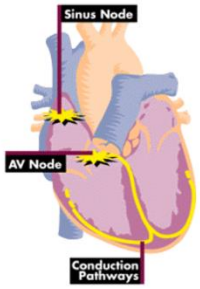

CATHETER ABLATION for ATRIAL FIBRILLATION

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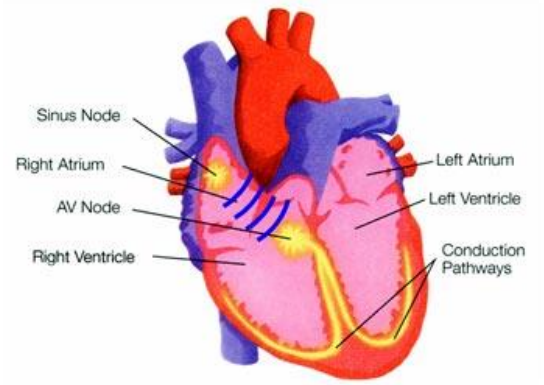
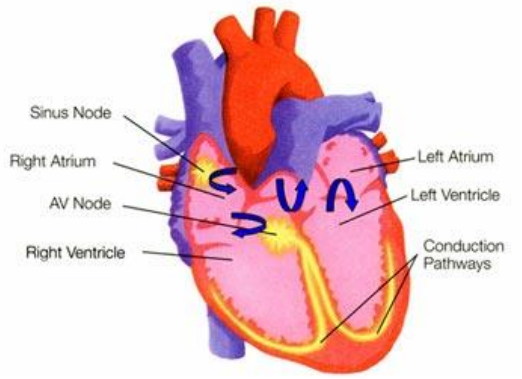
What is Atrial Fibrillation?



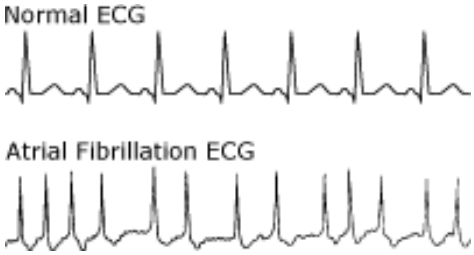
Normal Conduction



Atrial Fibrillation

Atrial Fibrillation (AF) is a very common heart rhythm disorder where the heartbeat is irregular and rapid. It originates in the heart's upper chambers, the atria. The incidence of AF increases dramatically as people age, with about 5% of people over the age of 70 affected. AF may be **persistent** (i.e.

lasting many days or requiring chemical or electrical conversion to restore normal, sinus rhythm) or occur in spells lasting minutes to hours/days (**paroxysmal**).



Symptoms associated with atrial fibrillation vary widely from patient to patient & range from mild to severe. Complaints include palpitations (an unpleasant awareness of the heart beat), weakness, dizziness, chest pain and shortness of breath.

Concerns with Atrial Fibrillation

The 2 most important medical concerns with atrial fibrillation (i.e. those which can affect patient prognosis) are the ***risk of stroke*** and ***uncontrolled heart rates*** (either too slow or too fast). We always attempt to alleviate unpleasant patient symptoms, but the degree of symptoms does not affect the prognosis.

The risk of having a stroke from atrial fibrillation is not changed by any therapies for atrial fibrillation aside from the use of anticoagulation. In other words, elimination of the atrial fibrillation with medications or ablation may not decrease stroke risk. Stroke risks with atrial fibrillation include:

-Age > 65 years -Significant heart disease

-High blood pressure -Prior stroke -Diabetes mellitus

Patients at high risk for stroke are usually (not always) treated with the blood thinner Coumadin (warfarin) or one of the Novel Oral Anticoagulants (NOACs) such as Rivaroxaban (Xarelto), Dabigatran (Pradaxa) or Apixaban (Eliquis). A very small number of patients with lower stroke risks may only require aspirin. Young patients with no stroke risk factors (other than atrial fibrillation) can do well even without aspirin.

Once a patient is protected against stroke we can look to control the symptoms of atrial fibrillation. The two basic approaches are to **control the rate of the atrial fibrillation or to control the arrhythmia itself**. Again, the risk of a stroke is not changed by the approach or method of treatment used.

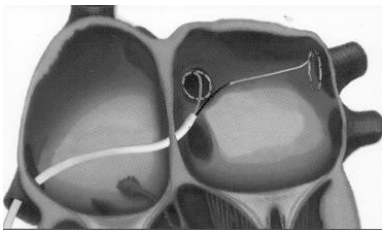
Rate control means that the fibrillation is allowed to happen, but the rate that the heart beats is controlled with medications or a pacemaker. If this adequately controls a patient's symptoms, then attempts at converting the rhythm back to normal may not be necessary.

