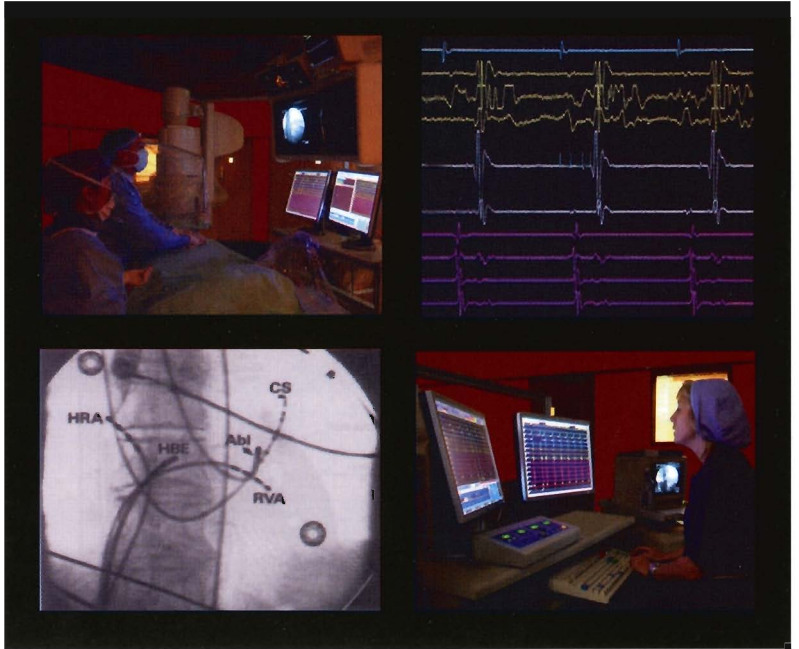


AUCKLAND HEART GROUP

EP and Catheter Ablation



A Patient's Guide

MERCY ANGIOGRAPHY



ELECTROPHYSIOLOGY (EP) STUDY AND CATHETER ABLATION

A Patient's Guide

Your doctor has recommended that you undergo a diagnostic electrophysiology and/or catheter ablation procedure. The EP study is to diagnose an abnormal rhythm problem and catheter ablation is to treat the problem.

The Heart's Electrical System

The heart's rhythmic contractions depend on its electrical system to conduct electrical impulses throughout the heart.

The sinus node, a group of specialized cells in the right atrium, is the place where the electrical impulse normally begins. The sinus node functions as the heart's "natural pacemaker," setting the pace for the heartbeat.

The electrical impulse spreads throughout the atria, causing the muscle in the atrial walls to contract and squeeze blood into the ventricles.

From the atria, the electrical impulse reaches the atrioventricular node, (AV node) located between the atria and the ventricles.

This node acts like a gate, slowing down each electrical impulse before allowing it to pass on to the ventricles.

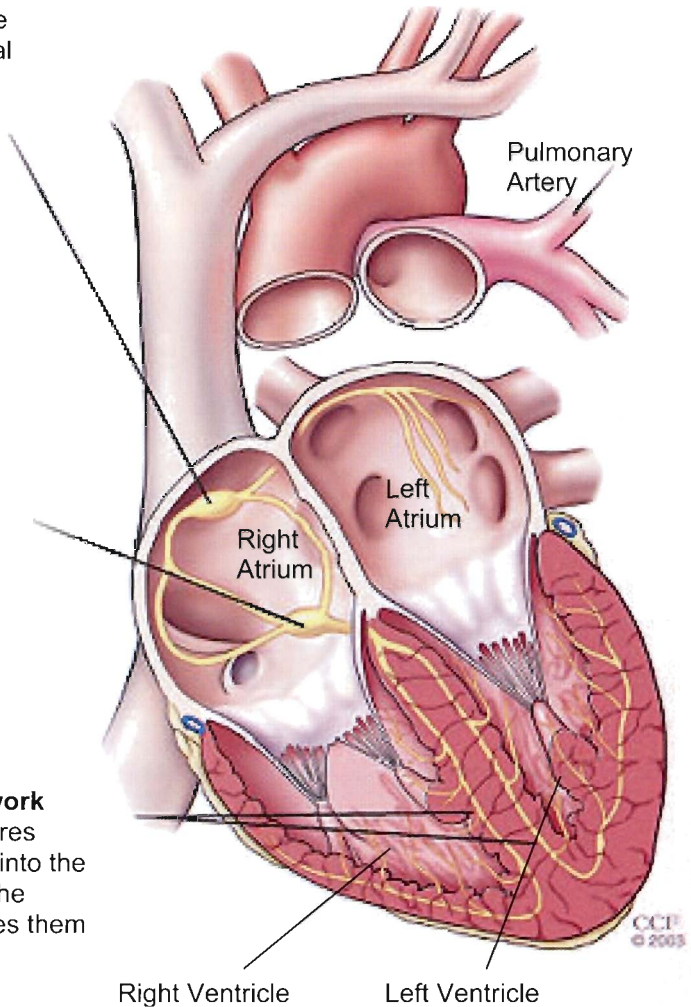
The impulse then travels throughout the ventricles through a system of specialised muscle fibers referred to as a pathway. The impulse stimulates the ventricular muscle, causing it to contract and pump blood.

