

LEADS - fine insulated flexible wires that transmit the impulse from the heart to the ICD and the energy from the ICD back to the heart.

PACING - small electrical impulses that stimulate the heart to contract.

SINO-ATRIAL NODE - the hearts natural pacemaker.

SUDDEN CARDIAC DEATH - an unexpected death due to cardiac causes.

VENTRICLES - the two lower chambers of the heart, right and left.

VENTRICULAR FIBRILLATION - a very fast and chaotic abnormal rhythm. Defibrillation is vital to stop this otherwise fatal rhythm.

VENTRICULAR TACHYCARDIA - an abnormal fast regular rhythm originating from the ventricles. If left untreated this rhythm may lead to collapse and loss of consciousness.



Biventricular Implantable Cardioverter Defibrillator/ Cardiac Resynchronisation Therapy with Defibrillator (CRT-D)

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Cardiac Intervention Unit

This booklet provides information
and advice for patients and their families

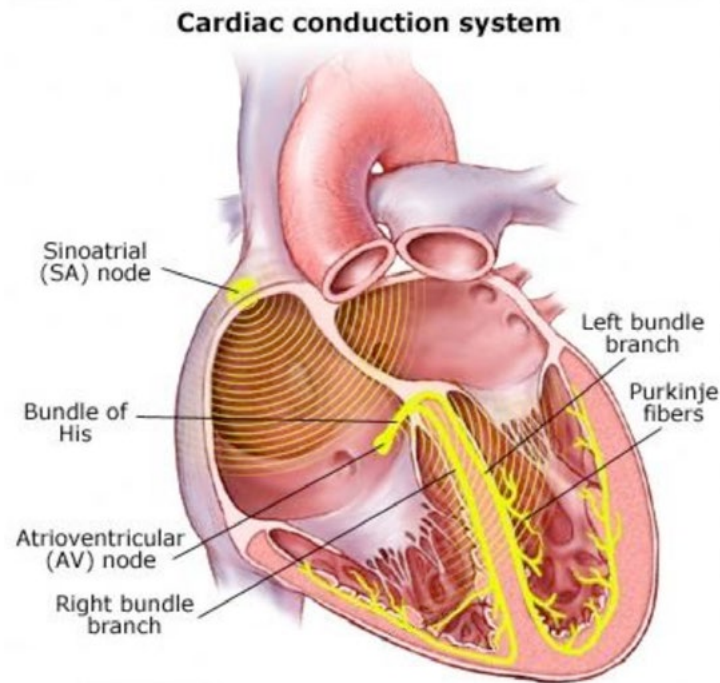
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It has been identified by your Doctor that you have weakened heart function 'heart failure' and may be at risk of abnormal rhythms arising from the bottom chambers of the heart. Your Doctor recommends that you have a Biventricular Implantable Cardioverter Defibrillator inserted and this booklet is designed to provide further information about this. The other name for this is Cardiac Resynchronisation Therapy with Defibrillator.

The Electrical System of the Heart

The heart consists of two pumps side by side. One pump circulates blood around the lungs before emptying into the second pump. The second pump circulates blood around the body. Each pump consists of two chambers, the atrium and the ventricle.



Courtesy of Boston Scientific

Glossary of terms

ARRHYTHMIA - an abnormal heart rhythm.

ATRIA - the two top chambers of the heart, right and left.

ATRIOVENTRICULAR NODE - the 'junction' between the atria and the ventricles allowing communication between the two.

BIVENTRICULAR PACING - The right and left ventricles are stimulated with tiny electrical impulses to improve the co-ordination of the heart.

CARDIOVERSION - a low energy electrical shock delivered to the heart to correct an abnormal rhythm.

CONDUCTION SYSTEM - specialised tissue in the heart allowing the electrical impulse to travel.

DEFIBRILLATION - a higher energy electrical shock delivered to the heart in order to correct an abnormal rhythm.

ELECTROMAGNETIC FIELD - an invisible area of energy that is emitted from magnetic or electrical equipment.

ELECTROMAGNETIC INTERFERENCE (EMI) - interference from very strong electromagnetic fields which can affect the functioning of the ICD.

EXTERNAL DEFIBRILLATION - an electric shock to the heart from paddles that are placed on top of the chest.

