

*Step by step through*

**CARDIAC  
CATHETERIZATION  
and  
ANGIOPLASTY**

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**Produced by the Irish Heart Foundation**

This booklet is one of the publications in our patient information series. For a complete list of patient booklets, see page 33.

**Acknowledgments:**

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## **INTRODUCTION**

We have designed this booklet to add to the information that you have already received from your doctor and to take you through a cardiac catheterization step by step.

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# FÁILTE

Your doctor feels that you need to have a test called a cardiac catheterization (angiogram). You may never have heard of it, or if you have, you may have a lot of questions. This book will take you step by step through a cardiac catheterization. After reading it you will know a little about the heart itself and exactly what is involved in having a cardiac catheterization. Having this information may help you feel less anxious.



## *What is a cardiac catheterization?*

A cardiac catheterization is a test using dye and x-ray to see if there are any problems in the arteries, valves or chambers of the heart.

## *Your heart*



Your heart is a hollow muscular organ about the size of your fist that is slightly to the left centre of your chest. Its main job is to pump blood through arteries and veins to all parts of your body.



There are two sides to your heart, a **right** side and a **left** side, which are separated by a muscular band known as the **septum**.



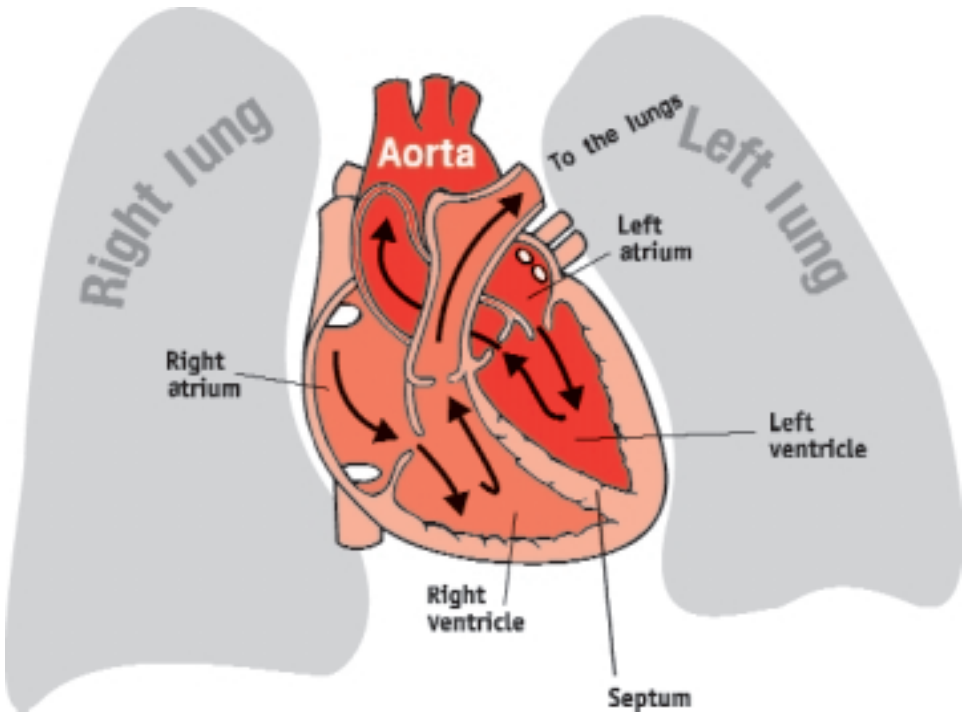
On each side there are two chambers (an **atrium** and a **ventricle**) with a valve separating them.



The chambers collect the blood, the valves keep it flowing in the right direction and the heart's muscular walls squeeze to pump the blood to all parts of the body.

***Lets follow the blood flow through the heart to give you a better understanding. (Please refer to diagram)***

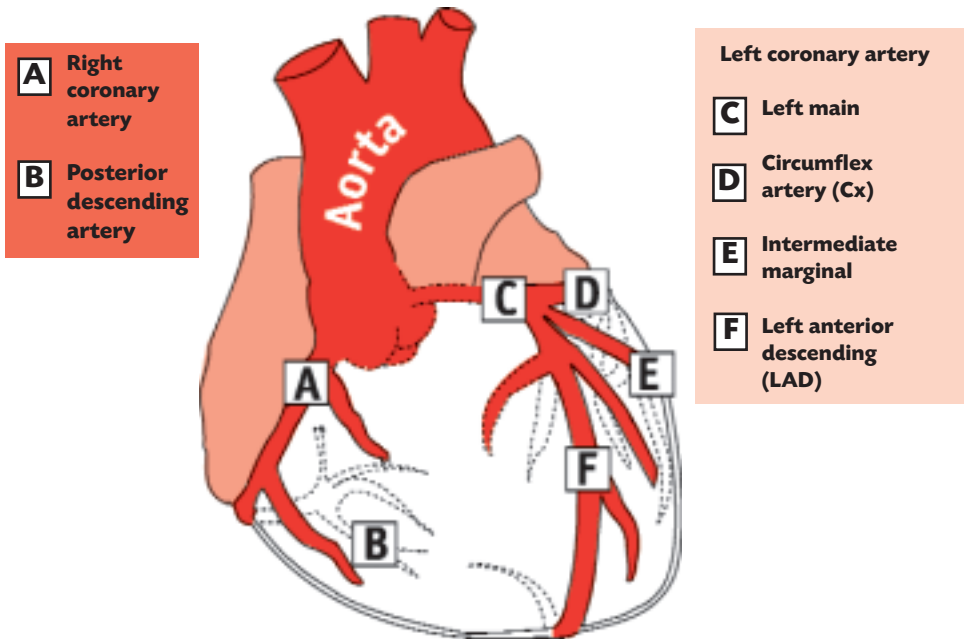
Veins carry blood that has already been pumped around the body and from which some oxygen has been removed. This blood returns to the right side of the heart to the chamber called the **right atrium**, it then passes through the **tricuspid valve** into the chamber called the **right ventricle**. The right ventricle then pumps the blood through the **pulmonic valve** into the lungs.



