

Genetic testing for inherited cardiac conditions



Working together to improve the diagnosis, treatment
and quality of life for all those affected by arrhythmias

Glossary

Inherited Cardiac Conditions (ICCs) Conditions that can be passed down in families via your genes

Hypertrophic Cardiomyopathy An inherited disease of the heart, where the muscle wall of the heart becomes thickened

Long QT Syndrome (LQTS) An inherited condition where there are problems with the electrical activity of the heart

Electrocardiogram (ECG) is a simple test that records the heart's rhythm and rate

Important Information

This information leaflet has been produced for people who have been diagnosed with an Inherited Cardiac Condition and their families. Its aim is to outline the process and implications of genetic testing and to give you an idea of what to expect from your genetic counselling appointment.

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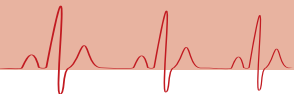
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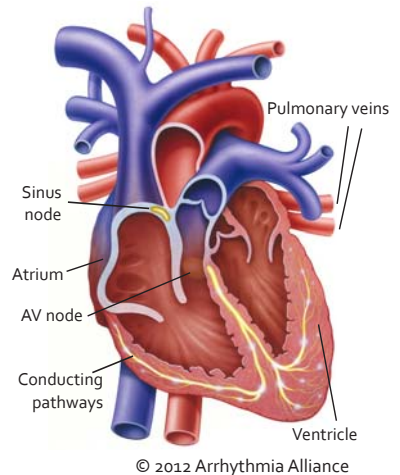


What is an inherited cardiac condition (ICC)?

Inherited Cardiac Conditions (ICCs), for example Hypertrophic Cardiomyopathy and Long QT Syndrome (LQTS), are conditions that can be passed down in families via your genes. Genes act as instructions telling our bodies how to grow, develop and function. There are many genes known to be involved with ICCs. A change, or 'spelling mistake', in one of these genes can cause someone to be affected by, or be at risk of, an ICC.

The way these 'spelling mistakes' are inherited can vary, but there is usually a 50:50 or one in two chance that a close blood relative (child, parent, sister or brother) also has the 'spelling mistake' themselves, and therefore has the risk of developing the ICC too. Most people with ICCs do not suffer troublesome ongoing symptoms. However a small number of people are at risk of dangerous heart problems and it is important to have regular heart checks, as many of these problems are treatable or preventable.

The heart and normal conduction



What is genetic testing?

A genetic test is a type of medical test that is used to try and identify the gene change, or 'spelling mistake' that can cause an ICC. For example:

A correctly 'spelt' gene:

THE CAT SAT MAT

A gene with a 'spelling mistake':

THE CATTSA TMA T

Within the genes that are associated with causing ICCs, there are a large number of different gene changes that can cause the condition. It is not always possible, using current technology, to find the 'spelling mistake'. If this is the case, your sample may be kept and stored as it may be possible to do additional testing in the future. Even if the gene change causing the condition in your family is found, your sample may still be stored for further testing if and when medical knowledge increases and new technologies become available.

You will be asked for your written consent before you give a sample, and your permission will also be gained before any results are shared for the purposes of helping other family members who are also considering genetic testing.

Are there different types of genetic tests?

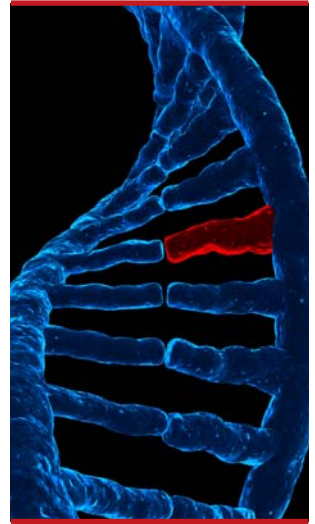
There are two different types of genetic tests: 'genetic screening' and 'pre-symptomatic' or 'familial' testing. The first affected person in the family to come forward for testing will be offered a genetic screen; if a causative spelling mistake is found, then their relatives may be offered a familial test. The process involved and implications to consider are quite different for each type of test.

Genetic screening

Genetic screening can be offered to someone who has been diagnosed with an ICC by their specialist heart doctor (cardiologist) based on the results of clinical tests (like ECG and echocardiography) and examination.

The aim of genetic screening is to try and identify the genetic cause of your ICC. The results of a genetic screen may not change anything for you in terms of your diagnosis and management - these decisions are usually based on the results of clinical tests and examination.

However, if the causative spelling mistake is found, it can be a very useful and efficient tool for finding out who else in your family may be at risk of developing the same ICC as you.



There are several possible results from 'genetic screening':

- 1) A genetic 'spelling mistake' is found which is believed to be responsible for causing your ICC. This allows for pre-symptomatic genetic testing of family members to be offered.
- 2) The responsible genetic 'spelling mistake' is not found. This does not mean you do not have the ICC you were clinically diagnosed with, or that it is not an inherited condition, just that the specific responsible genetic 'spelling mistake' in you has not been identified.