HEART ATTACK - where an artery in the heart becomes blocked, usually by a clot, stopping the blood supply to an area within the heart. This causes death of this area of heart muscle. The medical name for this is Myocardial Infarction.

IMPLANTABLE CARDIOVERTER DEFIBRILLATOR (ICD) - a programmable battery operated device that sits in the upper left area of the chest. It has leads that sit in the chambers of the heart to constantly monitor and record the heart rate and rhythm. If an arrhythmia is detected it will provide appropriate therapy.

If you or your family would like to speak to someone about your ICD please contact the arrhythmia nurses on:

Tel: **0300 019 6154**

Email: **arrhythmia.nurses@uhd.nhs.uk**

9am until 5pm Monday - Friday

(please leave a message as the answerphone is checked frequently for messages and your call will be returned as soon as possible)

The above number should only be used for general enquiries. In the event of an emergency please dial 999 and ask for an ambulance.

You can also talk with people in an online, private community called 'ICD life'. This gives you the opportunity to connect, communicate and read information related to ICDs. If this is of interest please share your email address with an arrhythmia nurse and they will send you an invitation to the group.

Information on the Internet

The following are web sites that provide information for patients. Whilst we recommend these sites, we cannot be held responsible for information that you collect from them. To locate the site connect to the addresses below:

www.arrhythmiaalliance.org.uk

www.medtronic.com

www.bhf.org.uk

www.sjm.com

www.dvla.gov

www.bostonscientific.com

The heart needs an electrical impulse to generate a heart beat. The electrical impulse starts in the heart's natural pacemaker called the Sino Atrial node (SA node). The SA node is sited in the right atrium. The electrical impulse travels through the tissues of the conduction system causing the heart muscle to contract in sequence, the atrium before the ventricle. There is a junction between the atria and ventricles called the atrio-ventricular node (AV node) which allows communication between the chambers.

The heart normally beats 50 - 100 times at rest. The heart beats regularly and slowly at rest and faster during physical and emotional activity.

Fast abnormal electrical activity can occur in the ventricles and take over the normal conduction. This can cause abnormal heart rhythms called Ventricular tachycardia and Ventricular fibrillation.

Ventricular Tachycardia (VT)

Ventricular tachycardia is an abnormal fast rhythm that occurs in the bottom chambers of the heart (ventricles). Because the heart is beating a lot faster than normal, the ventricles don't have enough time to fill with blood between contractions. This results in not enough blood being pumped around the body. This can cause symptoms of faintness, dizziness, shortness of breath or chest pain. If the rhythm persists it may cause loss of consciousness.

Ventricular Fibrillation (VF)

Ventricular fibrillation is a very fast and chaotic abnormal rhythm that occurs in the bottom chambers of the heart (ventricles). The ventricles are getting so many impulses that the heart 'quivers' instead of contracting and therefore does not pump any blood around the body. Consciousness is lost within seconds. If not treated promptly this rhythm is fatal. An electric shock has to be delivered to the heart in order to restore normal heart rhythm.

Heart failure

Heart failure occurs when the heart pump is weakened or damaged. If the heart muscle begins to fail the heart does not pump as efficiently as it should do and this can increase the strain on the heart.

In some people with heart failure, problems can develop in the ventricles of the heart causing a delay in the contraction of the right and left ventricle. When this occurs the walls of the ventricles do not contract at the same time. This is sometimes referred to as dysynchrony. As a result the heart works less efficiently and this can lead to an increase in heart failure symptoms such as:

- Breathlessness
- Swelling of the ankles or legs
- Lack of energy and feeling tired
- Difficulty sleeping at night due to breathing problems

What is a biventricular ICD (CRT-D)?

A Biventricular Implantable Cardioverter Defibrillator combines the functions of an ICD with a biventricular pacemaker. ICD stands for 'implantable cardioverter defibrillator'. It is an implantable device about the size of a small matchbox and weighs about 75 grams. The sealed unit consists of a pulse generator (the pacemaker) an electronic circuit (the defibrillator), a battery and a sophisticated timer. The biventricular ICD is connected to the inside of the heart with leads. You may have one lead going to the top right heart chamber (right atrium) as well as two leads going to the right and left bottom chambers (the ventricles). The leads are very fine, flexible wires which are covered in a layer of plastic or silicone.

