

Coronary heart disease

The heart

The heart is a muscle that is about the size of your fist. It pumps blood around your body and beats approximately 70 times a minute. After the blood leaves the heart, it goes to your lungs where it picks up oxygen.

The oxygen-rich blood returns to your heart and is then pumped to the organs of your body through a network of arteries. The blood returns to your heart through veins before being pumped back to your lungs again. This process is called circulation.

The heart gets its own supply of blood from a network of blood vessels on the surface of your heart, called coronary arteries.

Coronary heart disease

Coronary heart disease is the term that describes what happens when your heart's blood supply is blocked, or interrupted, by a build up of fatty substances in the coronary arteries.

Over time, the walls of your arteries can become furred up with fatty deposits. This process is known as atherosclerosis, and the fatty deposits are called atheroma. If your coronary arteries become narrow, due to a build up of atheroma, the blood supply to your heart will be restricted. This can cause angina (chest pains).

If a coronary artery becomes completely blocked, it can cause a heart attack. The medical term for a heart attack is myocardial infarction.

The facts

Coronary heart disease is the UK's biggest killer, with one in every four men, and one in every six women dying from the disease. In the UK, approximately 300,000 people have a heart attack each year.

Angina affects about 1 in 50 people and, in the UK, there are an estimated 1.2 million people with the condition. It affects men more than women, and your chances of getting it increase as you get older.

By making some simple lifestyle changes, you can reduce your risk of getting coronary heart disease. And, if you already have heart disease, you can take steps to reduce your risk of developing further heart-related problems.

Symptoms

If your coronary arteries become partially blocked, it can cause chest pain (angina). If they become completely blocked, it can cause a heart attack (myocardial infarction). Heart attacks can cause permanent damage to the heart muscle and, if not treated

straight away, can be fatal. If you think that you are having a heart attack, you should dial 999 for immediate medical assistance.

If you have coronary heart disease, you may experience heart palpitations. Heart palpitations occur when your heart beats irregularly, or harder than normal. It is important to realise that heart palpitations are not necessarily linked to coronary heart disease and, if you experience them, you should not worry unduly. However, it is always best to have it checked out by your GP.

Heart failure can occur in people with coronary heart disease. The heart becomes too weak to pump blood around the body which can cause fluid to build up in the lungs, making it increasingly difficult to breathe. Heart failure can happen suddenly (acute heart failure), or gradually, over a period of time (chronic heart failure).

The symptoms of angina

Angina is a symptom of coronary heart disease. It can be a mild, uncomfortable feeling that is similar to indigestion. However, a severe angina attack can cause a feeling of heaviness, or tightness, usually in the centre of the chest, which may spread to the arms, neck, jaw, back, or stomach.

Angina is often triggered by physical activity or emotionally stressful situations. The symptoms usually pass within about 10-15 minutes and can be relieved by resting, or using a nitrate tablet or spray.

The symptoms of a heart attack

The discomfort or pain of a heart attack is similar to that of angina, but it is often more severe. During a heart attack you may also experience the following symptoms:

- sweating,
- light-headedness,
- nausea, and
- breathlessness.

The symptoms of a heart attack can be similar to indigestion. For example, they may include a feeling of heaviness in your chest, a stomach ache, or heartburn. A heart attack can happen at any time, including while you are resting. If the symptoms last longer than 15 minutes, it is probably a heart attack.

Unlike angina, the symptoms of a heart attack cannot be relieved using a nitrate tablet or spray.

Causes

Coronary heart disease is usually caused by a build up of fatty deposits on the walls of the coronary arteries. The fatty deposits, called atheroma, are made up of cholesterol and other waste substances.

The build up of atheroma, on the walls of the coronary arteries, makes the arteries narrower and restrict the flow of blood to the heart. This process is called atherosclerosis. Your risk of developing atherosclerosis is significantly increased if you:

- smoke,
- have high blood pressure,
- have a high blood cholesterol level,
- do not take regular exercise,
- have a thrombosis, and
- have diabetes.

Other risk factors for developing atherosclerosis include:

- being obese or overweight, and
- having a family history of heart attack or angina.

