



Atrial Fibrillation and You. Understanding It. Treating It.

Kyoko Hattori, R.N., B.S.N.

*Clinical Nurse Coordinator
UCSF Atrial Arrhythmia Center*

Michael D. Lesh, S.M., M.D.

*Associate Professor of Medicine
Chief, Cardiac Electrophysiology Service
Director, UCSF Atrial Arrhythmia Center
University of California San Francisco*

From the Director of the UCSF Atrial Arrhythmia Center



So you've been diagnosed with atrial fibrillation? (also known as "A Fib" or simply "AF")

Do you know someone who has? Do you simply want more information? You are not alone. Atrial fibrillation is the most common heart rhythm disturbance in the United States; it is the main reason for over one and a half million hospitalizations per year. It has been estimated that well over 2 million Americans have atrial fibrillation, with approximately 160,000 new cases each year. It is a growing problem.

Several years ago, recognizing the extent of this troubling disorder, we established the UCSF Atrial Arrhythmia Center. Its mission is to coordinate the care of patients with atrial fibrillation, develop insights into mechanism, and forge new modes of therapy. The UCSF Atrial Arrhythmia Center allows us to focus efforts on research, patient care, and education related to this most common of all cardiac arrhythmias.

We are fortunate at UCSF Stanford Health Care to have a highly motivated team of caregivers who are experts in their areas and who work together to carry out the mission of the UCSF Atrial Arrhythmia Center. The production of this booklet is in keeping with our belief that knowledge and education are an essential part of treating any illness. This booklet is one part of the UCSF Atrial Arrhythmia Center's ongoing commitment to you, the patient.

I truly hope this booklet meets your needs.

Sincerely,

Michael D. Lesh, S.M., M.D.

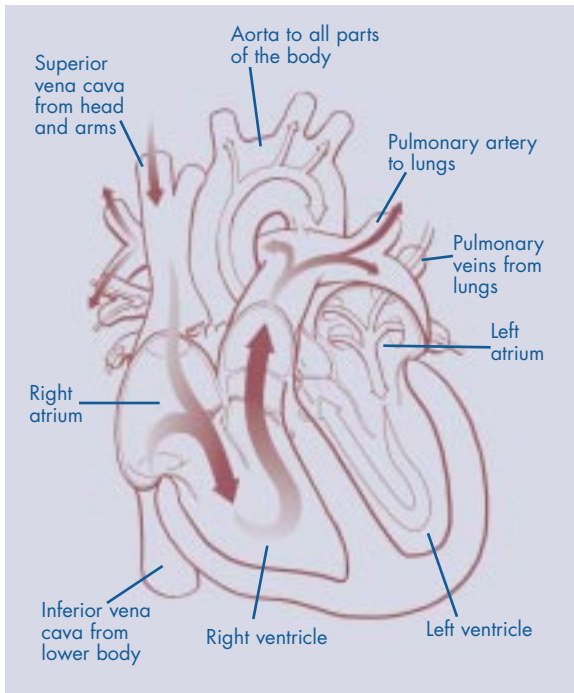
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Before You Can Understand What Atrial Fibrillation Is

To understand this type of arrhythmia (abnormal heart rhythm) known as atrial fibrillation, you must first know about your heart and its electrical activity. The heart is a pump which sends oxygen-rich blood throughout your body. There are four chambers to that pump: each of the two upper chambers is called an atrium (atria is plural), and each lower chamber is called a ventricle.

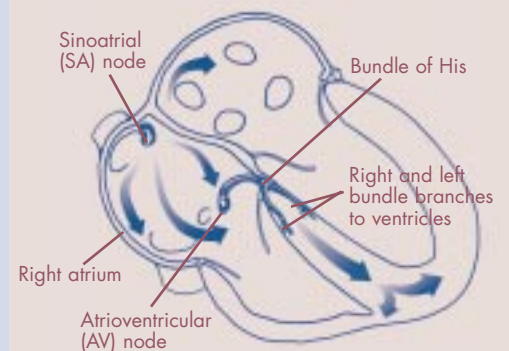


Each chamber of the heart has its own function. The right atrium receives the "used up" blood supply from all parts of the body, and pumps it into the right ventricle. The right ventricle then pumps this blood supply into the lungs, where the blood receives oxygen. The now oxygen-rich supply is returned into the left atrium and pumped into the left ventricle. The left ventricle then pumps this new blood supply to all the parts of the body. And all this is just one heart beat!