The other approach is ***rhythm control***. This therapy attempts to maintain normal rhythm of the heart, and usually this controls the rate as well as the symptoms. The usual initial method of rhythm control is to use anti-arrhythmic medication, sometimes combined with a cardioversion or 'shock' therapy in patients with persistent atrial fibrillation. These medications are either taken on a daily basis for prevention, or in some cases can be used just when the heart goes out of rhythm to help restore the normal rhythm more quickly.

What is Catheter Ablation for Atrial Fibrillation?

If anti-arrhythmic drugs do not work or are not tolerated, in some cases a catheter ablation may be considered. An ablation is a procedure designed to use either heat energy or freezing to disrupt or eliminate the faulty electrical pathways that cause abnormal heart rhythms. These impulses are usually found in the left atrium and pulmonary veins. The pulmonary veins are the vessels that bring blood back from the lungs into the left atrium of the heart. Normally there is no electrical activity in these veins, but if left atrial tissue extends into the veins (it is not unusual for atrial tissue to extend into the veins in an irregular fashion for up to 2-4 cm) and the veins develop some electrical activity, rapid firing of cells in the veins may occur and these impulses may conduct to the atrium and start atrial fibrillation.

There are 4 pulmonary veins in the heart. Any one or several of the veins could contain the cells that trigger the fibrillation. Therefore, it is usually necessary to electrically isolate all of the pulmonary veins as well as other sites in the left and right atria with abnormal electrical activity, which could be triggering or perpetuating atrial fibrillation to get a good chance at control of the arrhythmia.



In this drawing, EP mapping catheters are seen crossing the wall between the right atrium to the left upper and right upper pulmonary veins to allow measurement of electrical activity within the veins.

The Procedure

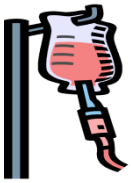
You will be admitted to our Cardiac Short Stay Unit on level 3 of the D&T building at the Royal Jubilee Hospital. The ablation will take place in a special room called the EP (Electrophysiology) Lab. Often the catheter ablation procedure is done as a "day procedure" although occasionally patients are admitted to hospital for observation pre- and post-procedure.

You must have an empty stomach. Do not eat or drink anything after midnight the night before your procedure, unless specifically instructed otherwise. If you must take medications, drink only small sips of water to help you swallow your pills.

You will receive instructions from the office about which of your medications you should continue and which you should stop and when prior to the ablation. **If you have not heard from the office about your medication please contact them at least a week prior to the ablation to get your specific instructions.** Certain medications must be stopped prior

to the procedure, and if this is not done your procedure might have to be cancelled and rescheduled.

Wear comfortable clothes; leave all jewelry and valuables at home.



A nurse will prepare you for the procedure. You will have an IV (intravenous) line started so that you can receive medications and fluids during the procedure.

Your skin will be prepared and certain areas may need to be shaved to allow monitoring pads to adhere.

Once you are in the EP Lab a Nurse and/ or an Anesthetist will remain with you throughout the procedure. You will be connected to several monitors that allow us to check your heart's rhythm and your body's response to any arrhythmias. The procedure generally lasts 3-4 hours and you will be asleep under a general anesthetic.

Once in the EP lab and the anesthetist has ensured you are safely asleep and monitored, intravenous sheaths are placed in the femoral vein (the large vein running up the leg) at the top, front of the right leg just below the groin crease. If a cryoballoon technique is used, sheaths will be inserted in both the right leg and left leg. Through the intravenous sheaths, temporary EP catheters (small, flexible wires) are advanced to the right atrium of the heart under X-Ray guidance.

Since X-Ray is required for the procedure you must alert the physician beforehand if you think you may be pregnant.

Once the catheters have advanced to the right atrium, a small opening is created to allow the sheaths and catheters to pass to the left atrium. The left atrium is then extensively mapped to locate ablation sites within the heart. Common sites for ablation include the mouth of the pulmonary veins (the veins that drain the blood back from the lungs to the left heart chambers) to electrically "isolate" the veins from the heart since it is known that electrical firing from inside the pulmonary veins are usually the triggers for atrial fibrillation. Several other sites within the right and left atria are also targeted for ablation.

The ablation can be done in one of two ways. With a radiofrequency (RF) technique, burns are delivered from the tip of one of the catheters using RF energy. RF energy is commonly used by surgeons with their electronic scalpel (cautery). The ablation "burns" are each only a couple of millimeters in diameter and depth and thus up to 10-15 burns are necessary to "isolate" each of the pulmonary veins. Additional ablation burns are placed in other locations within the left and right atria. The exact location for these burns depends on the type of atrial fibrillation and the type of signals detected during the electrical mapping of the atria. The

second technique is called Cryoballoon ablation. With cryoballoon technique, a small balloon is deployed just at the mouth of the pulmonary vein, and coolant is delivered for about 4 minutes to freeze the tissue. Often two sets of freezes are delivered. With either technique, if even small gaps are left in the burn lines or freeze sites the triggering impulses can "sneak through" and cause atrial fibrillation to recur after the ablation.

