

# 心臟科中心 Cardiology Centre

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Saturday: 9:00 am – 1:00 pm  
Closed on Sundays and Public Holidays

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Hospital Main Exchange : 2572 0211  
Outpatient Department : 2835 8600

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# Pacemaker / Implantable Cardioverter Defibrillator (ICD)



養和醫院  
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# Pacemaker / Implantable Cardioverter Defibrillator (ICD)

The human heart is an important organ that pumps blood throughout the body. The heart normally beats 60 to 100 times per minute at a resting rate. During exercise or emotional stress, the body requires more oxygen and the heart beats faster at over 100 times per minute.

## What Is Cardiac Arrhythmia?

Arrhythmia is any disorder of your heart rate or heart rhythm, such as beating too fast, too slow, or irregularly, which affects blood supply to the body.

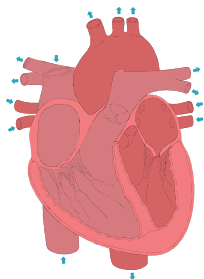
Arrhythmia may be caused by hereditary factors, ageing or disease. Common arrhythmias are the heart beating too fast (tachycardia) or too slow (bradycardia). Some types of arrhythmia cause dizziness, feebleness and fatigue, which in serious cases may lead to coma or death.

## Two Common Types of Arrhythmia

### Bradycardia

#### 1. Sick Sinus Syndrome (SSS)

The sinoatrial node (SA node) is located in the muscle area of the right atrium. It is the body's natural pacemaker, generating impulses that cause the heart to contract. Patients with SSS have a defective SA node, causing sinoatrial block, where some impulses generated fail to leave the node, or sinus arrest, where there are long pauses between the generation of impulses. As a result, the heart fails to beat as fast as the body requires.



## 2. Heart Block

The atrioventricular node (AV node) is located in the muscle area between the right atrium and the right ventricle. It transmits impulses from the SA node to the ventricle and the rest of the heart. Patients with Heart Block have a defective AV node, in which case some or all impulses fail to leave the AV node, thus blocking transmission between the atria and the ventricles.

The artificial pacemaker is a form of treatment for bradycardia in the above situations.

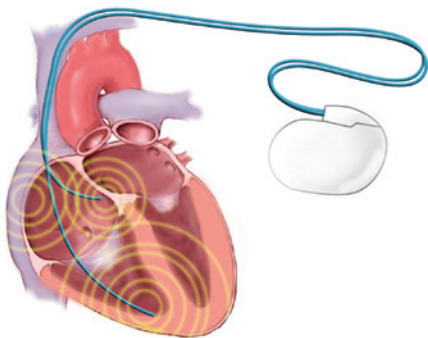
## Functions of Pacemaker

The basic functions of pacemaker are to monitor heart rhythm and control heartbeat. When the heart beats abnormally or irregularly, the pacemaker generates pre-determined impulses to stimulate the heart to beat regularly.

The pacemaker has two basic parts:

### **Pacemaker:**

A metal case which contains a battery and a circuit for monitoring the heartbeat and producing impulses.



### **Pacing Lead:**

It is an extremely flexible insulated wire which makes contact with the heart through a metal electrode at the lead tip. It helps monitor the heart's electrical activity and transmits electrical impulses to the heart from the pacemaker.

# Types of Pacemakers

## Single-Chamber Pacemaker

A single-chamber pacemaker has only one pacing lead to be placed into a chamber of the heart, either the right atrium or the right ventricle. It is mainly for patients with problems in either the sinoatrial node or the atrioventricular node.

## Dual-Chamber Pacemaker

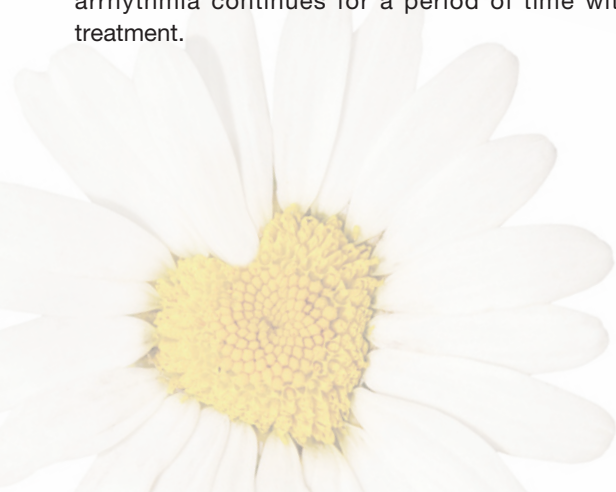
A dual-chamber pacemaker has two pacing leads to be placed in two chambers of the heart, usually the right atrium and the right ventricle. It is mainly used for patients with atrioventricular dissociation (lack of coordination between the atrium and the ventricle).