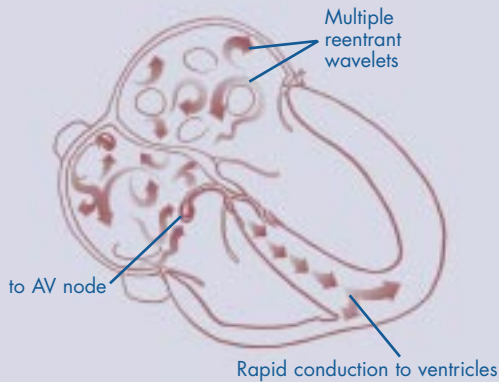
Your heart needs an electrical system to trigger that pump and to keep the chambers contracting in a coordinated fashion. To do that, the heart has its own built-in pacemaker called the SA node (**sinus node or sinoatrial node**) located on the wall of the right atrium. It sends out impulses at about 60 to 100 beats per minute, to both the right and left upper chambers (atria) of the heart, telling them it's time to beat. The SA node sets the pace to meet your body's demands: During rest, the speed of the impulses originating

from the SA node decreases, resulting in a slowing of the heart beat, and during exercise or excitement, the speed of impulses from the SA node increases, accelerating heart beating. The impulse then travels through the AV node (atrio-ventricular node), the "gatekeeper" of impulses, to the lower chambers of the heart (ventricles) via the His bundle, telling them it's their turn to beat. The sequence of this electrical event causes the atria to beat first and a split second later, the ventricles to beat. This is **normal sinus rhythm**.

The Normal Conduction System



Atrial Fibrillation: Reentry



The Heart With Atrial Fibrillation

During atrial fibrillation, the normal sinus rhythm is disrupted by a very rapid, uncontrolled and disorganized rhythm. Think of it as numerous little tornadoes wandering about, upsetting the normal flow of electrical activity. Instead of initiation of conduction from the SA node to the AV node in the normal sinus rhythm, the atrium's activity proceeds as multiple wavelets. As a result, the atria beat so rapidly (as fast as 350 beats per minute) they quiver (fibrillate). There is no effective contraction of the atrial muscles in this situation. The rapid atrial rate effectively overrides any activity from the SA node. In other words, these rapid

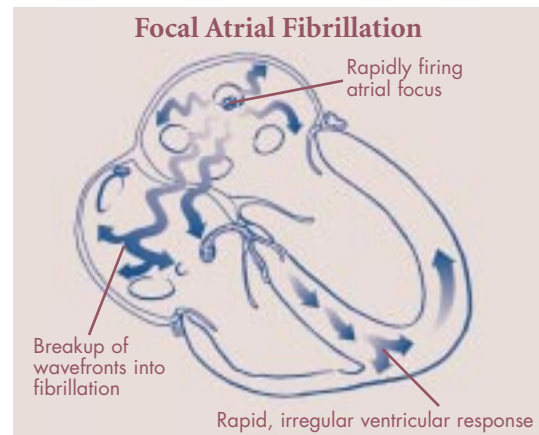
wavelets take control of the atrium. The rapid, erratic electrical impulses reach the AV node, and some of them pass to the ventricles. This causes the ventricles to pump in a rapid and/or irregular pattern in response. If you try to feel your pulse during atrial fibrillation, you can tell that your heart is beating irregularly.

Recently, we have begun to recognize that there is more than one type of atrial fibrillation. For example, some cases of atrial fibrillation have been demonstrated to have a single focus, similar to a pacemaker. This abnormal focus is most commonly located somewhere near the wall of the left atrium often in the pulmonary veins. This focus may fire so rapidly that the atria cannot follow such a rapid rate in an orderly fashion. Conduction becomes fragmented and irregular, creating a pattern of atrial fibrillation. This has been called **"focal atrial fibrillation"** because there is a single focus that drives or triggers the arrhythmia. The other common type has been called **"multi-wavelet" atrial fibrillation** because there are multiple wandering eddies circulating in the atria. Both types may exist in a given person. For example, a focal trigger from the pulmonary vein could initiate multiple wavelets.

Think of this like dropping pebbles in a still pond. If the pebbles are dropped fast enough, the still surface of the pond becomes quite turbulent. The pebbles are like the focal triggers that start AF, and the turbulence is like the multiple wavelets that perpetuate AF.