For men, the likelihood of developing atherosclerosis is increased if you have a close family member (father or brother) who has had a heart attack, or angina, before the age of 55. For women, the risk is increased if you have a close family member (mother or sister) who has had a heart attack, or angina, before the age of 65.

Cholesterol

Cholesterol is a fat that is made by the liver from the saturated fat that we eat. Cholesterol is essential for healthy cells but, if there is too much in the blood, it can lead to coronary heart disease.

Cholesterol is carried in the blood stream by molecules called lipoproteins. There are several different types of lipoproteins, but two of the main ones are low-density lipoproteins (LDL), and high-density lipoproteins (HDL).

LDL, often referred to as 'bad cholesterol', takes cholesterol from the liver to the cells. LDL cholesterol tends to build up on the walls of the coronary arteries, increasing your risk of heart disease. HDL, often referred to 'good cholesterol', carries cholesterol away from the cells, back to the liver, where it is broken down, or passed from the body as a waste product.

Normally, the blood contains about 70% of LDL, but the amount will vary from person to person. However, if your LDL cholesterol level is too high, the HDL will not be able to remove it sufficiently.

The total amount of cholesterol in the blood can range from 3.6-7.8 mmol/litre (milli-molecules per litre). A level above 6 mmol/litre is considered to be high, and a risk factor for arterial disease. Government advice recommends a target total blood cholesterol level of less than 5.

High blood pressure

Hypertension (high blood pressure) puts a strain on your heart and can lead to coronary heart disease.

Blood pressure is measured at two points during the blood circulation cycle. The systolic pressure is a measure of your blood pressure as the heart contracts and pumps blood out. The diastolic pressure is a measure of your blood pressure when your heart is relaxed and filling up with blood.

Blood pressure is measured in terms of millimetres of mercury (mmHg). When you have your blood pressure measured, the systolic pressure is the first, higher number to be recorded. The diastolic pressure is the second, lower number to be recorded. High blood pressure is defined as a systolic pressure of 140 mmHg or more, or a diastolic pressure of 90 mmHg or more.

Thrombosis

A thrombosis is a blood clot within an artery (or a vein). If a thrombosis occurs in a coronary artery (coronary thrombosis), it will cause the artery to narrow, increasing your chance of having a heart attack.

A coronary thrombosis occurs when blood turns from liquid form to solid, in one of the heart's arteries. The blood clot prevents the blood supply from reaching the heart muscle. Coronary thrombosis usually happens at the same place as where atherosclerosis is forming (furring of the coronary arteries).

Diagnosis

A number of different tests are used to diagnose heart related problems including:

- **Coronary angiogram** - provides information about the blood pressure inside your heart, and how well the chambers and valves are working.
- **Electrocardiogram (ECG)** - records the rhythm and electrical activity of your heart and can sometimes show if a person has had a heart attack.
- **Magnetic Resonance Imaging (MRI)** - can be used to produce detailed pictures of your heart, and blood vessels, and can measure the flow of blood through your heart and major arteries.
- **Radionuclide tests** - can be used to show how strongly your heart pumps, it can measure the flow of blood to the muscular walls of your heart, and it can help diagnose coronary heart disease.
- **Electrophysiological testing** - can help diagnose abnormal heart rhythms, and can show whether they are being effectively controlled with certain medicines. It can also identify whether the abnormal heart rhythm is causing palpitations.

Coronary angiogram

A coronary angiogram, also known as a catheter test, is usually performed under local anaesthetic. As well as providing information about your heart's blood pressure, and how well your heart is functioning, an angiogram can also identify whether the coronary arteries are narrowed, and how severe any blockages are.

In an angiogram, a catheter (flexible tube) is passed into a vein, or artery, in your groin or arm and, using X-rays, it is guided into the coronary arteries. A dye is injected into the catheter to show up the arteries supplying your heart with blood. A number of X-ray pictures are taken which will highlight any blockages.

A coronary angiogram is a relatively safe procedure, and serious complications are very rare. The risk of having a heart attack, stroke, or dying during the procedure is estimated at about one or two in every 1,000. However, after having a coronary angiogram, you may experience some minor side effects including:

- a slightly strange sensation when the dye is put down the catheter,
- a small amount of bleeding when the catheter is removed, or
- a bruise in your groin or arm.

Depending on the result of the coronary angiogram, medication, or further procedures, may be recommended.

