Electrocardiogram - ECG

This factsheet is for people having an electrocardiogram, ECG. An electrocardiogram records the rhythm and electrical activity of your heart.

You may need to have an ECG if you have a problem with your heart – such as palpitations, dizziness or chest pain – to find out what the problem is. The ECG can detect whether you have an abnormal heart rhythm, whether you have had a heart attack, and/or if your heart is working under strain.

If you are about to have an operation, you may have an ECG beforehand to check how well your heart is functioning. You may have an ECG after surgery to help decide how much exercise you can do. An ECG can also form part of a routine health check-up.

GPs are often able to do the ECG in their surgery; but sometimes you will need to be referred to a hospital.

About the ECG

Small metal adhesive discs – called electrodes – will be stuck onto your skin – one on each arm and/or leg and several on the front of your chest. The **electrocardiogram** or **electrocardiograph** is a record of the electrical impulses that your heart produces every time it beats, obtained from electrodes connected to the chest.

The procedure is completely painless, harmless and safe. The machine does not generate any signals on your skin. It only records the changing small voltages at the electrodes. It cannot give you an electric shock or affect your heart in any way. It is just your own heart that produces the electrical signals.

The tiny voltages at each electrode are amplified and either connected to a pen producing a wavy line on paper, or produce the same pattern on a screen.

The ECG results indicate whether or not the heartbeats are normal; abnormalities such as damage to heart muscle from a past heart attack; and/or that some part is enlarged, damaged, or working under strain – eg from high blood pressure.

Types of ECG

The standard ECG test, sometimes called a **resting ECG**, is taken while you are not doing any activity. There are also other types of ECG your doctor may suggest you have, if a standard resting ECG won't provide all the necessary information. These tests are normally done in a hospital, so your GP will need to refer you.

An implantable loop recorder (or ILR) is a small, slim device that is inserted just under your skin in the front of your chest (you will have a local anaesthetic for this, so won't feel any pain). The device can continuously monitor your heartbeat and can be activated whenever you experience symptoms – such as dizziness or a blackout.

Resting ECG

The standard, resting ECG, is very simple and only takes a few minutes – you'll be able to sit or lie down while having it. You will have a number of small metal plates or sticky patches called electrodes stuck or strapped to you (one on each arm and leg and six on your chest). The electrodes are attached to a recording machine by wires. When your heart beats, it produces electrical signals that are picked up by the electrodes and transmitted to the recording machine. The machine then prints out your heartbeat onto a paper strip.

Exercise ECG

An exercise ECG (also known as an exercise stress test or treadmill test) involves taking the ECG while you are carrying out some form of exercise – such as walking on a treadmill or cycling on a stationary exercise bike. The test can help to diagnose coronary heart disease and assess how severe it is.

If you have an exercise ECG, electrodes from the recording machine will be connected to you with wires in the same way as a standard ECG. You will then be asked to exercise – either by walking on a treadmill or cycling on a stationary exercise bike.

The test will last between a few minutes and 15 minutes. The exercise will be very easy to start with, and may gradually be made harder (eg, by increasing the speed or the slope of the treadmill). You'll be able to ask to stop if you need to. A doctor or technician will monitor your ECG reading while you are exercising.

Event monitoring

Event monitoring or ambulatory ECG, records your ECG over 24 hours or up to a week. You wear a portable electronic recorder in a pocket or clipped to a belt for 24 hours or a week, and make a note of when you feel any symptoms, such as palpitations or dizziness during the period. This test is useful in detecting whether you have an irregular heartbeat (arrhythmia), and for getting a recording if you have something happen occasionally.

You go home and carry out your normal activities. You are asked to keep a diary of what you do throughout the day, noting any times when you feel symptoms. At the end of the period, you return to the hospital to have the monitor taken off and the results analysed.

Some machines have a switch so you can switch on to record your ECG just when you are having symptoms.

In addition, if your symptoms don't happen often enough to be picked up on a 24-hour or week recording, there are other devices doctors can use to record your heart's activity over a longer period of time.

Afterwards

Your doctor will be able to advise you on the best course of action after looking at your ECG results.

If your ECG is normal, your doctor may suggest other tests to explain what is causing your symptoms. While a normal ECG can sometimes mean that there isn't anything wrong with your heart, it's also possible for heart disease not to show up on an ECG. That's why other tests may also be needed.

On the other hand, if your ECG is abnormal, it doesn't necessarily mean that you definitely have a problem with your heart. You may need other tests. Although an ECG is useful and simple to do, it does have limitations in what it can show. There are a number of different tests that doctors can do to get more information on the structure of your heart and how it's functioning. These include:

- an echocardiogram – this uses ultrasound to create a moving image of your heart
- a chest X-ray
- a cardiac magnetic resonance imaging MRI scan, which uses magnets and radiowaves to produce images of your heart.

Knowledge gained

Problems with the heart often show up on the ECG display or printout, which shows the electrical activity in your heart as it beats. An ECG recording looks like a wavy line, with a series of bumps and spikes that relate to the different phases of your heartbeat. Everyone's normal heartbeat pattern is similar.

However if you have a problem with your heart, the bumps and spikes may look abnormal. They may be too big or too small; too close together or too far apart; or some of the bumps may be missing. How the spikes look depends on what exactly is wrong with your heart.

The ECG recording gives some idea of how your heart is functioning and what seems to be the problem. You may need further tests to confirm this.

Abnormal ECG

You may have nothing wrong with you, even if you have an abnormal ECG. An abnormal ECG can also be a sign of a number of different heart conditions. Various things can cause an abnormal ECG, including certain heart conditions and other factors. These include:

- abnormal heart rhythms (arrhythmias), such as atrial fibrillation, atrial flutter, ventricular tachycardia and heart block
- heart valve disease
- heart failure or coronary heart disease – causing the heart to work under strain
- diseases of the heart muscle (cardiomyopathy)
- certain drugs, including beta-blockers and digoxin.

However, remember that having an abnormal ECG doesn't necessarily mean you have a heart disease. It's possible to have an abnormal ECG recording when there's actually nothing wrong with you.

Harmless and safe

An ECG is a very simple procedure, is completely painless, and cannot be harmful.

It is a non-invasive procedure, which means it is done entirely outside the body and doesn't involve putting anything inside you. This means you won't feel any discomfort during the test. The recording machine cannot give you an electric shock or affect your heart in any way.

An exercise stress test ECG might make you feel uncomfortable as the exercise is gradually made harder – by increasing the speed and/or slope slightly every three minutes. However, it shouldn't be too much for you, and you can ask to stop the test if you don't feel able to carry on.

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