The electrical impulse begins at the **Sinoatrial (SA) Node**, located in the right atrium. The electrical activity spreads through the walls of the atria and causes them to contract.

The **AV node** is located between the atria and ventricles and acts like a gate that slows the electrical signal before it enters the ventricles. This delay gives atria time to contract before the ventricles.

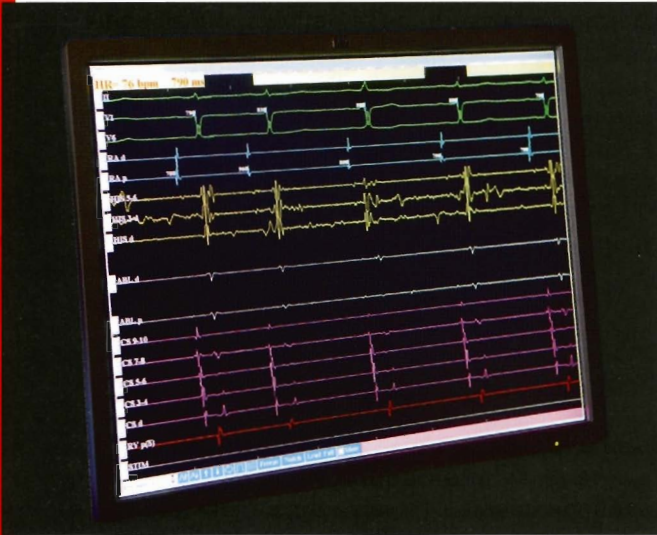
His-Purkinje Network

This pathway of fibres sends the impulse into the muscular walls of the ventricle and causes them to contract.



Abnormal Rapid Heart Rhythms

An abnormal heart rhythm, or arrhythmia, is a change in either the speed or pattern of the heartbeat. During an arrhythmia, the heart may beat too slowly called bradycardia, too rapidly, or irregularly called tachycardia.



Catheter Ablation (see later) is used for treating certain rapid heart rhythms called tachycardias. Here's a brief description of several common tachycardias that may be treated with ablation.

Supraventricular Tachycardia (SVT)



SVT is a general term describing a series of very rapid heartbeats that begin in the upper chambers of the heart. Specific examples include:

AV nodal re-entrant tachycardia (AVNRT)



(AVNRT) is the most common form of SVT.

In this condition, two pathways exist in the AV node. If an electrical impulse enters only one of the pathways, it may double back through the unused second pathway and start travelling in a circular pattern. This may cause the heart to contract with each cycle, and may result in a very rapid, regular heartbeat.

Wolff-Parkinson-White Syndrome (WPW)



In WPW, an abnormal "bridge" of tissue connects the atria and the ventricles.



This extra pathway is called an accessory pathway and makes it possible for electrical impulses to travel from the atria to the ventricles without going through the AV node



In people with WPW, an arrhythmia can get started when an impulse travels down the normal conduction pathway to the ventricles and then back up through the accessory pathway to the atria.



If the impulse continues to travel in a circular pattern, it may cause the heart to contract with each cycle, and may result in a very rapid heartbeat.



Some accessory pathways conduct impulses rapidly and thereby may allow very rapid and serious rhythms to occur.

Atrial Fibrillation (AF)

- ♥ In AF, multiple circuits in the atria occur simultaneously, stimulating the heart in an unco-ordinated fashion. As a result, the atria quiver quickly and ineffectively.
- ♥ The loss of a co-ordinated beat may allow the blood to stagnate and form blood clots.
- ♥ The AV node, which acts as a gate, allows only some of these impulses to travel down the electrical system to stimulate the ventricles.
- ♥ As a result, the heart rhythm is irregular and usually, but not always rapid. Atrial fibrillation may recur periodically or it may be persistent.

