Permanent Pacemaker Insertion

If there is a problem with your heart's normal conduction system and the pathway is blocked there may be a disturbance to the normal rhythm of your heart. Please see the section in the "You and your heart" book on How your Heart Works for a detailed description of the heart's conduction system. (page 9)

This disturbance to your normal rhythm may cause your heart rate to become very fast, very slow or irregular. This can make you feel short of breath, dizzy, drowsy or even faint.

These rhythm disturbances can be corrected by inserting a permanent pacemaker, which is designed to take over the natural pacemaker function and/or the function of a blocked part of the heart's conduction system. The pacemaker may also have the ability to stop a rapid heart rate and return it to its natural rate.

PACEMAKERS

As explained in the how your heart works section of your "You and your heart" book the heart is a specialised organ that pumps blood to the organs of the body. To achieve this pumping action the heart is equipped with a special area that initiates the heartbeat (pacemaker site).

The heart's natural pacemaker can sometimes stop working properly. This may be caused by:

- a delay of messages from the pacing site to the muscle
- Failure of the site to start a beat.

This may cause the heart to beat very slow or very fast or fast then slow, preventing the heart from beating efficiently. Please see the section on arrhythmias in your "You and Your Heart" book.

To enable the heart to regain a normal beat it may be necessary to stimulate the heart artificially rather that by your own (natural) pacemaker. The artificial pacemaker delivers the signals through a wire - inserted into the right side of your heart - at regular programmed intervals.

WHAT IS A CARDIAC PACEMAKER?

A cardiac pacemaker is an electronic device designed to deliver a pulse to the heart at a programmed rate This will assist your heart to maintain a healthy rhythm on those occasions when your own heart rate is too slow.

THE PACEMAKER

Your new electronic pacemaker consists of two main parts:

- the pacemaker (stimulating) device, and

- one (or two) pacing wires inserted into your heart

The pacemaker weighs approximately 135 grams. The size and weight depends upon the type of pacemaker and manufacturer.

The pacing wire (lead) is a narrow (<2mm wide) insulated conducting wire. The pacemaker fires a signal through an electrode (the unshielded end portion of the lead)which is in direct contact with your heart.

All current pacemakers are known as **'demand'** pacemakers - that is, the device will fire a stimulus when it detects (through the wire in the heart) that your own heart rate has fallen below its preset limit. In this way the artificial pacemaker will not compete with your own heart if your own heart rate is faster than the limit set for your pacemaker. If your heart rate does not rise above the rate set for your device, then, the pacemaker will work continuously, maintaining a regular beat.

TYPES OF PACEMAKERS

There are a number of pacemakers available today. They work on a **'demand'** basis. This means that the pacemaker is able to sense your natural rhythm and will only deliver a pulse when your heart rate falls below the rate preset for your pacemaker. Most pacemakers today are also **'programmable',** where features such as rate, voltage output, sensitivity (to your heart signals) and mode of pacing can be adjusted external to the body. This allows the selection of the most suitable settings for your heart. A programmable pacemaker provides the specialist doctor with the ability to readjust your pacemaker rather than replace it if changes are necessary. The readjustment does not require an operation, it is done with the use of an external programming wand, which when placed over the pacemaker can reprogram the pacemaker to the new settings selected. This does not cause any discomfort.

SINGLE CHAMBER

The single chamber unit has a single wire passing into the heart (normally positioned at the apex of the right ventricle). This type of pacemaker is used to stimulate one chamber of the heart, with the majority used to stimulate the right ventricle. Some are used to stimulate the upper chamber (right atrium).

DUAL CHAMBER

A dual chamber device has two wires attached. One wire passes into the upper chamber (atrium) and the second wire into the lower chamber (ventricle). The use of the dual chamber device is recommended when the heart has lost the synchrony between the upper and lower chambers and would benefit from a pacemaker that can stimulate both atrium and ventricle. This enables the heart to maintain a regular rhythm.

Dual chamber pacemakers are recommended when malfunction occurs not only at the sinus (SA) node but also at the intermediate (AV) node. The dual chamber device, like the single chamber device, operates on demand, monitoring the rate in both upper and lower

chambers and stimulation in accordance. This device has the added feature of being able to vary its rate of stimulation and thus respond to your body requirements (provided the upper (SA) node is operating normally). Thus, if the atrium is operating normally but the ventricles are not responding so the rate falls below that set for your device, the pacemaker will stimulate your ventricle. It will thus maintain an appropriate heart rate in response to your requirements automatically. If both chambers begin to malfunction the device will then only operate at the set rate. The upper and lower ranges over which the device is to operate will be determined for you by your heart specialist.