The blood absorbs oxygen in the lungs. From the lungs the blood returns to the left side of the heart to the chamber called the **left atrium**. It passes through the **mitral valve** into the chamber called the **left ventricle**. From here the blood is pumped through the **aortic valve** into the main artery **the aorta** which carries the blood to all parts of your body.

## The coronary arteries

The heart muscle, like every other muscle in your body, must be supplied with blood that is rich in oxygen and nutrients. Therefore, the heart pumps blood to itself through the **coronary arteries**. These arteries come from the aorta and spread out over the surface of your heart like the branches of a tree.



There are two large arteries. The **right coronary artery** mainly supplies blood to the right side and lower surface of the heart. The **left coronary artery** divides into two large branches, the **circumflex** branch and the **left anterior descending** branch. These mainly supply blood to the left side of the heart.



These arteries can become damaged over time by atherosclerosis (ath-er-o-scler-o-sis). Atherosclerosis comes from the Greek meaning hard porridge. This condition develops when fatty material builds up on the inside wall of the coronary arteries. This fatty material hardens to form an atherosclerotic plaque.



The fatty build-up (atherosclerotic plaque) in these arteries cause narrowing and reduce the flow of blood to the heart muscle (myocardium). This is what is known as hardening of the arteries, which can cause angina.



Angina is a tightness or pain in the chest, jaw or arm which is brought on by doing an activity that needs some effort. The arteries may become very narrowed by the growth of this plaque. This plaque may tear and as a result a blood clot may form in this area. This narrowing of the arteries reduces the flow of blood to the heart muscle and, in some cases, stops the blood from getting through completely.



As we mentioned earlier, the blood carries oxygen and nutrients to the muscle in the walls of the heart. If the muscle does not get oxygen and nutrients it becomes damaged and may die. When an area of muscle dies it is called a heart attack (myocardial infarction).



Some people's coronary arteries can go into spasm. The reason for this is not fully understood. If the spasm lasts for long enough, the oxygen to the heart muscle will be reduced and the muscle may be damaged.



The valves in the heart can be damaged by certain conditions such as rheumatic fever or infection. This may cause the valves to become narrow or leak.

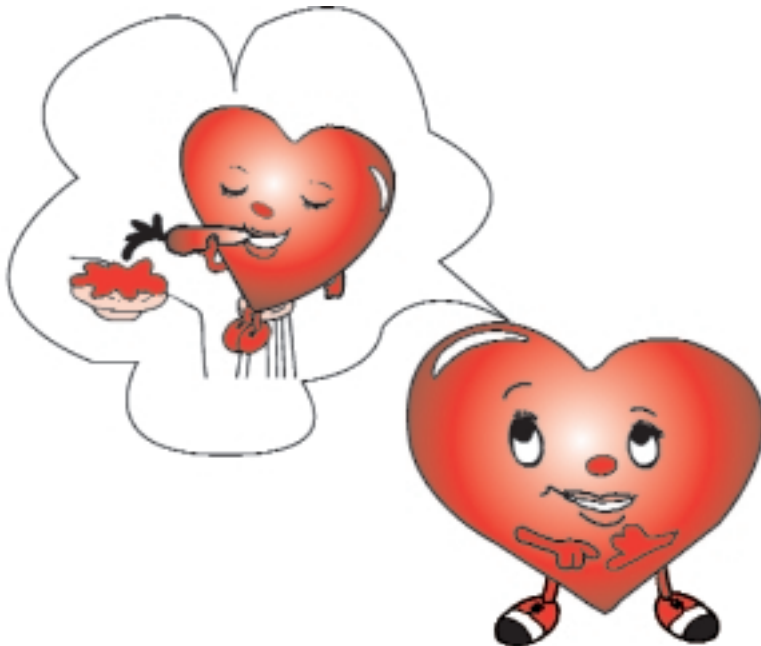
A cardiac catheterization will allow your doctor to see if any of the problems above exist. You and your doctor will then decide on the best course of treatment for your condition.

## ***Time to prepare for a cardiac catheterization!***

Some people have a cardiac catheterization during a hospital stay. Most of the time, a cardiac catheterization is done as an outpatient. The preparation is the same.