Atrial Flutter (AF)

- ♥ In atrial flutter there is a single, short circuit that conducts electrical impulses rapidly around the inlet valve of the right ventricle.
- ♥ Usually every second beat is conducted from this abnormal circuit to the ventricles resulting in a heart rate of around 150 beats per minute.
- ♥ This rhythm can often be difficult to treat with medication.
- ♥ Similarly to atrial fibrillation, there can be a risk of blood clots forming in the atria.
- ♥ If the heart rate can not be controlled there can be a risk of weakened heart muscle pumping function.

Ventricular tachycardia (VT)



Ventricular tachycardias arise from the major pumping chambers at the bottom of the heart.



VT is a more serious rhythm problem because it often occurs in a setting of previous heart damage (e.g. a heart attack) and may be best managed with an implanted defibrillator.



Sometimes with VT, the heart is otherwise healthy and the abnormal rhythms arise from an irritable trigger point. This trigger can often be localised and successfully ablated.

Why is Catheter Ablation Important?

Although medications are frequently used to treat rapid heart rhythms, they may be ineffective or cause side effects, and in addition must be continued indefinitely.

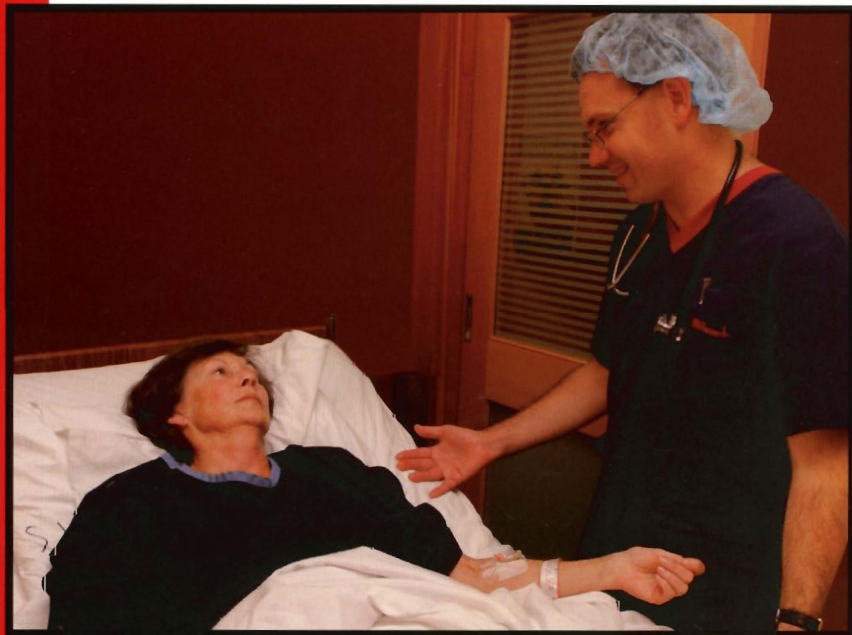


An EP Lab

Surgically implantable devices are the mainstay of treatment for serious arrhythmias (ventricular tachycardia with heart damage) but are inappropriate for supraventricular tachycardias. Nowadays, surgery to treat arrhythmias has been almost completely superseded by catheter ablation, because of the much lower risk. Catheter ablation is a relatively low-risk procedure with high success rates. When successful, catheter ablation should permanently cure the problem you have been experiencing.

Preparing for Catheter Ablation







Unless you are already in hospital, you will usually be admitted to the hospital on the day of the procedure. You may need to stay overnight following the treatment although many patients can go home the same day. Routine tests will be performed including an ECG and blood tests. If you take Warfarin and have discontinued it for the procedure, you may need an INR test the day before and possibly the day of the procedure.



The doctor performing the procedure will review your medical history and examine you if you have not already been seen at the consultation rooms several days before the procedure. The doctor will explain catheter ablation, its purpose, potential benefits, and possible risks. This is a good time to ask questions and, most importantly, to share any feelings or concerns you may have about catheter ablation. You will then be asked to sign a consent form.

A nurse will shave and cleanse the area where the catheters will be inserted. In most cases this will be the groin, but occasionally, the arm or neck area may be used. Shaving and cleansing makes it easier to insert the catheters and helps to avoid infection. A small intravenous needle ("IV line") will be inserted into a vein in your arm. It allows drugs to be injected directly into the vein, if necessary. You may also be given a sedative to help you relax.