Electrocardiogram (ECG)

An electrocardiogram, or ECG, records the rhythms and electrical activity of your heart. A number of electrodes (small, sticky patches) are put on your arms, legs and chest. The electrodes are connected to a machine that records the electrical signals of each heartbeat.

Although an ECG can detect problems with your heart rhythms, an abnormal reading does not always mean that there is anything wrong. Therefore, as well as an ECG, you may need to have some other tests, such as:

- **An exercise ECG** - an electrocardiogram recording is taken while you are exercising (usually on a treadmill or exercise bike). If you experience pain while exercising, the test can help to identify whether your symptoms are caused by angina, which is usually due to coronary heart disease.
- **24-hour ECG recording** - an electrocardiogram recording is taken continuously over 24 hours. It can be used to diagnose symptoms that do not occur regularly, such as palpitations. You can usually do the test at home, as an outpatient.

Magnetic Resonance Testing (MRI)

Magnetic Resonance Testing (MRI) can be used to produce very detailed pictures of your heart. During an MRI scan, you lie inside a 'tunnel-like' scanner that has a magnet around the outside. The scanner uses a magnetic field, and radio waves, to produce detailed images. You have to lie completely still during the test, which takes about an hour to perform.

An MRI scan will clearly show the structure of your heart and its blood vessels. It can also measure the flow of blood through your heart, and the major arteries, and will highlight any structural abnormalities, or disorders, such as cardiomyopathy (a disease of the heart muscle) and coronary heart disease.

Radionuclide tests

Radionuclide tests are used to diagnose coronary heart disease. They can also indicate how strongly your heart pumps, and show the flow of blood to the muscular walls of your heart. Radionuclide tests are safe and provide more detailed information than the exercise ECG test.

During a radionuclide test, a small amount of a radioactive substance, called an isotope, is injected into your blood (sometimes during exercise). If you have difficulty exercising, you may be given some medication to make your heart beat faster. A camera, placed close to your chest, picks up the gamma rays transmitted by the isotope as it passes through your heart.

Electrophysiological testing

Electrophysiological testing is a relatively new method of understanding and treating fast, abnormal heart rhythms. A catheter (flexible tube) is inserted into a vein in your arm, or groin. The catheter is gently passed into your heart where it stimulates the heart and measures its electrical activity.

As well as identifying abnormal heart rhythms, electrophysiological testing can determine whether they are being effectively controlled by medication. It can also confirm whether abnormal heart rhythms are causing palpitations. If they are, it may be possible to treat the problem at the same time using radio-frequency electrical energy to destroy the parts of the heart that are causing the abnormal heart rhythm. This procedure is known as radio frequency ablation.

There are a few risks associated with electrophysiological testing. In rare cases, the atrio-ventricular node (the heart's 'electrical wiring system') may be damaged.

Blood test

A blood test is used to measure the amount of cholesterol in your blood. Before having the test, you may be asked not to eat for 12 hours to ensure that all food is completely digested and will not affect the results. Your GP, or practice nurse, can carry out the blood test, and will take a sample either using a needle and a syringe, or by pricking your finger.

The blood test will show the amount of LDL ('bad cholesterol') and HDL ('good cholesterol') that is in your blood. Blood cholesterol is measured in units called millimoles per litre of blood (mmol/litre). In the UK, the current government recommendation is that you should have a total blood cholesterol level of less than 5 mmol/litre, and an LDL cholesterol level of under 3 mmol/litre.

Anyone can have their blood cholesterol level tested, but it is particularly important to have it checked if:

- you are aged over 40,
- you have a family history of cardiovascular disease - for example, if your father, or brother, developed heart disease, or had a heart attack, or a stroke

before the age of 55, or if your mother, or sister, had these conditions before the age of 65,

- a close family member has a cholesterol related condition, such as familial hypercholesterolaemia, or combined hyperlipidaemia,
- you are overweight or obese,
- you have high blood pressure (hypertension), or
- you have another medical condition, such as a kidney condition, an under-active thyroid gland, or acute inflammation of the pancreas (acute pancreatitis). These conditions can cause an increased level of cholesterol.