At the end of the procedure, depending on how thin your blood is, all of the catheters and sheaths will be removed and you will return to the Cardiac Short Stay Unit for close monitoring. On the rare occasion that your blood is too thin, the sheaths are left in for a brief period post procedure to allow the blood thinners to wear off. To prevent bleeding at the sheath site in the groin, you must lie flat with the leg(s) straight for approximately 4 hours. Keep your leg(s) as still as possible during this time to prevent bleeding. Occasionally you may feel a burning sensation and shortness of breath in the chest for a few days after the ablation procedure. This is usually caused by some irritation to the lining of the heart (the pericardium) from the catheters and the ablation of the tissue. An anti-inflammatory medication such as ibuprofen or a simple painkiller like Tylenol can be effective at settling the burning pain. It is not usual that you should need this for more than a few days

Outcomes of the Ablation Procedure

The best way to determine whether the ablation procedure has been successful is by assessing clinical outcome (i.e. - whether or not atrial fibrillation is better after ablation than before). There are a number of

ways to define a successful ablation (pulmonary vein isolation) procedure. They include:

-**No further atrial fibrillation**

-Less frequent or less prolonged atrial fibrillation

-Atrial fibrillation now responds to medical therapy

It is not uncommon for atrial fibrillation to flare up post procedure for up to 8 weeks. This is likely just a reaction to the procedure and, as healing occurs, the arrhythmia settles. Occasionally medication is needed for symptomatic relief over the first few weeks but can usually be stopped subsequently.

As defined by the criteria above, the atrial fibrillation catheter ablation procedure has a success rate of **60-70% depending on your pattern of atrial fibrillation**. The success rate with one procedure is better for paroxysmal atrial fibrillation, but less for patients with persistent AF. For those with recurrent atrial fibrillation after the first procedure, a second (and occasionally a third) procedure is sometimes needed to find and ablate the gaps in the ablation sites around the pulmonary vein(s) and in the left and right atria. Current success rates with more than one procedure may be as high as **80-85%.**

Potential Complications:

Stroke- Since the ablation procedure is being done on the left side of the heart, and blood that leaves the left side of the heart goes out to the body (including the brain), a blood clot forming at the ablation site, on the EP catheter or dislodged from the heart by the catheter and travelling to the brain could cause a stroke. Left heart procedures have been done for decades and the quoted stroke risk with most left heart procedures, such as coronary angiography, is 1/1000. Since the ablation procedure involves more involved work in the left atrium this risk may be closer to 1/500. To decrease this risk all patients coming for the procedure are fully anti-coagulated for at least one month pre procedure. It is very important that you do not miss any doses of your medications during this time and if you are on warfarin it is important that your INR be consistently >1.9 with weekly blood checks to confirm this. Warfarin is usually continued up to the day of the procedure but this may be different in certain cases. The NOACs are usually held for the entire day before the ablation procedure to lessen the risk of bleeding at the time of catheter placement. During the procedure, heparin (an intravenous anti-coagulant) is administered to keep the risk of a clot low. For patients who may not have adequate anticoagulation before the case, or in those suspected to have blood clots in the left atrium, a Trans Esophageal Echocardiogram (TEE) might be considered necessary. Anticoagulation is always continued after the ablation for at least 3 months.

Cardiac perforation- The left atrial wall and pulmonary veins are quite thin, measuring only a couple of millimeters in thickness. It is possible that one of the EP Catheters in the heart could perforate the heart. Usually this simply heals over without any untoward effects. Very infrequently blood from the heart could seep out through a perforation filling the space around the heart, and thus constricting the heart, impairing heart function. If so, a needle would be inserted through the chest wall to remove this blood and a drain would likely be left in place overnight. Very rarely an operation to repair the perforation might be needed.

Pulmonary stenosis- Since the pulmonary veins are quite small (10-15mm diameter where they enter the left atrium), it is possible to damage the pulmonary vein with the ablation procedure. The vein could develop an irreversible constriction. If only one vein is involved there would likely not be any associated symptoms, however, shortness of breath and cough are possible as is the rare complication of pulmonary hypertension (high pressures in the lung on that side), which presents with a cough sometimes productive of blood.

Damage to other structures in and around the heart- With any ablation procedure other structures such as heart valves, coronary arteries, phrenic nerve (the nerve supplying the diaphragm), inferior vena cava or the AV node can very rarely be damaged. Worldwide, there have been 60 reports in the past 15 years of atrial-esophageal fistula – which is a hole, or connection, developing between the back of the left atrium and the

esophagus (or swallowing tube), which is situated directly behind the left atrium. While this complication is exceedingly rare it is very serious and could be fatal. We have modified our procedure to decrease the risk of this complication, but it does remain a remote risk.

We estimate the risk of one of the significant complications occurring with the pulmonary vein isolation catheter ablation procedure to be between 0.5- 2 %.

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