## Biventricular Pacemaker

A biventricular pacemaker has three pacing leads connected to the right atrium, the right ventricle, and the coronary sinus, which pace the left ventricle respectively. It can also provide cardiac resynchronisation therapy (CRT) for patients with heart failure.

## Tachycardia

In some instances, tachycardia can be fatal if an episode of extremely fast and irregular ventricular arrhythmia continues for a period of time without treatment.



## 1. Ventricular Tachycardia (VT)

When the heart's conduction system malfunctions, electrical signals arrive at the ventricle too soon or lead to a "short circuit", causing Ventricular Tachycardia common in patients with a history of Myocardial Infarction. As the heart beats faster, there is not enough time for the heart to fill with blood between beats, which decreases the heart's efficiency of pumping blood to the rest of the body. Within a short time, the brain and the body may be deprived of oxygen. The patient may feel that the heart is skipping beats and may lose consciousness. Without proper treatment, VT can be fatal.

## 2. Ventricular Fibrillation (VF)

In Ventricular Fibrillation, electrical signals originate from many different locations in the ventricles, each one trying to give signals to the heart to beat. As a result, the heart beats much faster than normal, sometimes over 300 beats a minute. The ventricles quiver instead of actually contract, and very little, if any, blood is pumped from the heart to the rest of the body. If one's heart is in VF, one becomes unconscious very quickly. If these irregular, fast heart rhythms continue for a length of time, the body will not get enough oxygen-carrying blood. Without oxygen, the brain and body tissues cannot function normally and may even die.

# Functions of Implantable Cardioverter Defibrillator (ICD)

ICD is a pacemaker-like device that continuously monitors the heart rhythm, and delivers life-saving shocks if a dangerous heart rhythm is detected. It can significantly improve survival rate of patients with ventricular fibrillation, which is the primary cause of sudden cardiac death. ICDs also have the ability to act as a pacemaker for those with slow heart rate, and can be modified to provide resynchronisation therapy. Different pacemakers serve different purposes. Your doctor will provide a detailed explanation and choose the best option for you.

# Implantation of Pacemaker/ICD

## How the Pacemaker/ICD Is Implanted

While the procedure usually takes 2 hours, the implantation of biventricular pacemaker and ICD may take longer. No general anaesthesia is needed; patients are conscious throughout the procedure.

1. Local anaesthesia is performed under the left or right collarbone. A small incision is made and a little “pocket” is created
2. Insert a pacing lead through a vein and into the heart
3. Use X-ray to monitor if the lead is in correct position and working
4. Place the lead firmly into position and connect it to the pacemaker
5. Insert the pacemaker into the “pocket” and suture the wound

## Pre-Operative Preparation

1. Most patients are to be admitted to the hospital one day before their operation to undergo basic investigation, including ECG, blood test, chest X-Ray, etc.
2. Stop medication as instructed by your doctor
3. Notify your doctor and all healthcare personnel about your drug or food allergies
4. Refrain from eating or drinking 6 to 8 hours before the operation
5. Sign the consent form
6. If necessary, a mild sedative may be prescribed before the operation
7. A venous catheter is inserted into the forearm

## **Post-Operative Care**

1. Limit upper limb movement on the operated side to help with wound healing
2. Inform your doctor immediately if you experience any of the following symptoms:
  - Difficulty in breathing, dizziness or fainting
  - Swelling over your wrist and ankle
  - Chest pain or hiccups
  - Redness over incision site with bloody discharge

## **Going Home**

Patients can resume normal activities shortly after implantation. Discuss with your doctor prior to resuming your hobbies, sports and/or sexual activities.

1. Take the prescribed medication as instructed
2. Attend follow-up appointments regularly
3. Carry your pacemaker/ICD identification card with you all the time
4. Contact your doctor if you notice anything strange with your pacemaker
5. Take note of your surroundings and the devices that may interfere with your pacemaker, such as power generating equipment, powerful magnets, etc.
6. Discuss the possible risks and benefits with your doctor before you undergo any medical/diagnostic procedures such as MRI, lithotripsy, radiofrequency ablation, transcutaneous electrical nerve stimulation (TENS), dental drilling or diathermy usage
7. If you experience any symptoms, such as dizziness, irregular pulse or rapid heartbeat while approaching certain electrical devices, stay away from them and/or turn them off immediately. Consult your doctor for further advice