### ***What about food?***

You must have nothing to eat or drink for about 4 hours before the cardiac catheterization. This will prevent you feeling sick and actually being sick. If you have diabetes, be sure to discuss this with your doctor before the day of your test. Cheer up - you can eat and drink as much as you want after the test.



## ***What about tablets?***

If you are on any medication, you will need to know the name and the amount of medicine you take. To help you remember, it might be a good idea to take your medication bottles or a list of them with you to the hospital .

Anticoagulants are medication that thin the blood and prevent clots. Warfarin is a blood thinner and you must stop taking it a few days before the test. Again you should discuss this with your doctor before the day of the test.

Aspirin is a blood thinner, but it is safe to take as usual before the cardiac catheterization.

## ***Will I have to have any other tests?***

Before a cardiac catheterization you will need to have the following tests.



Blood tests.



An ECG (electrocardiogram).



A chest x-ray.

## ***Medical history***

Once you are at the hospital you will be asked about your past and present health. It is very important that you tell the doctor if you have any allergies to medications or food.

A cardiac catheterization is considered to be a safe procedure, but any work done inside the blood vessel carries a small risk of problems. These include bleeding and rarely heart attack and stroke. Your doctor will discuss any risk that cardiac catheterization might hold for you and ask you to sign a consent form.

## ***Clothing***

You will be asked to remove all of your clothing (including underwear) and jewellery and then put on a hospital gown. The nurse will tell you if you can wear your eyeglasses and false teeth. If you have a hearing aid, leave it in.

## ***Preparing your skin***

A small tube will be inserted into a blood vessel in your groin during the test. So before the test, hair in the groin area will need to be shaved and the skin will be cleaned with a special soap.

## ***Finally***

You will have a small tube placed in a vein in your arm called an IV through which medicine can be given into the blood stream as needed. You may also be given medication to help you to relax.

You are now ready to go to the cath lab (angio suite) to have your cardiac catheterization.

You should go to the bathroom before you leave for the test.

## ***Who are the people in the lab?***

A number of people are needed to perform a cardiac catheterization.



A doctor performs the test



A nurse assists in the lab



A radiographer operates the x-ray equipment



A cardiac technician monitors your heart rate and blood pressure

## *The angiogram (cardiac catheterization)*



When you arrive in the lab you will be asked to lie on the procedure table. The x-ray camera will be over the table and you will be able to see x-ray screens to the side.



The cardiac technician will attach sticky pads to your body so he or she can monitor your ECG (heart rhythm). You may be able to see it on the screen.



Although a cardiac catheterization is a test not an operation, the doctor and nurse may be wearing gowns and masks. This helps the equipment to stay germ free (sterile).



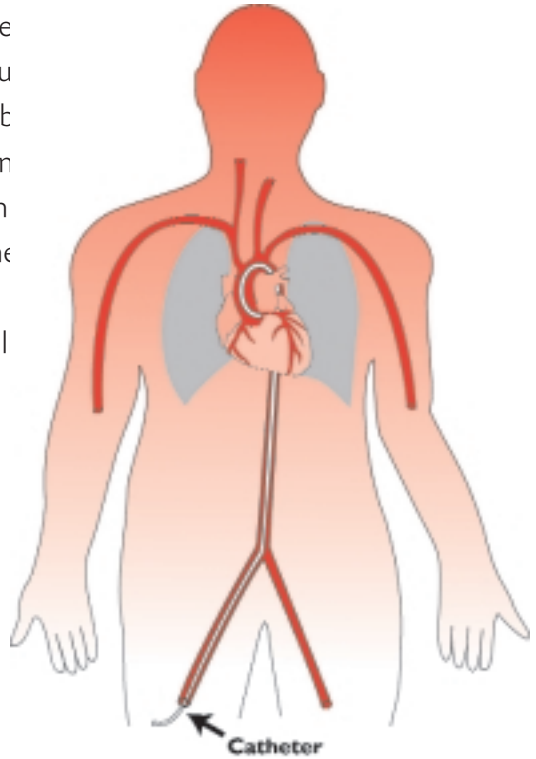
Your groin area will then be cleaned with an antiseptic soap. A sterile drape will be placed over you.



Your groin will be injected with local anaesthetic (numbing medicine). This may sting a little.



When the area is numb, a needle is placed into your artery. Through the needle, a tiny guide wire is threaded into the artery, a sheath (a long thin plastic tube open at each end) is threaded over the wire. Through this sheath a thin tube called a catheter is passed into your artery and guided up to your heart. Once your groin is numb, you should not feel the catheter being placed as blood vessels have no pain cells.



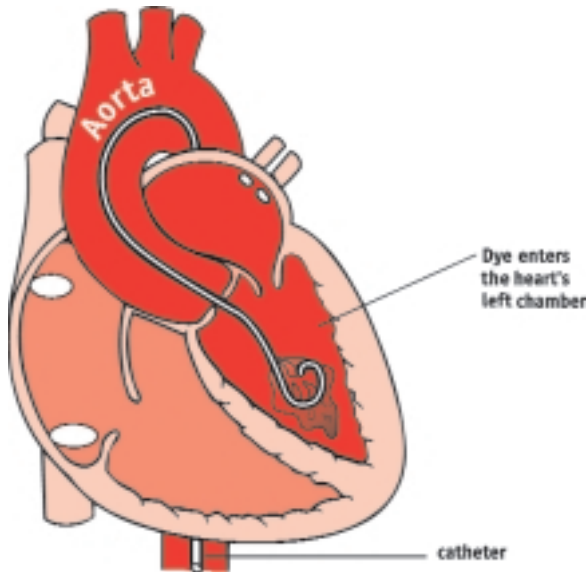
At this point you will be asked to place your hands behind your head. The x-ray camera will move close to you and will move around as the doctor performs the test.



