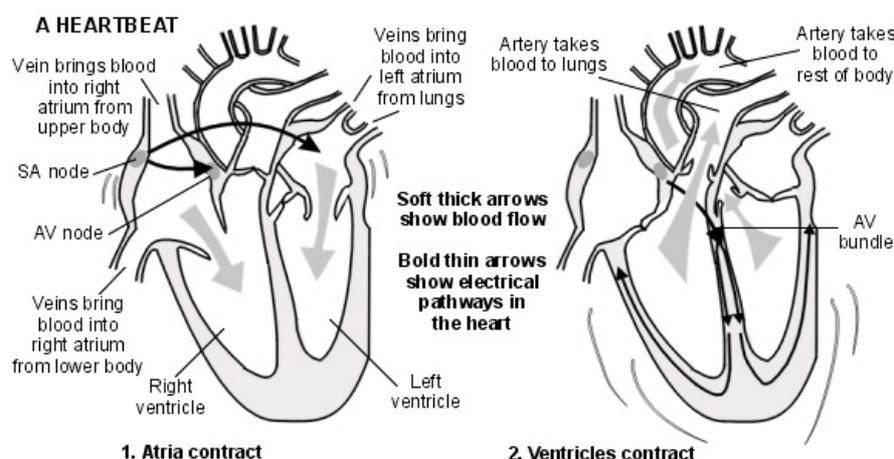


Arrhythmias (Abnormal Heart Rhythms)

This leaflet explains the heart's conduction system. It briefly describes some common problems of the heartbeat and heart rhythm (arrhythmias). There are other more detailed leaflets on some of the conditions mentioned. Note: this leaflet is intended as an overview that aims to explain how any diagnosed arrhythmia fits into the overall picture. It should not be used to self diagnose. For example, many people who have sensations of palpitations in fact do not have an arrhythmia. You should always see a doctor if you have concerns that you may have an arrhythmia.

A normal heartbeat and conducting system

The heart has four chambers - two atria and two ventricles. The walls of these chambers are mainly made of special heart muscle. The chambers have to contract (squeeze) in the correct order for the heart to pump blood correctly with each heartbeat.



The sequence of each heartbeat is as follows:

- The sinoatrial node (SA node) in the right atrium is a tiny in-built 'timer'. It fires off an electrical impulse at regular intervals (about 60-80 per minute when you rest and faster when you exercise; this controls your heart rate). Each impulse spreads across both atria. This causes them to contract and pump blood through one-way valves into the ventricles.
- The electrical impulse gets to the atrioventricular node (AV node) at the lower right atrium. This acts like a 'junction box' and the impulse is delayed slightly. Most of the tissue between the atria and ventricles does not conduct the impulse. However, a thin band of conducting fibres called the atrioventricular bundle (AV bundle) acts like 'wires' and carries the impulse from the AV node to the ventricles.
- The AV bundle splits into two - a right and a left branch. These then split into many tiny fibres (the Purkinje system) which conducts the electrical impulse throughout the ventricles. This makes the ventricles contract and pump blood through one-way valves into large arteries.
 - The artery going from the right ventricle (pulmonary artery) takes blood to the lungs.
 - The artery going from the left ventricle (aorta) takes blood to the rest of the body.

- The heart then rests for a short time (diastole). Blood coming back to the heart from the large veins fills the atria during diastole.
 - The veins coming into the left atria bring blood from the lungs (full of oxygen).
 - The veins coming into the right atria bring blood from the body (needing oxygen).

Some variations of normal

Sinus tachycardia

This means a normal heartbeat which is faster than usual (more than 100 beats a minute). This is usual when you exercise. It may also occur if you: are anaemic, have a fever (raised temperature), have an overactive thyroid gland, or are frightened (when you release adrenaline into the bloodstream, which can speed up the heart).

Sinus bradycardia

This means a normal heartbeat which is slower than usual (fewer than 60 beats per minute). Many people who are fit have a heart rate between 50 and 60 beats per minute - sometimes slower. It may also occur if you have an underactive thyroid gland.

Ectopic beats

These are extra heartbeats which occur out of sync to the normal regular rate. They are very common and are usually harmless. Most people with normal hearts have at least one ectopic beat a day. You do not normally notice them. Sometimes you may notice them as a slight thud in the chest if you are lying still in bed. Caffeine in tea or coffee, and alcohol may cause you to have more ectopic beats than usual. Some people with some types of heart disease have frequent ectopic beats.

What are arrhythmias?