Other factors

In assessing your risk of cardiovascular disease, heart attack, or stroke, your cholesterol ratio should not be taken on its own. A number of other factors should also be taken into consideration including:

- smoking,
- diet,
- BMI (body mass index - your weight in relation to your height),
- treatable risk factors, such as high blood pressure (hypertension) and diabetes, and
- fixed risk factors, such as your age, sex, and ethnicity.

Treatment

Coronary heart disease cannot be cured, but recent progress in the research and development of new medicines and significant improvements in surgical procedures, have meant that the condition can now be managed more effectively. With the right treatment, the symptoms of coronary heart disease can be reduced, and the functioning of the heart improved.

Medicines

Many different medicines are used to treat coronary heart disease. This gives GPs a wide choice and means that a medication can be prescribed to meet your particular circumstances and requirements. Some heart medicines have side effects so it may take a while to find one that works for you. Your GP, or specialist, will be able to discuss the various options with you.

Some of the medicines that are commonly used to treat heart conditions are outlined below.

Low dose aspirin and 'clot-busting' medication

Blood clots in the coronary arteries are a major cause of heart attacks. A low dose aspirin and/or a clot-busting medicine may be prescribed for you by your GP, unless there are reasons not to - for example, if you have a bleeding disorder. This type of medicine will help prevent your blood clotting, reducing your risk of heart attack and angina.

Anticoagulants

Anticoagulants, such as warfarin, are sometimes used to stop the blood clotting. However, they can cause bleeding, or increase bleeding from cuts, or during menstruation (a woman's period). As a result of this, your GP may advise you to have regular blood tests. It is also a good idea to carry a card with you stating that you are taking anticoagulants.

Statins

A high level of 'bad cholesterol' (LDL) in your blood, can cause a build up of atheroma (fatty deposits) in your arteries, increasing your risk of heart attack, or stroke. If you have a high blood cholesterol level, cholesterol-lowering medicine, called statins, may be prescribed. They work by changing the inner lining of your blood vessels, making it more difficult for atheroma to form, or get bigger. This helps to slow the progression of coronary heart disease, and will make having a heart attack less likely.

Beta blockers

Beta blockers are often used to prevent angina, and treat high blood pressure. They work by blocking the effects of stress hormones which make your heart beat faster and harder. This slows down your heartbeat, improves blood flow, and helps your heart to pump more effectively. Beta blockers are usually taken in small doses alongside ACE inhibitors (see below) and diuretics (medicine that helps your body get rid of extra fluid). However, beta blockers are not suitable if you have respiratory problems, such as asthma, or diabetes.

ACE (Angiotensin Converting Enzyme) inhibitors

Angiotensin Converting Enzyme (ACE) inhibitors are commonly used to treat heart failure and high blood pressure. They block the activity of a hormone called angiotensin II which narrows blood vessels. As well as stopping the heart working so hard, ACE inhibitors improve the flow of blood around the body.

Your blood pressure will be monitored while you are taking ACE inhibitors, and regular blood tests will be needed to check that your kidneys are working properly. Around 1 in 10 people have kidney problems as a result of taking ACE inhibitors.

If ACE inhibitors have been prescribed for you, do not stop taking them without first consulting your GP. If you do, it is very likely that your symptoms will get worse quickly. Common side effects of ACE inhibitors include a dry cough, dizziness, and fainting.

Angiotensin II receptor antagonists

Angiotensin II receptor antagonists work in a similar way to ACE inhibitors. They are used to lower your blood pressure by limiting angiotensin II. Angiotensin II receptor antagonists have fewer side effects than ACE inhibitors, and are often prescribed as an alternative. Mild dizziness is usually the only side effect.

Anti-arrhythmic medicine

Anti-arrhythmic medicine is sometimes used to control the rhythm of your heart. However, this type of medicine is most effective when exactly the right level is in your bloodstream, so it is important that the correct dosage is taken.

Nitrates

Nitrates are used to widen your blood vessels. GPs sometimes refer to nitrates as vasodilators. They are available in a variety of forms, including tablets, sprays, skin patches, and ointments. They work by relaxing and widening your blood vessels, letting more blood pass through them. This lowers your blood pressure and relieves any heart pain that you have. Nitrates can have some mild side effects, including headaches, dizziness, and flushed skin.