The doctor uses an x-ray to see the catheter and move it to the opening of the coronary artery. The doctor will then inject dye into the arteries. The x-ray camera takes moving pictures of the flow of dye through the arteries. If there is any plaque in the arteries, the dye will outline it.



When all of the arteries have been examined, a catheter will be placed into the heart's main pumping chamber (left ventricle) and more dye will be injected. The dye will fill up the chamber and the x-ray camera will take moving pictures of the dye as it is pumped out of the chamber into the aorta (main blood vessel). This part of the procedure is called a ventriculogram.



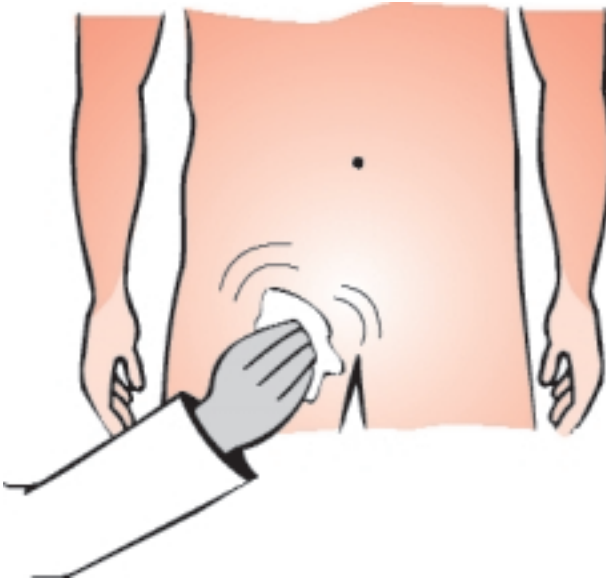
You will feel warm all over after that injection. This feeling will last for about 20 seconds. You may feel a few extra heart beats or feel slightly sick. These feelings will also pass quickly.



On some occasions your doctor may choose to do a catheterization through an artery in your arm.

That's all there is to it! The cardiac catheterization usually only takes about 30 - 45 minutes.

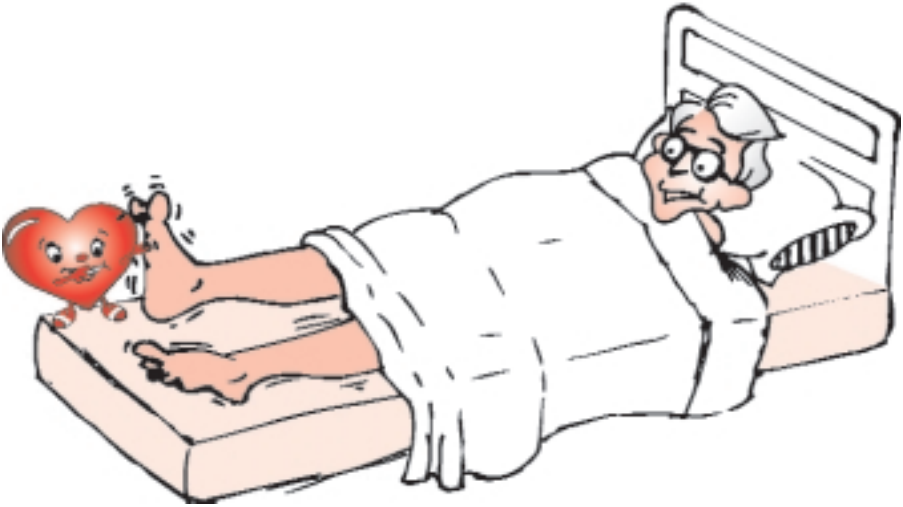
## *After the angiogram*



### *What about the tubes?*

After all the pictures have been taken, the catheter will be removed and firm pressure will be applied to the puncture site for about 10 - 20 minutes. This allows a seal to form over the puncture site in the artery.

*(Some doctors use a little device that plugs the puncture site. This device reduces the amount of time you will need to stay in bed after the test. If your doctor uses this, he or she will explain more about it to you.)*



Now begins a period of bed rest. You will be in bed for up to 6 hours to allow the puncture site to seal fully. Your movements will be limited during this time. You may have a sand bag placed over the puncture site to remind you not to bend your leg at the knee. You may wiggle your ankle or toes on the leg that was used for the test. You don't have to keep your leg stiff, just straight. The head of the bed will be raised slightly, but you may not sit up, lift your head off the pillow or turn on your side. If you need to cough or sneeze, put your hand over the puncture site and press it firmly. If you need to go to the toilet you must use a bedpan or urinal (bottle) at this time. The nurse will assist you with this. It is important that you empty your bladder whenever you need to.