An arrhythmia is an abnormal rate and/or rhythm of the heartbeat. There are various types, but all are due to some problem with the electrical conducting system of the heart. Some arrhythmias are more serious than others. Some are intermittent and come and go, others are permanent unless treated. The main types of arrhythmia include the following:

Supraventricular tachycardia (SVT)

In this arrhythmia, the heartbeat is not controlled by the SA node (the normal timer of the heart). Another part of the heart overrides this timer with faster regular impulses. The source or trigger of the impulse in an SVT is somewhere above (supra) the ventricles. But, the impulse then spreads to the ventricles. The heart then contracts (beats) faster than normal, usually between 140 and 240 beats per minute. The heartbeat is regular. An episode of SVT may last just a few minutes, but can last several hours (sometimes even longer).

The time between episodes of SVT can vary greatly. In some cases, short bursts of SVT occur several times a day. At the other extreme, an episode of SVT may occur just once or twice a year. In most cases it is somewhere in between, and an episode (paroxysm) of SVT occurs now and again. (See separate leaflet called '*Supraventricular Tachycardia*' for more details.)

Atrial fibrillation

In atrial fibrillation (AF) many random electrical impulses 'fire off' from different parts of the atria. The atria then fibrillate. This means they only partially contract - but very rapidly (up to 400 beats per minute). Only some of these impulses pass through to the ventricles in a haphazard way. So, the ventricles contract between 160 and 180 beats per minute, but in an irregular way with varying force. If you feel your pulse, you may count up to 180 beats per minute; the force of each beat can vary, and it feels erratic.

Once AF develops, it is usually permanent. But, in some cases, episodes of AF come and go (paroxysmal AF). AF is common in older people, but it also affects some younger people. (See separate leaflet called '*Atrial Fibrillation*' for more details.)

Ventricular tachycardia

This is an uncommon arrhythmia. In this condition the ventricles beat faster than normal (between 120 and 200 beats per minute). The rate in the atria is normal. So, there is a trigger of electrical impulses somewhere in the ventricles which overrides the normal impulses coming down from the atria.

Ventricular fibrillation

In ventricular fibrillation (VF) many random electrical impulses 'fire off' from different parts of the ventricles. The ventricles then fibrillate. This means they only partially contract, which is not enough to push blood out of the heart. This is life-threatening and a common cause of cardiac arrest. It is fatal unless corrected within a few minutes. It is a complication of various heart disorders, most commonly after a large heart attack (myocardial infarction).

Heart block

This is where the electrical impulses are partially or fully blocked between the atria and the ventricles. The SA node in the right atrium 'fires' at the normal rate, but the rate at which the ventricles contract (pulse rate) depends on how many impulses get through to the ventricles.

- First-degree heart block means there is a slight delay in each impulse going from the atria to the ventricles. But, each impulse does get through and the heart rate is normal.
- Second-degree heart block means that some impulses from the atria are not conducted through to the ventricles. The rate that the ventricles contract can then be slow.
- Third-degree, or complete, heart block means that no impulses are conducted through. The ventricles then contract at their own in-built rate of about 20-40 beats per minute. So, you have a very slow pulse.

Sick sinus syndrome

This condition is where the SA node (the heart's natural pacemaker) becomes damaged. The heart then tends to beat slowly or miss a few beats. But, in some cases, the heart alternates between beating slow for a while, and then fast for a while.

There are other rare types of arrhythmias.

What are the causes of arrhythmias?

There are various causes of arrhythmias. They include the following:

Heart conditions

Many arrhythmias occur as a complication of a heart condition. For example:

- Ischaemic heart disease (which causes angina and heart attacks). This reduces the blood supply to parts of the heart which may include parts of the conducting system. A damaged section of heart muscle (following a heart attack) can trigger an arrhythmia, or block electrical impulses.
- Heart valve diseases can cause the heart muscle to enlarge which can trigger abnormal electrical activity. For example, AF is a common complication of mitral valve disease.
- High blood pressure can put strain on the heart and cause arrhythmias.
- Age-related degeneration (ageing) around the conducting fibres is one cause of complete heart block.
- Cardiomyopathy (a disorder of the heart muscle) can sometimes cause arrhythmias.
- Some arrhythmias are due to abnormalities in the electrical pathways, which are present from birth. One example is an extra electrical pathway which sometimes develops between the atria and ventricles. This can cause a type of SVT. (However, symptoms may not first start until you are a young adult.)
- Some congenital heart defects are associated with certain arrhythmias.
- Inflammation of the heart and other less common heart disorders are other possible causes.

Non-heart causes

Certain medicines and excess thyroid hormone can sometimes trigger an arrhythmia.

In some cases the cause is not clear

For example, some cases of AF and SVT occur out of the blue in otherwise healthy hearts. A section of the conducting fibres just becomes faulty and can trigger fast impulses.

What are the symptoms of arrhythmias?