Before the Procedure

-  Generally, you will be asked not to eat or drink anything for 6 to 8 hours before the procedure. (You may have sips of water to swallow your medications.)
-  Make arrangements with a family member or friend to drive you to the hospital.
-  Be sure to check with your doctor several days before the procedure. You may be asked to stop taking certain medications for up to a week before the procedure. This can help get more accurate test results.
-  Bring a list of all the medications you are currently taking. It is important for the doctor to know the exact names and dosages of any medications that you take.
-  Be sure to mention to the doctor (or nurse) if you have experienced allergic reactions to any medications.
-  Because the ablation procedure can be lengthy, occasionally a urinary catheter may be inserted to drain your bladder during the procedure.



An Electrophysiology Technician preparing a patient for the procedure

During Catheter Ablation

Catheter ablation is performed in an especially equipped room called an EP lab.

You will be transported to the EP lab on a moveable bed, then transferred on to an x-ray table. This table has a large camera above it and television screens close by. The equipment in the EP lab also includes heart monitors and various instruments and devices.

The EP lab team generally includes the electrophysiologist (a cardiologist with sub-specialty training in heart rhythm disturbances), an anaesthetist and anaesthetic technician, specialist nurses, and a highly trained electrophysiology technician.

After being positioned on the x-ray table, you'll be connected to a variety of monitors, and covered with sterile sheets. The staff will be wearing sterile gowns and gloves

What Happens During the Procedure?

An EP study and a catheter ablation procedure have similarities. In fact, if you haven't already undergone an EP study, your doctor will usually perform both procedures, one after the other, while you are in the EP lab. This possibility will be discussed with you beforehand.

The area where the catheters are to be inserted (groin, arm, shoulder, or neck) is cleansed thoroughly. A local anaesthetic is injected into the skin through a tiny needle to numb the area.

A small incision is made in the skin, and a needle is used to puncture the blood vessel (usually a vein) into which the catheters will be inserted.

The special electrode catheters used for the procedure are long and flexible wires that can conduct electrical impulses to and from the heart. One or more catheters are inserted into the body and advanced toward the heart, while the staff follows their progress on a television screen. The catheters are then positioned inside the heart.

The Electrophysiology (EP) Study

The EP study portion of the procedure is done to diagnose your heart rhythm problem.



An EP technician monitoring and recording electrical signals.

The EP study is performed by doing two things:

1) Recording Electrical Signals and ECGs.

Electrode catheters sense electrical activity in various areas of the heart and measure how fast electrical impulses travel.

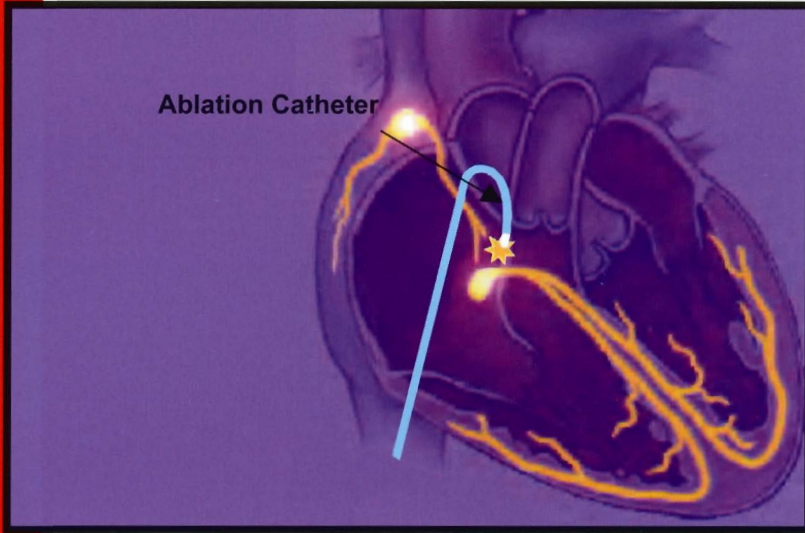
2) Pacing the Heart.

Electrode catheters can also be used to deliver tiny electrical impulses to pace the heart. By doing so doctors try to induce (bring on) certain abnormal heart rhythms, so that they can be observed under controlled conditions.

In order to bring on an arrhythmia, medications may be given through the IV line to speed up the heart. The EP study helps determine the location of the heart's abnormal electrical activity. For example, in people with WPW, several electrode catheters are inserted into the heart, to help define the exact location of the accessory pathway-this technique is called "mapping". The location and type of rhythm problem you have will help confirm if catheter ablation is an appropriate treatment option for your condition.