While the future is unpredictable and having an ICD may seem like a big decision, should you suddenly experience a dangerous heart rhythm, an ICD may save your life.

EMI can be caused by close contact with certain procedures, activities and equipment. Try and avoid:

- Direct contact with car ignition systems whilst the engine is running (during car maintenance)
- Welding equipment
- High powered radio equipment and television transmitters
- Standing next to large stereo speakers (e.g. Those found at concerts)
- Carrying strong magnets or placing a magnet over your chest
- Power generators
- Induction hobs

Mobile phones are safe but should be kept approximately 15cms (6 inches) from the ICD. When making phone calls the mobile should be held to the ear on the opposite side of the ICD. When carrying a mobile phone do not store it in a pocket on the same side of the ICD.

Anti-theft security gates at shops and banks provide a very small risk of interfering with the ICD. Walk through doorways normally and try not to wait around in the area of the security system.

If you have concerns about the safety of equipment or situation please contact the Arrhythmia Nurse Specialists.

Further support and advice

If you and/or your partner feel that you would benefit from speaking to someone with a CRT-D you will be invited to join our online, private community 'Beating together'. This gives you the opportunity to connect, communicate and read information related to CRT-D/ICDs. If this is of interest, please share your email address with an arrhythmia nurse and they will send you an invitation to the group.

ICD deactivation

You have chosen to have an ICD to treat potential life threatening heart rhythm disturbances that may occur and, therefore reduce your risk of sudden cardiac death. However, there may come a time when you no longer wish to have such treatment. This situation might occur, for example, because you have received a diagnosis of a terminal illness. Deactivation involves turning off the treatment that your ICD gives for life threatening heart rhythms. This option will be discussed with you and your family by those health care professionals involved in your care. You will be fully informed and supported in any decision that you make.

Deactivation is done with the same external programmer that is used for your ICD checks. It is a simple and painless process. Once deactivated the ICD will still be able to function as a pacemaker but will no longer be able to treat life threatening heart rhythms if they occur. This process can be reversed if your situation changes.

Is there any equipment that may affect my device?

Equipment that uses electricity and magnets has electromagnetic fields around them. These fields are usually weak and will not affect your ICD. Strong electromagnetic fields can cause electromagnetic interference (EMI) and affect the functioning of your ICD.

The majority of everyday mechanical and electrical devices will not affect the function of the ICD as long as they are properly maintained. Household appliances such as radios, cookers, computers, dishwashers and microwaves can all be used as long as they are in a good working condition.

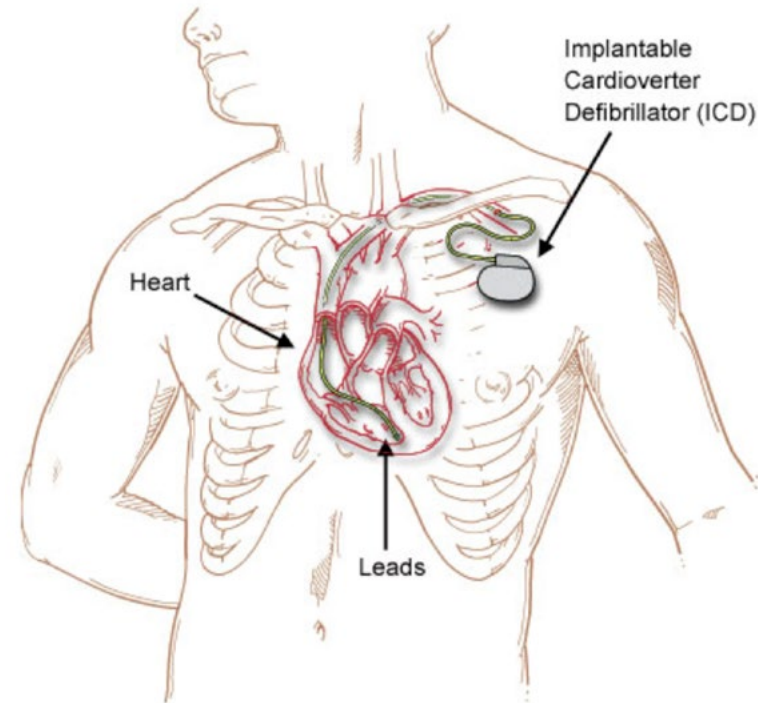


Diagram of ICD battery and lead placement

Courtesy of Boston Scientific

How does the device work?

