The Heart

The heart is a pump responsible for maintaining blood supply to the body. It has four chambers. The two upper chambers (the right atrium and left atrium) are the chambers that receive blood as it returns from the body via the veins. The lower chambers (the right and left ventricle) are the chambers responsible for pumping the blood out to the body via the arteries. Like any pump, the heart has an electrical system that controls how it functions.

Normal heart rhythm.

In order for the heart to do its work (pumping blood throughout the body), it needs a sort of spark plug or electrical impulse to generate a heartbeat. Normally this electrical impulse begins in the upper right chamber of the heart (in the right atrium) in a place called the sino-atrial (SA) node. The SA node is the natural pacemaker of the heart. The SA node gives off electrical impulses to generate a heartbeat in the range of 60 to 100 times per minute. If you are exercising, doing strenuous work or you are under a lot of stress, your heart rate may be faster. When you rest or sleep your heart rate will slow down. If you take certain medications, your heart rate may be slower. All of this is appropriate.

From the SA node, the electrical impulse is relayed along the heart’s conduction system. It spreads throughout both the right and left atria causing them to contract evenly. When the impulse spreads over the right atrium it reaches the atrio-ventricular (AV) node. This is a very important structure in the heart because it is the only electrical connection between the top chambers and the bottom chambers. It is therefore the only way in which an electrical impulse can reach the pumping chambers (the ventricles). The impulse spreads through the AV node and down into the lower chambers or ventricles of the heart. This causes them to contract and pump blood to the lungs and body.
How does atrial fibrillation occur?

In some hearts, an abnormal heart rhythm develops when an electrical impulse either starts from a different location, other than the SA node, or follows a route (or pathway) that is not normally present. This is what happens in atrial fibrillation. Multiple electrical short circuits develop in the upper heart chambers as shown in the diagram below.

Atrial Fibrillation is due to multiple short circuits in the upper chambers of your heart termed the left and right atria. These rapid short circuits have several consequences:

1. The short circuits drive the pumping chambers very rapidly and erratically. This produces palpitations, shortness of breath, and tiredness. In some people it can also cause dizziness and chest pain.
2. The short circuits result in ineffective pumping of the upper chambers. This leads to slow blood flow in both of these upper chambers (the left and right atria). This can rarely cause blood clots and possibly stroke. The reason you are taking aspirin or warfarin is in order to thin the blood and prevent stroke.

What treatments are available for atrial fibrillation?

1. Atrial fibrillation can be treated with medication. In some people these medicines can be very effective. In others however, the medications are ineffective and may produce side effects. If you elect to take medication, your doctor will discuss the different options and the possible side effects of these medications.
2. DC Shock. When the heart is in fibrillation it can be reverted to the normal rhythm with a “shock on the chest”. You receive a short general anaesthetic and the shock reverts the rhythm to normal in the majority of cases. With this approach the possibility of the fibrillation returning remains present (approximately 50% of patients...
will have another episode of atrial fibrillation over the next year). In addition, most patients will also require medication to try to prevent the fibrillation coming back.

3. Blood Thinning medication. Because of the risk that atrial fibrillation may cause blood clots in the heart most patients with this heart rhythm disturbance will require blood-thinning medication to prevent blood clots forming. At your doctors discretion this may either be with aspirin or warfarin.

Can Atrial Fibrillation Be Cured?

At the present time only very few patients with atrial fibrillation can be cured. Unfortunately, for the majority of patients with atrial fibrillation this is not possible at the present time.

What is AV node ablation and how will a pacemaker help?

AV node ablation and pacemaker implantation is usually reserved for patients in whom all other treatments of atrial fibrillation have been ineffective.

The first step is to implant the pacemaker. By itself the pacemaker will not improve the way you feel. However, following this a special procedure called AV Node ablation (sometimes also called His bundle ablation) will be performed. This procedure is a simple procedure which effectively “knocks out” the AV node. This will prevent any of the electrical short-circuits in the atria from reaching the ventricles. The pacemaker will now have complete control of your heart rhythm. The heart rhythm will be regular and will no longer race rapidly.