Cardiac glycosides

Cardiac glycosides, such as digoxin, strengthen and slow the heartbeat. By making the heart muscles contract (squeeze together) more strongly, blood is pushed around the body with more force. Cardiac glycosides are usually only taken in addition to other medicine, such as ACE inhibitors and diuretics.

Surgical procedures

If your blood vessels are very narrow due to a build up of atheroma (fatty deposits), or if your symptoms cannot be controlled using medication, surgery may be needed to open up, or replace, the blocked arteries. Some of the main surgical procedures that can be used to treat blocked arteries are outlined below.

Coronary angioplasty

Coronary angioplasty is sometimes used to treat mild coronary heart disease. An angioplasty opens up a blocked, or narrowed, coronary artery, improving the blood flow to the heart. A catheter (flexible tube) is inserted through the upper leg, groin, or upper arm, and threaded through to the coronary artery using a thin wire.

A stent (small tube made of stainless-steel mesh) is inserted into the artery and, using a small balloon, is gently inflated. As the stent expands, it widens the artery, allowing the blood to flow freely. Once the stent is in place, the balloon is deflated and removed. For further information about the coronary angioplasty procedure, see the separate health encyclopaedia topic.

Coronary artery bypass

A coronary artery bypass is a procedure that allows the blood flowing through the coronary artery to bypass (get round) the part of the artery that is blocked. This is a major operation because it involves using an artery from another area of the body, usually the chest wall, or a vein from the leg, and grafting (attaching) one end of it below the blockage and the other end above the blockage.

The bypass that is created provides an alternative path for the blood to travel through. The coronary artery bypass is a major procedure, and can take several months to recover from. For further information about the coronary artery bypass procedure, see the separate health encyclopaedia topic.

Heart transplant

Sometimes, in a small number of cases, when the heart is severely damaged and medicine is not effective, or when the heart becomes less efficient at pumping blood around the body (heart failure) a heart transplant may be required. A heart transplant involves replacing a heart that is damaged, or is not working properly, with a healthy donor heart.

Not all people are suitable candidates for having a heart transplant, and finding a suitable donor may take many months. However, the success rate of heart transplant surgery has improved significantly over the past few decades, and many people who have had transplants ten years ago, or more, are still going strong.

Although heart transplant surgery is usually a successful procedure, afterwards you will need to take medicine to control your immune system's reaction to having a 'foreign heart'. The medicine can cause your immune system to become weaker, making you more vulnerable to illness and infection. Your GP may also prescribe medicine to help reduce your risk of a having heart attack.

Laser surgery

Laser surgery is a technique that creates channels in the heart to allow blood to flow more easily. Using a catheter (thin wire) with a laser attached, the surgeon makes lots of tiny holes in your heart muscle. The holes encourage new blood vessels to grow in the diseased heart muscle. This procedure is sometimes carried out on its own, or in conjunction with coronary bypass surgery.

The future

Research into heart-related problems is ongoing and GPs are looking at new ways of preventing the body rejecting donor hearts, as well as developing new treatments so that people with heart conditions can live long, healthy lives. In the future, cardiologists (heart GPs) hope to be able to investigate, diagnose, and treat heart conditions without the need for using surgical procedures.

Recovery

Cardiac rehabilitation

The purpose of cardiac rehabilitation is to help you to recover, and resume a normal life as soon as possible after having a heart transplant, a coronary angioplasty, or coronary artery bypass surgery. It may also be useful if you have other heart-related conditions, such as a heart attack, angina or heart failure.

If you have heart surgery, a member of the cardiac rehabilitation team may visit you in hospital to give you information about your condition and the procedure that you are having. This care will usually continue after you have left hospital. For the first few weeks following your surgery, a member of the cardiac rehabilitation team may visit you at home, or call you, to check on your progress.

Cardiac rehabilitation programmes vary widely throughout the country but most will cover the following basic areas:

- exercise,
- education,
- relaxation and emotional support.

Once you have completed your rehabilitation programme, it is very important that you continue to take regular exercise and lead a healthy lifestyle, in order to protect your heart and reduce the risk of further heart-related problems.