This may be because the testing procedure was unable to identify your particular gene alteration or because the particular gene alteration is in genes that the laboratory does not test, or have not been discovered yet. In this situation, pre-symptomatic genetic testing cannot be offered to other family members. However, usual practice is to store your sample, in case additional testing becomes possible in the future.

- 3) A genetic 'spelling mistake' is found, but it is not yet certain whether this is what is causing your ICC. In this situation, further genetic tests and clinical investigations of your family may be needed to learn more about this gene change.

Pre-symptomatic genetic testing

If an ICC-causing gene change is found in a family member who has already been diagnosed with an ICC (see genetic screening section), pre-symptomatic genetic testing can be offered to blood relatives who are not already known to have the ICC. In the first instance this would usually mean offering testing to close relatives such as parents, brothers, sisters and children, depending on their age.

If a relative chooses to have pre-symptomatic testing, there are two possible outcomes:

- 1) The causative gene change is found. That person is at increased risk of developing the ICC and should have their heart checked by a cardiologist. If they have children, they too would be at risk of the familial ICC and genetic testing and/or screening would be recommended, depending on their age.
- 2) The causative gene change is not found. That person is not at increased risk of developing the ICC and does not need heart checks. If they have children, then they do not need genetic testing or heart checks either.

This approach of finding out who else in the family may have inherited the ICC is sometimes called 'cascade screening'.

The aim of pre-symptomatic testing is to predict someone's future risk of developing the ICC that is known to run in the family. By identifying family members who also have the genetic 'spelling mistake', it is hoped that their risk of ill-health and dangerous heart problems can be reduced through screening, surveillance and appropriate medical and/or surgical therapy.

If you would like to find out more about genetic testing, you should ask your GP or cardiologist to refer you to a specialist inherited cardiac conditions clinic or your local clinical genetics department. You should be offered a genetic counselling appointment with a specialist health professional (usually a genetic counsellor or doctor) to discuss genetic testing in greater depth.

If, for any reason, you do not want to have pre-symptomatic genetic testing you can still have clinical tests such as ECG and echocardiography. Your GP should refer you to a specialist inherited cardiac conditions clinic for this.



What is genetic counselling?

Your genetic counselling appointment is a chance to learn more about the genetic basis of your ICC and to discuss what having the condition may mean for you and your family. You will be able to discuss the pros and cons of genetic testing in reference to your own personal situation, so you can work out whether having a genetic test really is the right choice for you.

Genetic counselling has an especially important role when you are considering pre-symptomatic genetic testing. Discovering you are at increased risk of an ICC when you feel well can have a significant impact on your life, and people can often react to this in different ways. It is worth thinking about your motivation for having genetic testing and finding out what genetic testing can actually tell you. For example, pre-symptomatic genetic testing will only be able to tell you whether you are at an increased risk of developing the ICC. It will not be able to tell you if you will ever develop symptoms, when you will develop them or how severe they may be.

If your pre-symptomatic genetic test shows that you do carry the 'spelling mistake', an outpatient appointment with a heart specialist (cardiologist or specialist nurse) is recommended and this can have implications for insurance, exercise, lifestyle and career choice. So it is worth thinking about how it may affect you and your lifestyle, before and during your appointment.

A genetic counselling appointment will typically last 30-45 minutes and can be used to discuss a variety of issues, as mentioned above, as well as any other questions you may have. The genetic counsellor or doctor will draw a family tree and discuss any health issues in the family. You should therefore come prepared with as much relevant personal and family information as possible (including documents where available).

How is the genetic test done?

The genetic test itself involves you giving a blood sample or cheek swab. This will then be sent away to a specialist genetics laboratory.

If it is a genetic screening test, scientists there will look at the genes in your sample to see if they can find a gene change that might be responsible for causing your ICC. They will only look in the genes they know are involved in causing your ICC, not in any other genes, so it will not usually be possible to tell whether you are also at increased risk of other inherited conditions. The results of genetic screening can take several months (sometimes longer) to come through as this is a complex process.

If it is a pre-symptomatic genetic test, the scientists in the lab simply look to see whether you carry the same gene change as your relative(s) or not. The results for pre-symptomatic genetic tests therefore take less time to come back – usually about a month.

Results will be sent back to the genetic counsellor or doctor you saw originally and they will then let you know by whatever means you arranged e.g. another appointment, telephone, letter or email. When your genetic counsellor or doctor informs you of your results, you can have another discussion as to what are the appropriate next steps to take and ask any more questions that you may have.

Where can I get more information?

If you would like more information about testing then please ask your GP to refer you to either a specialist inherited cardiac conditions clinic, a specialist cardiologist or your local clinical genetics department.



Arrhythmia Alliance

www.heartrhythmalliance.org

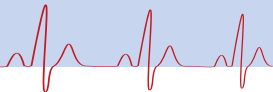
Working together
to improve the
diagnosis, treatment
and quality of life for
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Please remember that this publication provides general guidelines only. Individuals should always discuss their condition with a healthcare professional.

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