What are the advantages of having an AV Node Ablation and Pacemaker Inserted?

1. Your heart will no longer race rapidly but will be appropriately controlled by the pacemaker.
2. Your heart rhythm will be regular.
3. You will no longer require many of your medications to control the heart rhythm (you should check with your doctor as to which ones you may stop taking).
4. There is a very high probability that you will feel very much better.

What are the disadvantages of having an AV Node Ablation and Pacemaker Inserted?

1. This procedure will control the heart rhythm but the multiple short circuits in the atria will still be present. You will simply no longer be aware of them. Thus, the procedure does not cure the condition. It only treats the symptoms.
2. YOU WILL STILL NEED WARFARIN.
3. You will be dependent on the pacemaker.
4. The procedure cannot be reversed.

What is involved in Pacemaker Implantation?

Insertion of a pacemaker is a very common procedure. This is performed under local anaesthetic with sedative medication to make you feel comfortable. The procedure takes approximately 1 hour and is performed in the cardiac catheter laboratory.

This is a special room that has a patient table, X-Ray tube, ECG monitors and other equipment. The staff in the lab will all be dressed in hospital theatre clothes and during the procedure will be wearing hats and masks.

Many ECG monitoring electrodes will be attached to your chest area. A nurse or doctor will insert an intravenous line usually into the back of your hand. This is needed as a reliable way to give you medications during the procedure without further injections. You will also have a blood-pressure cuff attached to your arm that will automatically inflate at various times throughout the procedure.

The pacemaker is inserted just under the collar-bone usually on the right side. The area is prepared with a special sterile solution that may feel cold. You will be covered by a large sterile sheet that will partly cover your face. You will be able to look out from under the sheet to the side and a nurse will be present at all times. You will be given oxygen to breathe by a small tube that is positioned under your nostrils.

At the start of the procedure, the doctor will inject local anaesthetic into the area under the collar-bone where the pacemaker is to be inserted. This will sting momentarily but the area will then be numb. During the
procedure you may feel some firm pushing in the shoulder area but this should not be painful. If you experience pain or discomfort you should tell the nurse or doctor.

After the procedure you will have some bruising and discomfort in the area of the pacemaker that may persist for several weeks. You should avoid strenuous activities with your arm for a period of 4 weeks. You should refrain from driving for 2 weeks. You will be allowed to go home 1 or 2 days after the procedure.

**What is involved in AV Node Ablation?**

**Step 1**

*Prior to the AV node ablation a pacemaker will be implanted. By itself the pacemaker will not improve the way you feel. The second stage is to perform the AV node ablation.*

**Step 2**

*During an AV node ablation a catheter is advanced up the leg. Heat energy is delivered to cauterise the AV node. This means the rapid impulses of AF cannot conduct through the AV node to Ventricles.*

**Step 3**

*After the AV node ablation the rapid impulses of AF cannot conduct through the AV node to activate the Ventricles.*

*Because the atrial are still in Atrial Fibrillation after the AV node ablation, you will still need to take blood thinning medications such as Warfarin to prevent strokes.*
What is involved in AV Node Ablation? …continued

This is usually performed approximately 4 weeks after the pacemaker is implanted to ensure that the pacemaker has adequately healed and is functioning properly. Occasionally it may be performed at the same time as the pacemaker implantation.

The procedure is also performed in the cardiac catheter laboratory. The procedure will also be performed under local anesthetic with sedative medication to make you feel relaxed and comfortable. Usually before leaving your ward you will be given a light sedative and your groin will be shaved.

As described above, the lab has a patient table, X-Ray tube, ECG monitors and other equipment. The staff in the lab will all be dressed in hospital theatre clothes and during the procedure will be wearing hats and masks.

Many ECG monitoring electrodes will be attached to your chest area and patches to your chest and back. These patches may momentarily feel cool on your skin.

A nurse or doctor will insert an intravenous line usually into the back of your hand. This is needed as a reliable way to give you medications during the procedure without further injections. You will also be given further sedation if and as required. You will also have a blood-pressure cuff attached to your arm that will automatically inflate at various times throughout the procedure.

