple of flights of stairs in terms of the strain that it puts on your heart.

## Medication and further treatment

Most people need to take blood-thinning medications for up to one year after having an angioplasty.

This is usually a combination of low-dose aspirin and a medication called clopidogrel. It is very important to follow your medication schedule, as stopping medication early greatly increases the risk of the treated artery becoming blocked suddenly, causing a heart attack.

The course of clopidogrel will be withdrawn after about a year, but most people need to continue taking low-dose aspirin for the rest of their life.

You may need to have another angioplasty if your artery becomes blocked again and your angina symptoms return. Alternatively, you may need a coronary artery bypass graft (CABG).

## Cardiac rehabilitation

Many hospitals offer a programme called cardiac rehabilitation for people who have had a heart operation. This programme aims to help you recover from the procedure and get back to everyday life as quickly as possible.

Before you have a coronary angioplasty, a member of the cardiac rehabilitation team may visit you in hospital to give you information about your condition and the procedure you are having.

You may also be invited to join a cardiac rehabilitation programme starting about a few weeks after you leave hospital.

What happens in cardiac rehabilitation programmes can vary widely throughout the country, but most will cover areas such as exercise, education, and relaxation and emotional support.

Once you have completed your rehabilitation programme, it is important you continue to take regular exercise and lead a healthy lifestyle (see below). This will help protect your heart and reduce the risk of further heart-related problems.

### Lifestyle changes

If you have a coronary angioplasty, it's still important to take steps to reduce your risk of having further problems in the future. This may include:

trying to lose weight if you're overweight

stopping smoking if you smoke

eating a healthy diet with low levels of fat and salt

being active and exercising regularly

Smoking and being overweight are two of the main causes of heart disease. They also make treatment less likely to work.

### Risks of coronary angioplasty and stent insertion

As with all types of surgery, coronary angioplasty carries a risk of complications. However, the risk of serious problems is small.

Complications that can occur during or after an angioplasty include:

bleeding or bruising under the skin where the catheter was inserted – estimated to occur in more than one in every 20 cases

damage to the artery where the sheath was inserted – estimated to occur in less than one in every 100 cases

allergic reaction to the dye used during the procedure – estimated to occur in less than one in every 100 cases

damage to an artery in the heart – estimated to occur in less than one in every 350 cases

excessive bleeding requiring a blood transfusion – estimated to occur in less than one in every 100 cases

heart attack, stroke or death – estimated to occur in less than one in every 100 cases

Who's most at risk?

Several factors increase your risk of experiencing these complications. These include:

Your age – the older you are, the higher the risk.

Whether the procedure was planned for angina or is emergency treatment for or after a heart attack – emergency treatment is always riskier because there is less time to plan it and the patient is unwell to start with.

Whether you have kidney disease – the dye used during an angioplasty can occasionally cause further damage to your kidneys.

Whether more than one coronary artery has become blocked – this is known as multi-vessel disease.

Whether you have a history of serious heart disease – this could include heart failure.

Your cardiology team can give you more information about your individual circumstances and level of risk.

Alternatives to coronary angioplasty and stent insertion

The most widely used surgical alternative to a coronary angioplasty is a coronary artery bypass graft (CABG).

## Coronary artery bypass graft

A coronary artery bypass graft is surgery to bypass a blockage in an artery. This is done using segments of healthy blood vessel, called grafts, taken from other parts of the body.

Segments of vein or artery from your legs, arms or chest are used to create a new channel through which blood can be directed past the blocked part of the artery. This allows more blood to get through into the heart muscle.

Complications of CABG are uncommon, but are potentially serious. They include:

a heart attack, which is estimated to occur in one in every 20 cases

a stroke, which is estimated to occur in one in every 50-100 cases

A CABG is usually recommended when multiple coronary arteries have become blocked and narrowed. However, it is invasive surgery so may not be suitable for people who are particularly frail and in poor health.

A CABG may also be used if the anatomy of the blood vessels near your heart is abnormal because a coronary angioplasty may not be possible in these cases.

Which procedure is best?

You may not always be able to choose between having a coronary angioplasty or a CABG, but if you are it's important to be aware of the advantages and disadvantages of each technique.

As a coronary angioplasty is minimally invasive, you will recover from the effects of the operation quicker than you will from a CABG. Coronary angioplasty usually has a smaller risk of complications, but there is a chance you will need further treatment because the affected artery may narrow again.

However, the number of people who need further surgery has fallen because of the use of drug-eluting stents. See how a coronary angioplasty is performed for more information about these.

CABG has a longer recovery time than coronary angioplasty and a higher risk of complications. However, only one person in 10 who has a CABG requires further treatment. Also, some evidence suggests that CABG is usually a more effective treatment option for people who are over 65 years of age and particularly for people with diabetes.

You should discuss the benefits and risks of both types of treatment with your cardiologist and cardiac surgeon before making a decision.

### Alternative types of coronary angioplasty

If a conventional coronary angioplasty is unsuitable because the deposits in your coronary arteries are very hard, you may be offered a different type of angioplasty procedure that involves destroying or cutting away these deposits.

Examples of this type of procedure include:

percutaneous transluminal coronary rotational atherectomy (PTCRA) – where a small rotating device is used to remove the fatty deposit

percutaneous laser coronary angioplasty – where a laser is used to burn through the fatty deposit

These procedures are usually used when the coronary artery has a high level of calcium in it. Calcium makes the artery very hard and can prevent balloons or stents expanding properly to relieve the narrowing.

Once the deposit has been removed, the artery is then treated with balloons and stents as during a conventional angioplasty procedure.