## *Remember*



Do **not** bend your leg



Do **not** sit up

The nurse will check your heart rate and blood pressure regularly and also check your groin site and leg pulses. Please tell the nurse if you have any discomfort in your chest, neck, jaw or arm. As the numbing medicine wears off your groin may be a little sore. Let the nurse know, as you may be able to get some medication to relieve the pain.

## *Important. You must tell the nurse immediately if you:*



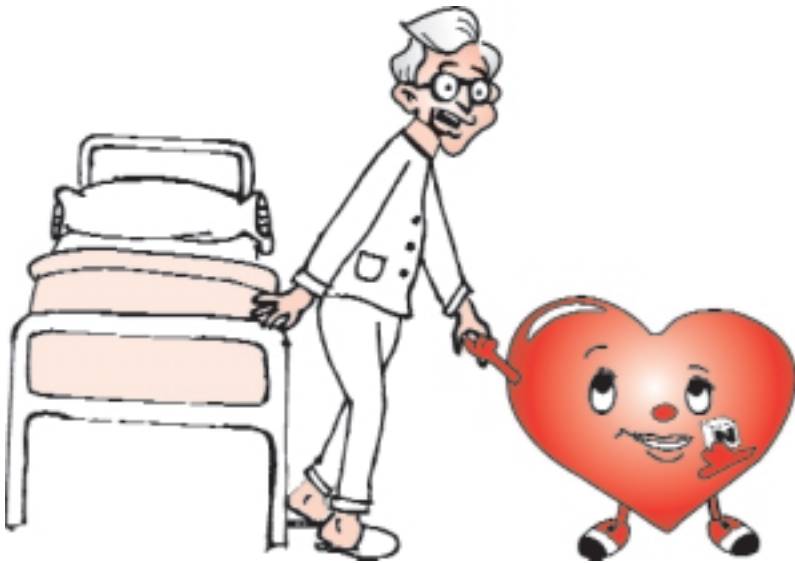
Feel sudden pain at the site



Notice warm, sticky or wet feelings on the leg that was used

## ***Time to get up!***

The nurse must be with you when it is time for you to get out of bed. He or she will take your blood pressure and help you to sit and then stand. You have been in bed for a little while and you may feel a little light-headed, so take it easy. The nurse will also make sure that there is no oozing or bleeding from the puncture site.



If you are an outpatient, you can go home when your doctor has seen you.

## ***Leaving hospital***

Your doctor will see you before you go home. He or she may discuss the results of your cardiac catheterization with you at that time, or they may wait until your next appointment.

The nurse will give you information on what to expect after you leave hospital. You may feel a little tired, but unless your doctor tells you otherwise most people return to their normal routine within 2-3 days. Your groin may have a bruise or a lump and be a little sore, for a few days.

## ***What did the cardiac catheterization show?***

If the cardiac catheterization shows that there is disease in your heart or coronary arteries (or both), your doctor will discuss treatment options with you.

Heart disease can be treated successfully with one or a combination of the following.



Medicines



Changes in lifestyle



Angioplasty or a stent



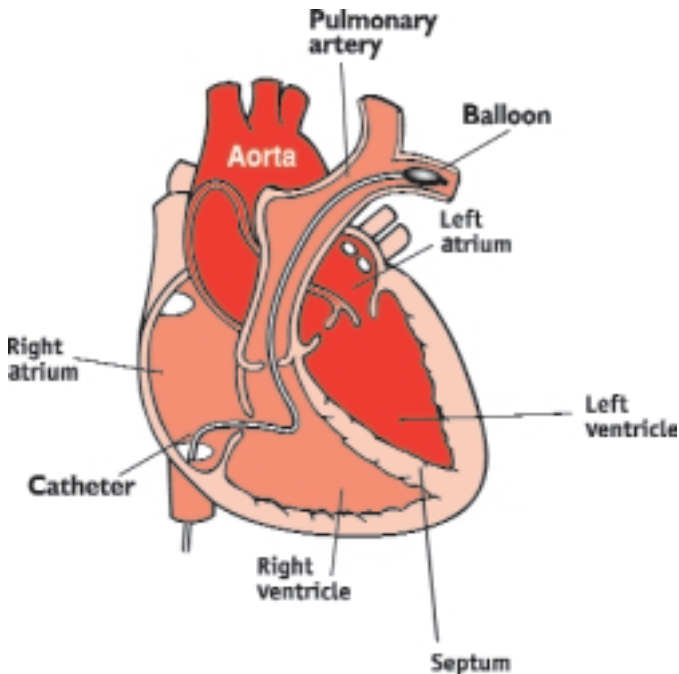
Surgery

If the cardiac catheterization showed that your heart and arteries are normal, it is up to you to keep them healthy. You can do this by not smoking, controlling your blood pressure, monitoring your cholesterol level, taking regular exercise, keeping your weight down and reducing your stress. Ask your doctor for some help with this.

## *Right heart study*

A right heart study as the name suggests, means that your doctor is looking specifically at the right side of your heart. From shortly after birth the human heart is divided by a partition (the septum) into two halves, between which there is usually no communication.

As mentioned earlier the right side of the heart pumps blood from which some oxygen has been removed to the lungs, while the left side of the heart pumps blood that is rich in oxygen to the rest of the body.