The oxygen level of your blood will also be measured during the procedure and a small plastic device will be fitted on your finger for this purpose. Your groin will be washed with an antiseptic cleansing liquid and you will be covered with a sterile sheet.

The doctor will inject local anaesthetic to the groin area and this will sting momentarily. After that, you may feel pressure as the doctor inserts the catheters but you should not experience any pain. The doctor will then insert a special catheter through the vein in your groin area. As this is all internal you will not feel any discomfort. This will pass via your veins up into your heart. The doctor controls its position with the aid of x-ray. A small burn will be delivered to the AV node through the tip of the catheter. This essentially destroys this electrical conducting pathway.

- The entire procedure takes approximately 30 minutes.
- You will have to lie flat for 4 hours after the procedure.
- You may have some bruising and discomfort in the groin area and you should avoid strenuous physical activity for at least 1 week.
- You will be able to go home the day after the procedure.

Should I have the procedure? Do I need the procedure?

AV node ablation and pacemaker implantation is usually reserved for patients who are fed up with the symptoms of atrial fibrillation which are significantly interfering with their quality of life and their lifestyle and for whom all of the medications are not effective. If you are in this category it is highly likely that you will feel very much better if you have the procedure.

What happens prior to your procedure?

You will receive a letter from the hospital bookings clerk or from the Doctors secretary outlining the date of your procedure and date and time of your admission to the hospital.

If you are taking anti-coagulation (blood thinning) medication eg warfarin then you will need to stop this for approximately 5 days prior to your procedure. Your doctor may arrange for you to have daily heparin injections after you stop the warfarin.

Patients having the procedure at the Royal Melbourne Hospital will be required to attend the pre-admission clinic on the day prior to the procedure.

Some country patients may need to make arrangements to stay overnight with family or friends.
At the pre-admission clinic you will see a doctor who will record your medical history. You will also require an ECG and blood test. The doctor will also confirm the time you should be at the hospital for admission the following day.

You will be required to fast for at least six hours before each of the procedures. If your procedure is in the afternoon you may have a light breakfast. If your procedure is in the morning, DO NOT EAT OR DRINK AFTER MIDNIGHT, except for sips of water to help you swallow your pills.

What are the Risks of AV Node Ablation and Pacemaker Insertion?

**Pacemaker implantation** is a very common and low risk procedure and should a complication arise, it will be dealt with at once.

Although most people undergoing pacemaker implantation do not experience any complications, you should be aware of the following risks:
- **Haematoma** (blood collection) - this may occur at the pacemaker insertion site. This may be uncomfortable and can take several weeks to settle.
- **Pneumothorax** – During the procedure it is necessary to insert the pacemaker leads into your heart via a small vein under the collar-bone. This vein runs very close to the lung and there is a small chance that a small hole could be inadvertently made in the lung (Pneumothorax). Should this occur, it would usually heal by itself. However, occasionally a small tube may need to be inserted to drain out the air. This can be uncomfortable and means spending several extra days in hospital.
- **Lead Dislodgment.** – Although a great deal of care is taken in placing the pacemaker leads inside your heart, occasionally one of them moves and will need to be repositioned. This usually occurs in the first 24 hours after the procedure and is detected by testing the pacemaker.
- **Infection** – There is a very small chance that the pacemaker will develop an infection. Should this occur, it is usually necessary to remove the pacemaker in order to clear the infection.

**AV Node ablation** is also a very common and very low risk procedure.

Although most people undergoing AV node ablation do not experience any complications, you should be aware of the following risks:
- **Local bleeding, blood clot or haematoma** (blood collection) - this may occur at the catheter insertion site.
- **Perforation or damage** - very slight chance that this may occur to either a heart chamber or to the wall of one of the blood vessels.
- **Pacemaker failure** – this is an extremely small risk.

Prior to both procedures, if you are taking warfarin, this will need to be stopped for several days (your doctor will advise you exactly).

During the time that you are not taking warfarin, there will be a very small chance of a blood clot forming.

If there are any questions about your ablation procedure please contact Karen Halloran via The Department of Cardiology on 93427000