Catheter Ablation

During catheter ablation, doctors insert an ablating electrode catheter into the heart. They position the catheter so that it lies close to the abnormal electrical pathway that is causing the arrhythmia, and then pass radio-frequency energy between the catheter tip and a patch on your chest.



Cross-sectional anatomy of Heart showing an abnormal electrical pathway being ablated by an ablation catheter.

The tip of the catheter heats up and destroys the small area of heart tissue that contains the abnormal pathway. This causes formation of a tiny scar that cannot transmit electrical impulses. As a result, the abnormal electrical pathway is no longer capable of producing arrhythmias. If the AV node behaves abnormally by transmitting impulses to the ventricles too quickly, such as during atrial fibrillation, the AV node can be ablated. An artificial pacemaker must then be implanted to keep the heart beating at a normal pace. This is usually done a few weeks before the ablation procedure if this type of procedure is planned.

What You Can Expect

You will be awake during the procedure; although with the medication given to help you relax, it is not uncommon to doze off. The staff will be monitoring your progress constantly.

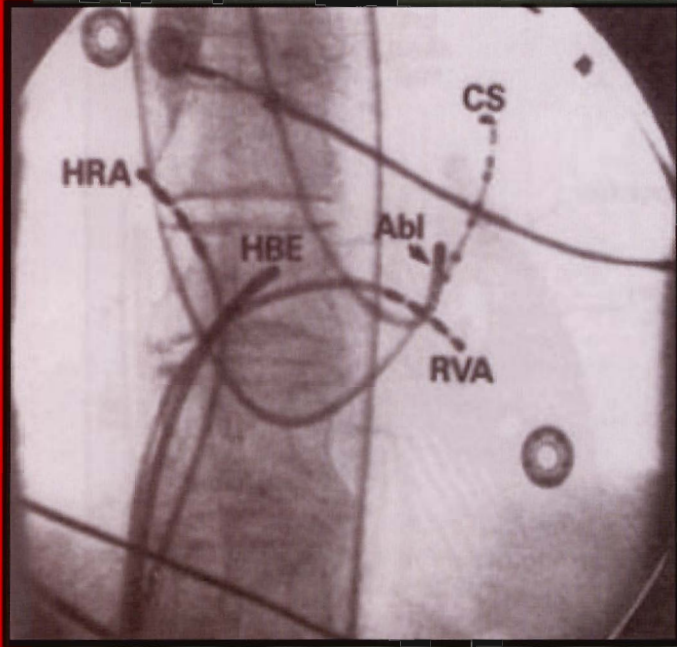
The procedure usually is not painful, although you may feel some pressure at the insertion site during the insertion of the catheters. You may experience mild chest discomfort during the application of an ablation. You may also feel tired and uncomfortable from lying still for a long time.

During the procedure, doctors will stimulate your heart with tiny electrical impulses. You won't usually feel these, but they may induce the arrhythmia that has caused your symptoms in the past. Let the staff know if you feel light headedness, palpitations, chest pain, or shortness of breath.

An arrhythmia induced in the EP lab may stop by itself, or be easily controlled by stimulating through the electrode catheters. If an arrhythmia persists, especially if it is very rapid, it may cause you to faint for a moment. If this occurs, the staff may deliver an electric shock to your heart to restore a normal rhythm.

Outside the EP lab, such arrhythmias could be dangerous and even life-threatening. In the EP lab, however, well-trained personnel have the equipment and medications to handle these arrhythmias.

The procedure can be quite lengthy. Depending on the particular arrhythmia you have and the shape of your heart, a complete procedure may last up to 5 hours. Most procedures however last only 2-3 hours.



An X-ray image showing Ablation catheters in place during a Catheter Ablation procedure

Is Catheter Ablation Safe?

Ablation is an “invasive” procedure that requires the insertion of catheters into the body and therefore involves some risk. This risk is small, and the procedure is considered relatively safe. Some patients may develop bleeding at the insertion site. Blood collects under the skin, resulting in local swelling or a “bruise” in the groin or arm.

Rarely, the procedure may be associated with more serious complications, including damage to the heart and blood vessels, formation of blood clots, and infection. Deaths are very rare.

Depending on the location and type of the abnormal pathway being ablated, there is a small chance of damage to the heart's normal electrical system. An artificial pacemaker may be needed to keep the heart beating at a normal pace.

An artificial pacemaker is a small device that's placed permanently in the body. It sends tiny signals that keep the heart beating at the right speed.