Symptoms can vary, depending on the severity of the condition. If the arrhythmia is intermittent and comes and goes, the symptoms develop suddenly, and can go just as suddenly. Symptoms can include:

- Palpitations (an abnormal awareness of your heartbeat). But note: sensations of palpitations are also common in people who do not have an arrhythmia. This is why it is important to see a doctor for correct diagnosis.
- An abnormally fast, slow, or irregular pulse.
- Dizziness or feeling faint.
- Shortness of breath.
- Chest pains which sometimes develop.

Some arrhythmias are more serious than others. A heart rate that is very fast or very slow can result in too little blood flowing through the heart. In some cases this can lead to heart failure, or you may collapse.

Do I need any tests?

Sometimes a doctor can easily diagnose that you have an arrhythmia by taking your pulse and examining you. However, some people have intermittent symptoms which may or may not be due to an arrhythmia. For example, some people who have palpitations may have ectopic beats, or may be just more aware of their normal heartbeat. Some people have dizzy spells, or fainting attacks which may be due to an intermittent arrhythmia. Tests can help to confirm if you have an arrhythmia, and to find which type it is.

Electrocardiogram (ECG)

The ECG test is painless and harmless. Small metal electrodes are stuck on to your arms, legs and chest. Wires from the electrodes are connected to the ECG machine. The electrical impulses in your heart can be detected by the ECG machine which records them on to a paper or computer. An ECG can confirm if you have an arrhythmia at the time of the test. Different arrhythmias cause different ECG patterns, so this test can often clarify the type of arrhythmia.

Ambulatory ECG

If you have an intermittent arrhythmia, this may not be detected by a standard ECG done at one particular time. You may then be advised to have an ambulatory ECG. This test records the electrical activity of your heart when you are walking about (ambulatory) and doing your normal activities. Wires from electrodes placed on your chest are connected to a small lightweight recorder. The recorder is attached to a belt which you wear round your waist. The electrical activity is usually recorded for 24-48 hours.

You will be given a diary to record the times when you develop any symptoms (such as palpitations). The ECG tracing is analysed at the end of the test. But, any times you record where symptoms occurred will be most carefully analysed to see if there was an arrhythmia to account for the symptoms.

Exercise ECG

Sometimes an ECG is taken whilst you exercise on a treadmill or bike to try to provoke symptoms which may be an intermittent arrhythmia.

Other more sophisticated tests may be advised in difficult cases.

What are the treatments for arrhythmias?

Each type of arrhythmia has specific treatment options. Also, treating any underlying cause (such as ischaemic heart disease, or high blood pressure) may also be important in controlling certain arrhythmias. The following are the sort of treatments which may be considered.

Medication

Various medicines can interfere with the electrical impulses in your heart. They are often used to prevent intermittent arrhythmias, or to control the heart rate in AF.

Catheter ablation (destruction) treatment

This is an option for some cases of SVT, ventricular tachycardia and AF. A catheter (small wire) is passed via a large vein in your leg into the chambers of your heart. It is guided by special X-ray techniques. The tip of the catheter can destroy a tiny section of heart tissue that is the source or trigger of abnormal electrical impulses. This treatment is suitable only if the exact site of the trigger can be found by special tests, and be located accurately by the catheter tip.

Cardioversion

This may be an option for some types of tachycardia - for example, in some cases of AF which have recently developed, and some cases of ventricular tachycardia. Whilst under anaesthetic, you are given an electrical shock over the heart. This may revert the abnormal rhythm back to normal.

Artificial pacemakers

These are used in cases of complete heart block and in certain other situations. An artificial pacemaker is a small device which is inserted just under the skin on the upper chest. Wires from the pacemaker are passed through veins into the heart chambers. The pacemaker can then stimulate the heart to maintain a regular normal heartbeat.

Implantable cardioverter defibrillators (ICDs)

These are sometimes used in difficult cases. They are small devices which are similar to pacemakers and are inserted under the skin in the upper chest. Wires are passed through a vein to the heart. The device monitors the heartbeat. If it detects a change to an abnormal rhythm, the device can send a short electrical shock to the heart to stop the abnormal rhythm.

Further help and information

Arrhythmia Alliance

PO Box 3697 Stratford Upon Avon, Warwickshire, CV37 8YL

Tel: 01789 450787

Web: www.rrhythmiaalliance.org.uk

Aims to promote better understanding, diagnosis, treatment and quality of life for individuals with cardiac arrhythmia.

British Heart Foundation

Greater London House, 180 Hampstead Road, London NW1 7AW

Tel (Heart Help Line): 0300 330 3311 (calls charged at local rate)

Web: www.bhf.org.uk

Further reading & references

- [Arrhythmia - implantable cardioverter defibrillators](#), NICE Technology Appraisal (January 2006)
- [Cardiac arrhythmias in coronary heart disease](#), Scottish Intercollegiate Guidelines Network - SIGN (2007)
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