The doctor gains access to the right side of your heart by placing a small balloon - tipped tube into the vein at the top of your leg.

Using x-ray, the tube is guided through the right side of the heart into the pulmonary artery. As the tube moves through the heart oxygen levels and pressure readings may be taken. By injecting small amounts of fluid through the tube the doctor can tell how much blood is pumped from the heart over a certain period of time.

A right - sided heart study is carried out to diagnose disease of the valves and lungs, or poor function of the left ventricle. This test takes about 30minutes. After the procedure the tube is removed from the groin and pressure is applied to the area for about 5 - 10 mins. This allows the puncture in the vein to seal. You then need to rest in bed for a short period.

## What is an angioplasty?

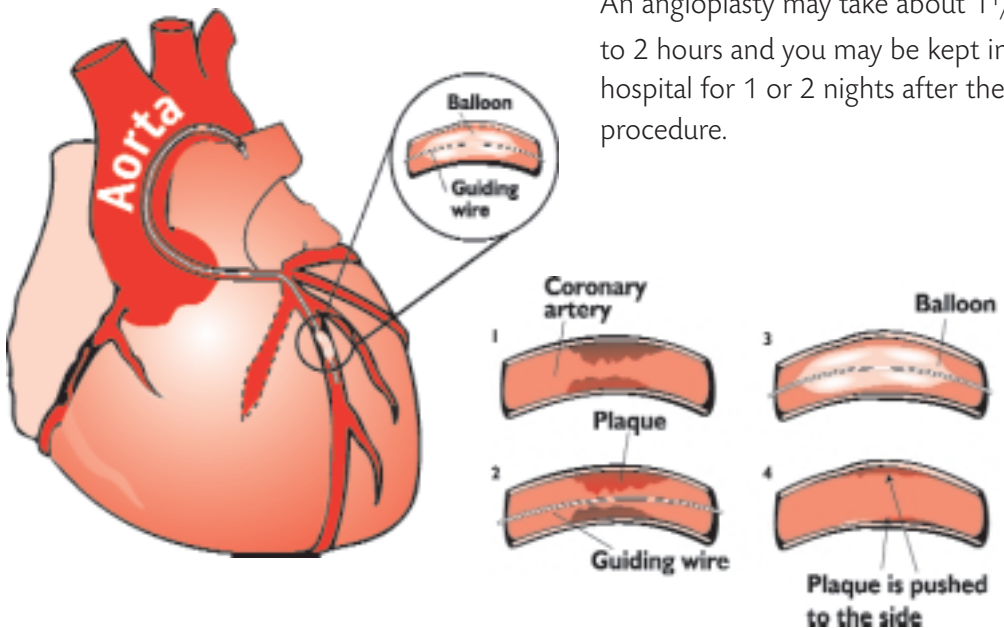
Your cardiac catheterization has shown that there are atherosclerotic plaques (fatty build-up) in your coronary arteries.

## Coronary arteries

As we have already discussed, plaque causes narrowing and blockages in the arteries, which reduce the blood flow to the heart muscle. Angioplasty is a treatment used to unblock the arteries and increase blood flow to the heart muscle.

The angioplasty procedure is very similar to a cardiac catheterization. It is not surgery. The preparation for the procedure is the same as for cardiac catheterization. The procedure is performed in the same department, (the Cath Lab), and you will be awake during the angioplasty.

An angioplasty may take about 1½ to 2 hours and you may be kept in hospital for 1 or 2 nights after the procedure.



**Lets go step by step through the angioplasty**

## *Preparation*



You will be asked not to eat or drink anything from midnight the night before the angioplasty.



Bring your medication bottles or a list of medications with you to the hospital.



You may not need to have another chest x-ray or ECG, so be sure to bring any recent results to the hospital with you.



You will have some blood taken before the angioplasty.



It would be a good idea to make a list of questions you may have for the doctor about the procedure or what happens afterwards. You may forget some of the questions you wanted to ask.

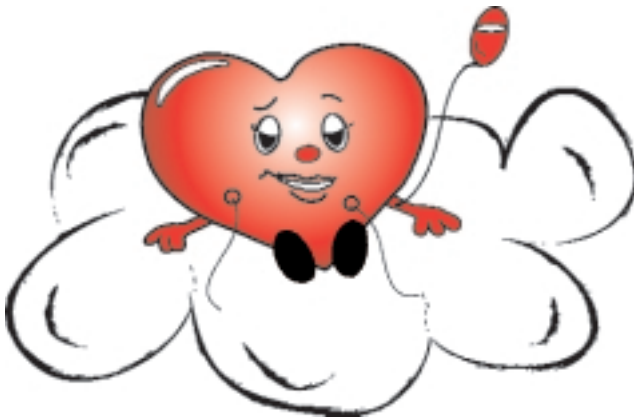


Remind the doctor of any allergies that you might have.



You may be given some blood thinners before the angioplasty. But if you are on warfarin it is likely to be stopped a day or two before the procedure.