Although most patients who undergo ablation do not experience problems, you should be aware of the risk. To learn about your particular risk, you should discuss the matter with the doctor.

Potential Benefits

Catheter ablation is a relatively low-risk procedure that may permanently cure the problem you have been experiencing. In many cases, it will allow you to avoid a lifetime of medications and give you the chance to lead a normal life.

After the Procedure

After the procedure when the catheters are removed, the doctor (or nurse) will apply firm pressure to the insertion site(s) for about 10 minutes to prevent bleeding. If the insertion site is in the arm, the doctor may close the incision with a few stitches. If a tube in the artery is required this may be removed several hours later.








You will be transported to your room in the recovery area. When you will be allowed to eat or drink after the procedure depends on your condition.

Back in your room, you will lie flat in bed for 2 to 4 hours, to allow a small seal to form over the puncture site in the blood vessel. During that time, do not bend or lift the leg where the catheters were inserted. To relieve stiffness, you may move your foot or wiggle your toes.

The nurse will check your pulse and blood pressure frequently, and will also keep checking the site where the catheters were inserted. If you feel sudden pain at the site or if you notice bleeding, notify the nurse immediately.

In most cases, your heart rhythm will be monitored during the day and sometimes overnight, to help assess the effectiveness of the ablation. Generally, your doctor will visit you that evening or the next morning, to discuss the results of the procedure. When it's time to go home, have a friend or family member drive you.

At Home, After Your Ablation

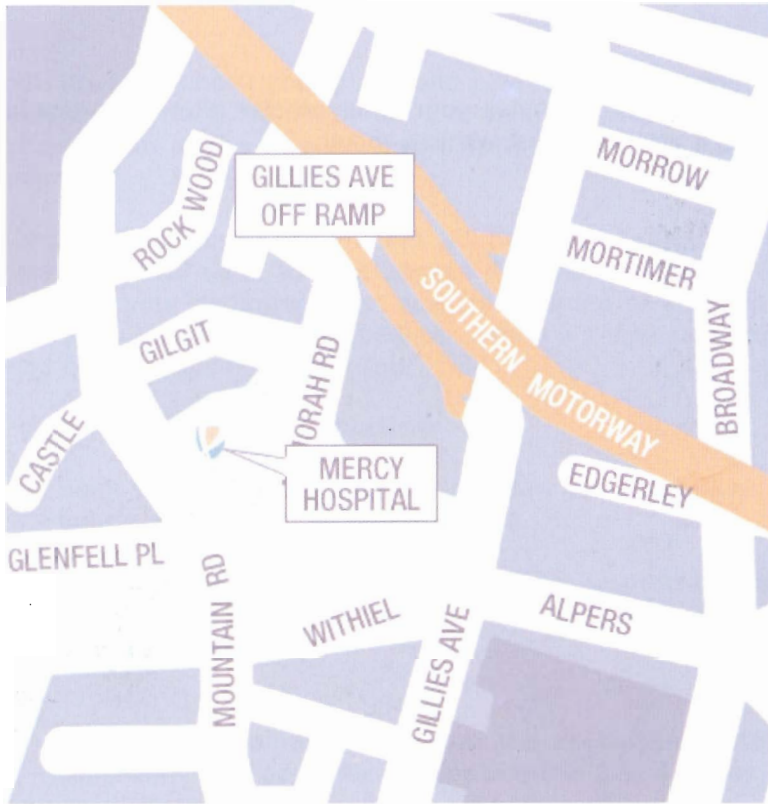
-  Limit your activity during the first few days. You can move about but do not strain or lift heavy objects.
-  Leave the dressing on the insertion site until the day after the procedure. The nurse will tell you how to take it off and when to take a shower.
-  A bruise or a small lump under the skin at the insertion site is common. They generally disappear within 3 to 4 weeks.
-  Call your doctor or nurse if the insertion site becomes painful or warm to the touch, the bruising or swelling increases, or you develop a fever over 38 degrees.
-  For a few weeks after your ablation, you may experience occasional skipped heartbeats. You may also feel palpitations lasting about 2 to 3 beats. These symptoms are common and will decrease with time.
-  Call your doctor if you have recurrence of your rapid heart rhythm, or if you experience dizziness, chest pain, or shortness of breath.
-  Be sure to check with your doctor or nurse about which medications to continue, and which ones to stop.

Follow up



You would normally visit your family doctor after the procedure and visit your specialist within a month.

Notes



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