The biventricular pacemaker aspect of the device delivers small electrical impulses to both of the lower chambers of the heart (the ventricles). This stimulates them to contract and is called pacing. This allows the ventricles to beat together in a more synchronized, coordinated pattern, therefore causing the heart to pump blood to the rest of the body more efficiently. This is why this treatment is also known as CARDIAC RESYNCHRONISATION THERAPY and it can help to reduce the symptoms that can occur with heart failure.

The ICD aspect of the device is constantly monitoring the heart rate and rhythm. If it detects an abnormal fast rhythm arising from the bottom chambers (the ventricles) it will deliver the appropriate treatment to restore normal heart rhythm.

If the heart rate goes too fast in the ventricles, the ICD can either pace faster than the abnormal rhythm (called Anti-tachycardia pacing), or if necessary, deliver a shock to the heart muscle (called Cardioversion or Defibrillation). The therapy received from the device depends on the programming of the ICD and how fast the heart rate is.

Why do I need a biventricular ICD?

Despite taking regular medication you may still be limited by your heart failure symptoms. A biventricular device is designed to assist your medications in improving these symptoms by synchronising the heartbeat and improving the pumping function of your heart. This should hopefully then lead to an improvement in your quality of life. It is also designed to provide protection against sudden cardiac death from abnormal heart rhythms from the bottom chambers of the heart.

The procedure for implanting an ICD

Prior to your admission you will have a pre-assessment with an arrhythmia nurse specialist, who will explain the procedure to you. You will receive an admission letter, which will tell you if you need to stop any medication, and will inform you of any other important information. Please read this admission letter carefully and call the arrhythmia nurses if you have any questions. X-rays are used during the procedure so it is important to inform the team looking after you if you think there is a risk you may be pregnant.

You may be in hospital overnight following the procedure. On admission to the ward you will be given a hospital gown to wear. A needle (cannula) will be inserted into a vein in your arm, some blood will be taken and antibiotics will be given using this cannula.

When can I return to work?

There are no hard and fast rules about when to return to work as everyone is different. Speak to your doctor about returning to employment and discuss your biventricular ICD with your occupational health department or health and safety advisor if necessary.

Do I still need my drugs when I have the device?

Never discontinue any drugs without consultation with your doctor. Some of your drugs may be adjusted by the doctor following insertion of the ICD but in general you will still need your drugs along-side the ICD.

What does a shock feel like?

People have different ways of describing a shock. It has been described as feeling like a firm thump or a kick in their chest or back. These shocks may be painful although the pain may only last a few seconds. It is not unusual to find this distressing. It is natural to feel anxious but try and stay calm.

Remember that it is the abnormal heart rhythm that is dangerous rather than the ICD.

Can I give someone else a shock?

No you cannot harm anyone else. You are **NOT** electrically charged following a shock.

Do I need to tell anyone that I have a biventricular ICD?

It is important to carry your biventricular ICD identification card at all times. This contains information about the make, model and settings of the ICD. Your General Practitioner will be informed of your biventricular ICD by the hospital. If you are seeing another doctor or a dentist or, in an emergency, the casualty service, inform them that you have a biventricular device.

When will I be able to drive?

The length of time that you are unable to drive for depends on the reason why the biventricular ICD was fitted in the first place. In general you will not be able to drive for at least six months following insertion of the biventricular ICD. However, if the biventricular ICD was fitted because you are at risk of having an abnormal heart rhythm but have never actually had one you may only have to stop driving for one month. Please ask the Arrhythmia Nurse Specialists if you are unsure.

If you were to have a shock when driving this could potentially place yourself and others at risk.

You must inform your insurance company that you have had a biventricular ICD inserted. Failure to do so will invalidate your insurance.

You must inform the Driver Vehicle Licensing Authority (DVLA) that you have had a biventricular ICD fitted. If you receive a shock or Antitachycardia Pacing (ATP) from your device which causes incapacity, you will not be able to drive for six months. The arrhythmia nurses will be able to advise you on this matter. If you drive for a living or hold a Group 2 (bus/lorry) licence please check with the arrhythmia nurses or DVLA what restrictions apply. You can access the DVLA guidelines at www.gov.uk/driving-medical-conditions.