PHYSIOLOGICAL PACEMAKER

The physiological devices represent a new class of pacemaker. The devices are also known as **Rate Responsive Devices.** These devices are similar to the single chamber device in so far as requiring only one wire to be attached. The physiological pacemaker is designed to respond to stimuli other than just heart rate. Other sources of stimuli driving the pacemaker include body motion (any physical activity), respiration rate or other natural events of the body that varies with activity (including blood temperature). Changes in these parameters normally signals the heart to respond by increasing its rate. These rate-responsive features of the pacemaker are connected to a special sensor that looks for changing physical parameters within the body. In this way the pacemaker is signalled to increase its rate of stimulation. This enables your body to cope with normal daily activities including sports.

The pacemaker chosen for you has been carefully selected by your heart specialist to be most suitable for your needs.

IMPLANTING YOUR PACEMAKER

Implantation of your new pacemaker is a relatively short procedure (normally less than an hour). The procedure will be carried out under a local or general anaesthetic, depending on the need. Sites of lead implantation are either Endocardial (within the heart) or Epicardial (on the outer surface of the heart).

The majority of implants are endocardial.

Following the anaesthetic a small incision is made in the skin at the upper chest wall to locate a suitable vein through which to pass the lead into you heart. On insertion of the wire into the vein it is then positioned into the heart under X-ray observation to ensure the wire is advanced appropriately and a suitable site hard against the inner heart wall has been found. A small pocket is then created under the skin in the upper chest wall into which the pacemaker will sit. On testing the electrical patency of the lead the pacemaker is then connected (at which point the device begins to work automatically) and inserted into the pocket and the wound stitched closed.

The alternate site of implantation (epicardial) requires the wire to be attached to the outer muscle of the heart. This would require a small incision to be made at the base of the sternum to expose the heart muscle to which the lead will be attached. On attachment of lead and pacemaker the device will then be located in a small abdominal pocket.

WHAT PRECAUTIONS SHOULD I TAKE?

Your new pacemaker is an electronically protected device. It is protected from the electrical interference of everyday devices such as toasters, washing machines, hair dryers, electrical shavers, microwave ovens, television sets, radios and open bar radiators. If you expect to come in contact with electrical equipment including electric welding gear or other equipment generating a strong magnetic field, discuss this with your specialist. If you should notice some unusual sensations (light headed or rapid heart beat) when near some equipment step away and your pacemaker will automatically revert back to normal operation. The unusual sensations may be due to the magnetic field activating an alternate pacemaker function used to check the device.

Should you be planning to travel, especially by air, you will encounter the metal detector gates at check-in. Inform the security or customs personnel attending that you have a pacemaker and show them your pacemaker ID card **before** attempting to go through. THIS WILL AVOID ANY PROBLEMS FOR YOU. ALWAYS CARRY YOUR PACEMAKER IDENTIFICATION CARD WITH YOU WHEREVER YOU GO!

MEDICATIONS

The new pacemaker may replace certain medications. However, your cardiologist may want you to continue with the same medications, together with your pacemaker.
CHECK WITH YOUR DOCTOR BEFORE TAKING YOURSELF OFF ANY MEDICATIONS. IF YOU ARE NOT SURE WHAT YOUR MEDICATIONS ARE FOR PLEASE ASK YOUR NURSE, DOCTOR OR PHARMACIST.

ACTIVITIES WITH MY PACEMAKER

Your new pacemaker will allow you to return to a regular normal lifestyle dependent on your physical conditioning and ability prior to requiring a pacemaker.

In the immediate 3 to 4 weeks following pacemaker implantation it is advisable to avoid strenuous muscular activity, like hanging up the washing or mowing the lawns for example. This will allow your pacemaker and lead to settle in and the wound at the implant site to heal. You should commence a regimen of arm exercises after implant eg: gentle shoulder rolls, to allow the shoulder continued mobility. After 4 weeks, gradually return to your normal routine. You could return to activities such as:

- driving a car
- bathing or showering
- swimming, walking
- sports like golf, tennis, etc
- household activities such as cleaning, gardening and mowing lawns
- return to work
- or other physical activities you were involved in.

PACEMAKER FOLLOW-UP

After you have been discharged from hospital it will be necessary for you to have your pacemaker checked at regular intervals by either your local heart specialist or at the hospital pacemaker clinic.

You will normally be asked to first return several weeks post discharge to check that the skin at the implant site has healed appropriately and to ensure the pacemaker is functioning well. Thereafter the routine for regular visits will depend on the type of pacemaker you have and the hospital procedure.

Should you notice any redness or discolouration, or any protrusion of wire or metal at your pacemaker insertion site, then you should report to your doctor **IMMEDIATELY.**

REFERENCES

CORONARY CARE MANUAL Thompson P.L. P367-377
What You Should Know About Your Pacemaker, Biotronik

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Authorised by Rachael Peake for North Shore Cardiovascular Education Centre – Date Created: 16th May 2001 – Phone: 9926-6560 – GroupWise: Rpeake - Date Authorised: 16th May 2001