- ❑ As with a cardiac catheterization, there are certain risks involved in having an angioplasty. The doctor will go through these with you and you will be asked to sign a consent form.
- ❑ Some hair will be shaved from your groin area before the procedure.
- ❑ A small needle will be placed in a vein in your arm. This IV will allow staff to give you any medication that you might need directly into the blood stream.
- ❑ You will be dressed in a hospital gown and you must remove all your jewellery.
- ❑ You must remove your false teeth and glasses before the angioplasty. They will be stored safely until you return.
- ❑ You will be given some medication to help you to relax.



## *In the cath lab*

Do you remember who is in the lab and what they do?



You will lie on your back on the procedure table, surrounded by x-ray equipment.



ECG electrodes will be attached to your chest to monitor your heart beat.



The doctor uses dye and x-ray in a similar way to a cardiac catheterization and takes moving pictures of the artery.



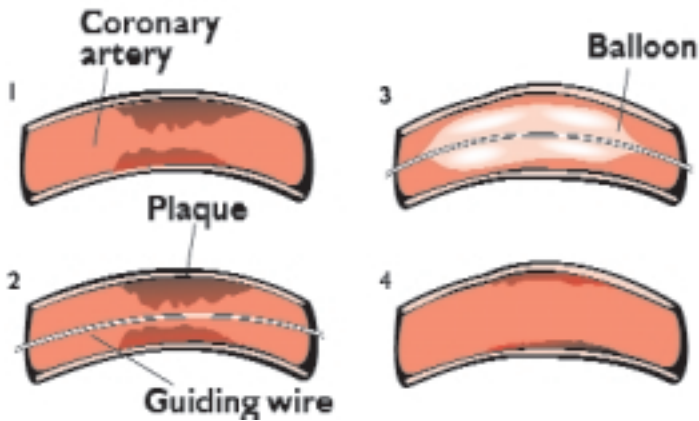
Sterile drapes are placed over you.



Your groin is numbed with local anaesthetic and an introducer sheath (tube which allows the angioplasty catheter to pass into the blood vessel) is placed into the blood vessel.

## *Now here are the differences*

Instead of just injecting dye into the arteries, your doctor will pass a tiny wire into the narrowed or blocked artery. Over this, he or she will thread the angioplasty catheter, which has a tiny balloon on the end of it. When the doctor has the catheter in the narrowed area he or she will inflate the balloon.

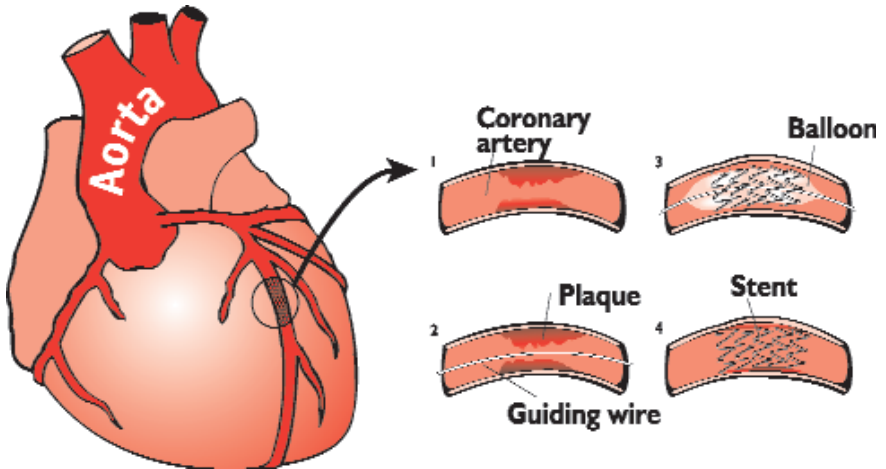


At this point you may feel your original symptoms, such as chest, jaw or arm discomfort. This happens because the balloon stops blood flow through the artery for a short time. These symptoms are fairly common, but tell your doctor so that he or she can deflate the balloon or give you some medication to ease the pain. Your doctor may inflate and deflate the balloon several times as the plaque is flattened against the walls of the artery and the vessel is widened.

The balloon is filled with dye and you may be able to see it on the x-ray screen (it looks like a tiny sausage!). The doctor will take some moving pictures while he or she injects dye into the artery to make sure that the opening is big enough to allow the blood to flow to the heart muscle.

## Stents

Sometimes one or more pieces of stainless steel mesh or coil are placed in a narrowed artery to prop it open. These wires are called stents. Usually the doctor opens the narrowing with an angioplasty (see 1-4) before putting in the stent. They are put in the same way as an angioplasty balloon.

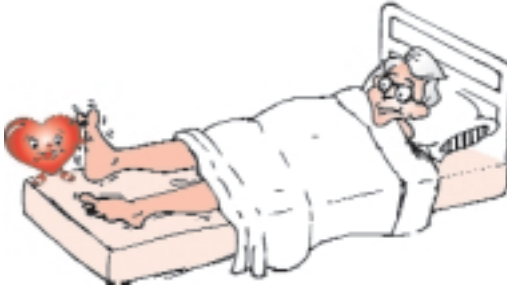


Blood may sometimes clot on these stents so you may be given blood thinning medicines to prevent this from happening. Your nurse will give you special instructions about your stent and medication.