The procedure will be performed in a catheter laboratory or 'cath lab'. You will be taken into the room and will be greeted by the team looking after you, consisting of a doctor, cardiac physiologist, radiographer and two nurses. Sometimes there may be other people in the room observing for teaching purposes. Please inform the staff if you have any objection to this.

You will be awake during the procedure but will be given sedation to make you feel relaxed and sleepy. Before the procedure starts your chest will be cleaned with iodine tincture (brown) and sterile towels will be draped over you. The device will routinely be implanted in the left upper chest, unless there is a medical reason why that side is unsuitable. In this instance your doctor will discuss alternative options with you prior to the procedure. If you are uncomfortable at any time or feel anxious, please let the doctor or nurse know.

Local anaesthesia will be injected to numb the area. The doctor will make a small cut just under your left collarbone. The defibrillation lead is passed down a vein into the bottom chamber of the heart (right ventricle). A pacing lead may be inserted through the vein and placed into the top chamber of the heart (right atrium).

The leads are moved into position using x-ray. The Cardiac Physiologist will then perform some tests on the leads to check that the leads are in a good position. The leads are secured together with a stitch.

A pocket is made, usually between the skin and muscle, for the ICD. Sometimes the device will be positioned under the muscle. The leads are connected to the ICD which is then inserted into the pocket. The Cardiac Physiologist will perform more checks to ensure that the ICD will function as intended. The cut will be closed with dissolvable stitches and a dressing will be applied.

Recovering from the procedure

For at least one week it is important that you are careful with any activities that involve using the arm on the side of the ICD. You should avoid lifting the arm above shoulder level or using it energetically. This includes such activities as hanging clothes on a washing line, Hoovering and heavy lifting. This will give time for extra tissue to grow around the leads of the ICD and prevent them moving out of place. However, you must do gentle exercises of your arm to ensure that the movement of the shoulder does not become restricted.

The cut has been closed with dissolvable stitches. It will take a few days to close completely. During this time it is important that the wound is kept clean and dry. The dressing will be checked before you leave hospital. If you notice any redness, soreness, swelling or oozing/bleeding from the cut please report this immediately to the Arrhythmia Nurse Specialists.

Are there any risks with having a biventricular ICD fitted?

As with any procedure there are risks involved and all measures are taken to minimise the chances of complications. However it is important to be aware that occasionally complications do occur during this procedure. Such complications are:

- Bleeding or haematoma around the wound site, which should resolve spontaneously (1:500 risk)
- The possibility of puncturing the lung causing air to be trapped between the linings of the lung (pneumothorax). This may need to be corrected by inserting a drain into the chest (1:100 risk)
- Rarely fluid can accumulate around the heart (pericardial effusion) and reduce the heart's ability to pump (cardiac tamponade) (1:500 risk)
- Infection (1:100 risk)

- The leads from the biventricular ICD to the heart chambers become displaced such that a further procedure is required (1:50 risk)

X-ray screening will be used during your procedure. This means that you will be exposed to ionising radiation. Such exposure carries a very small risk of tissue damage in the long term.

Please be reassured that all of these risks are extremely small. If you have any further concerns about these risks please discuss it with your Doctor.

What happens after the biventricular ICD is fitted?

Once you have returned to the ward you will remain in bed for a couple of hours depending on how sleepy you are. The wound may feel sore once the local anaesthetic has worn off. It is important you inform your nurse who can give you painkillers.

You should not lift your arm, on the same side as the ICD, above shoulder level for about one week. This is because there is a small risk that the leads can move out of position.

A few hours after the procedure you will have a chest x-ray to check the placement of the leads. Before you leave the catheter lab a wand will be held over the device which will look at the settings and make sure that the ICD is working properly. You will be given an ICD identification card upon discharge, if not this will be sent in the post within one month of having the device fitted. Please ask the physiologist or nurse if you have any questions or concerns about the device.

Getting back to normal

Get back to normal as soon as you can! It is normal for many emotions such as anxiety, fear, anger and relief, to come and go. Talk about your concerns and feelings with someone else as this can make it easier for you to adjust with living with a device.