Support groups

If you have, or have had a heart condition, or if you are caring for someone with a heart condition, you might find it useful to meet other people in your area who are in a similar situation to you. There are a number of heart support groups around the country that organise regular exercise sessions, such as walking groups, and other social activities. Your GP, or specialist, should be able to provide you with details about your nearest group, or you can use the post code search facility on the British Heart Foundation's web site (see the 'selected links' section).

Returning to work

After recovering from heart surgery, you should be able to return to work, but it may be necessary to change the type of work that you do. For example, you may not be able to do a job that involves heavy physical exertion. Your specialist will be able to advise you about when you can return to work, and what type of activities you should avoid.

Financial support

If, after having heart surgery, you are unable to work, you may be entitled to financial support, such as:

- severe disability allowance,
- carer's allowance,
- disablement allowance,
- attendance allowance, and
- statutory sick pay and short-term incapacity benefit.

To find out if you are entitled to financial support, you can contact your local Social Security department. To request a claim form, you can call the benefit enquiry line on 0800 882200.

Sex

If you have coronary heart disease, or you have recently had heart surgery, you may be concerned about having sex. This is an area that your GP, or specialist, will be able to advise you about. However, if you find talking about it difficult, useful resources, such as leaflets, and DVDs, are available from organisations such as the British Heart Foundation (see the 'selected links' section).

Prevention

The best way to prevent coronary heart disease is to make sure that your 'bad cholesterol' (LDL) level is low and that your 'good cholesterol' (HDL) cholesterol level is high. There are a number of ways you can do this including:

Eat a healthy, balanced diet

Your diet should be low in saturated fat, sugar and salt, and contain plenty of fruit and vegetables (at least five portions a day).

Fish, such as herrings, kippers, mackerel, pilchards, salmon, sardines and trout, contain oils that can reduce the risk of thrombosis. Many vegetables, fruit and cereals contain antioxidant vitamins (beta-carotene and vitamins C and E) that prevent saturated fats from being changed into cholesterol. Other foods that may help to lower your cholesterol level are beans, peas, lentils and oats because they contain soluble fibre, and Brazil nuts.

Be more physically active

Make sure that you take regular aerobic (cardiovascular) exercise, for a minimum of 30 minutes a day, at least 3-4 times a week. Exercise is known to increase 'good cholesterol' (HDL) which helps to keep your 'bad cholesterol' (LDL) levels down. As exercising burns calories, it can help you to control your weight and reduce stress.

Find out how many calories you can burn doing the activities you enjoy. Keep to a healthy weight.

Your GP, or practice nurse, will be able to tell you what your ideal weight is, in relation to your build and height and let you know what your BMI is.

Give up smoking

If you smoke, giving up will reduce your risk of developing coronary heart disease. Smoking is a major risk factor for developing atherosclerosis (hardening of the arteries). It also causes the majority of cases of coronary thrombosis in people under the age of 50.

Reduce your alcohol consumption

If you drink, make sure that you stick to the recommended guidelines for alcohol consumption. The recommended daily amount of alcohol for men is 3-4 units a day,

and it is 2-3 units for women. You can use the alcohol calculator at the link below to find out how this relates to different types of alcoholic drinks. You should always avoid binge drinking.

Keep your blood pressure under control

You can keep your blood pressure under control by eating a healthy diet that is low in saturated fat, exercising regularly and, if required, taking appropriate blood pressure lowering medication. Your target blood pressure should be below 140/85mmHg. If you have high blood pressure, ask your GP to check your blood pressure regularly.

Keep your diabetes under control

If you are diabetic, you have a greater risk of developing coronary heart disease. You can reduce your chances of developing diabetes by being physically active, controlling your weight, and keeping your blood pressure under control. If you have diabetes, these three things will help you to keep control of your blood sugar level. If you are diabetic, your target blood pressure level is below 130/80 mmHg.

Take any medication that is prescribed for you

If you have coronary heart disease, you may be prescribed medication to help relieve your symptoms, and stop further problems developing. If you do not have coronary heart disease, but you have high cholesterol, high blood pressure, or a history of family heart disease, your GP may prescribe medication to prevent you developing heart-related problems.

If you are prescribed medication, it is vital that you take it, and follow the correct dosage. Do not stop taking your medication without consulting your GP first, as doing so is likely to make your symptoms worse and put your health at risk.