## After your angioplasty

Medicines that thin the blood are used during angioplasty to stop clots forming in the artery. The introducer sheath is left in place in your groin until the blood starts to clot normally. This usually takes 3-4 hours. The sheath may be left in overnight. The period of time that you must stay in bed is slightly longer than after an angiogram, usually 8-9 hours (but it can be up to 24 hours).

## *Bed rest*



Now begins a period of bed rest. You will be in bed for at least 8 hours so the puncture site can seal fully. Your movements will be limited during this time. You may have a sand bag placed over the puncture site to remind you not to bend your leg at the knee. You may wiggle your ankle and toes on the leg that was used for the test. You don't have to keep your leg stiff just straight. The head of the bed will be raised slightly, but you may not sit up, lift your head off the pillow or turn on your side. If you need to cough or sneeze, put your hand over the puncture site, and hold it firmly. When you need to go to the toilet, you must use a bedpan or urinal (bottle) during this time. The nurse will help you with this. It is important that you empty your bladder whenever you need to.

## *Remember*



Do **not** bend your leg



Do **not** sit up

The nurse will check your heart rate and blood pressure regularly, and also check your groin and leg pulses. Please tell the nurse if you have any discomfort in your chest, neck, jaw or arm. As the numbing medicine wears off your groin may be a little sore. Let the nurse know, as you may be able to get some medication to relieve the pain.

## ***Important. You must tell the nurse immediately if you***



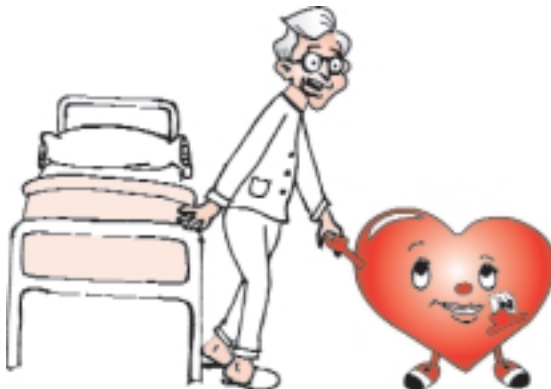
Feel sudden pain at the site



Notice warm, sticky or wet feelings on the leg that was used

## ***Time to get up!***

The nurse must be with you when it is time for you to get out of bed. He or she will take your blood pressure and help you to sit and then stand. You have been in bed for a little while and you may feel a little light-headed, so take it easy. The nurse will also make sure that there is no oozing or bleeding from the puncture site.



## *Leaving hospital*

Your doctor will see you before you go home. He or she may discuss the results of the angioplasty with you at the time, or they may wait until your next appointment.

The nurse will give you information on what to expect after you leave hospital. You may feel a little tired, but unless your doctor tells you otherwise most people return to their normal routine within 2-3 days. Your groin may have a bruise or a lump and be a little sore for a few days.

## *Helpful hints*

Doctors have been performing successful coronary angioplasty since 1977. A large number of patients have no problems. However, for a small amount of patients, symptoms may return in the first six months following angioplasty. If this happens a second angioplasty can be performed. Research is constantly being done to find new ways to prevent arteries from narrowing again.

Because there is a chance that new plaques can develop in other arteries, you need to change your lifestyle to reduce the risk of further problems developing. These changes include the following:

- 1. Not smoking**
- 2. Controlling blood pressure**

You can control your blood pressure with diet, exercise, medicines, and by reducing stress.



### 3. Controlling cholesterol level

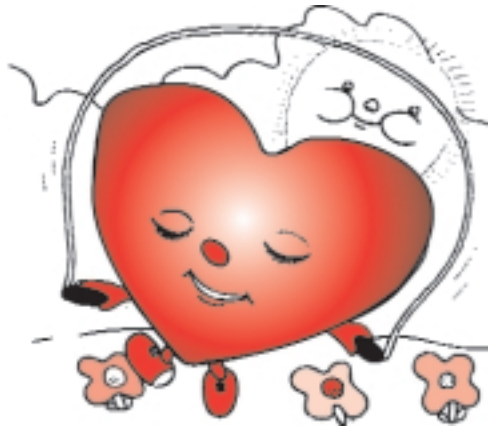
There are two kinds of cholesterol, LDL which is bad and HDL which is good. It is very important if you have heart disease to keep your LDL cholesterol level very low. Your doctor will be happy to give you information about cholesterol and how to control the levels by diet, exercise and medication.

### 4. Exercising

Exercise should be built up gradually and should be consistent. Ask your doctor about how much and what kind of exercise is best for you.

### 5. Loosing Weight

If you are overweight your heart has to work harder and it is harder to control your blood pressure. Find out what weight you should be, and, set realistic goals with your doctor or dietician.



### 6. Reducing Stress

Learning to relax is not easy, but it can reduce your blood pressure and even reduce cholesterol levels.

If you have reached this point, well done. We hope this booklet was helpful to you. Remember to ask your doctor if you have any more questions.

***Step by Step through cardiac catheterization and angioplasty is an Irish Heart Foundation patient information publication.***

***Other titles in this series are***

- Stroke, a guide for those affected by stroke and their carers
- Things you should know about blood pressure
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- Heart attack
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- Step by step through angina
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