Other Ways to Classify Atrial Fibrillation

Your doctors may use various terms to specify the type of atrial fibrillation you have, depending on how long you have had it, what other types of heart disease you have, and the pattern of your atrial fibrillation. For example, your atrial fibrillation is **"paroxysmal"** if you have recurrent episodes that stop on their own in minutes, hours or even days. This pattern may be erratic. You may have episodes only a few times a year, or you may have a number of episodes a day. The starting and stopping of this arrhythmia is usually very



unpredictable and may cause patients significant symptoms and anxiety. Patients in this group may progress to the chronic form of atrial fibrillation, which is why we at the UCSF Atrial Arrhythmia Center favor an aggressive approach to treatment before your atrial fibrillation follows this course.

Atrial fibrillation is called **“persistent”** if you are in it for longer periods (days or weeks) but drugs or electrical cardioversion can restore your normal rhythm.

Your atrial fibrillation is **“chronic”** or **“established”** if the arrhythmia is sustained over a long period of time. Some cases of chronic atrial fibrillation can still be amendable to therapeutic intervention (treatment responsive) or resistant to all attempts at conversion to sinus rhythm (permanent).

Some cases of atrial fibrillation occur in the absence of any cardiac risk factors. This is termed **“lone atrial fibrillation”**. Most patients with this form of atrial fibrillation tend to be somewhat younger. The arrhythmia in these individuals is usually paroxysmal, but can become chronic in some of these cases if not treated.

What Are The Signs And Symptoms of Atrial Fibrillation?

Signs and symptoms vary from person to person and depend on several factors, including the heart rate of the ventricles, your overall heart function, and any other on-going medical problems. Some people have no symptoms if the overall heart rate remains relatively slow. For others, the discomfort can be quite obvious. The most common symptom is palpitations (the fluttering sensation of your heart). With atrial fibrillation, the amount of blood your heart delivers per each heartbeat could be decreased by as much as 20 to 30% compared to one in a normal sinus rhythm. The decrease may be even greater in those with underlying heart disease. The result is less oxygen in your circulation and more blood being "backed up" in your heart. This will often create the feeling of anxiety, weakness, fatigue, dizziness, chest pain/pressure, shortness of breath, and decreased tolerance for exercise or even normal activity of daily living, significantly reducing the quality of your life.

What Are The Risk Factors for Atrial Fibrillation?

It is important to remember that atrial fibrillation is a problem with the electrical system, or the “wiring” of your heart. It is not the same as a heart attack, and it is not necessarily related to the “plumbing” of your heart, the coronary arteries. When we talk about “risk factors” for atrial fibrillation, we are not talking about the same risk factors that affect your chance of angina and myocardial infarction (heart attack) such as high cholesterol and smoking. While it is very important to have a healthy diet, not smoke, and exercise regularly, many patients with atrial fibrillation are frustrated because they have done what they can to reduce their risk for coronary disease, but they still have atrial fibrillation. Unfortunately, our knowledge of the specific risk factors (such as diet) for most cases of atrial fibrillation lags far behind that of coronary disease. Be assured, however, that we are working hard to answer one of the most common questions patients with atrial fibrillation ask: Why me?

While the specific cause in every case may not be known, studies have shown that atrial fibrillation may accompany a number of other medical conditions. For example, some of the known risk factors and associated factors for atrial fibrillation include:

- ☑ **More common in men than in women**
- ☑ **High blood pressure**
- ☑ **Advancing age**
- ☑ **Coronary heart disease, with or without previous heart attack**
- ☑ **Abnormal heart muscle function, including heart failure and cardiomyopathy**
- ☑ **Mitral valve disease**
- ☑ **Overactive thyroid**
- ☑ **Low amounts of oxygen in the blood from chronic lung disease**
- ☑ **Inflammation of the lining surrounding the heart (pericarditis)**
- ☑ **Blood clots in the lung (pulmonary embolism)**
- ☑ **Excessive alcohol intake**
- ☑ **Stimulant drug use (decongestants, caffeine, cocaine)**
- ☑ **Recent heart or lung surgery**
- ☑ **Electrolyte imbalances in the blood, especially low potassium level**
- ☑ **Diabetes**
- ☑ **Tachycardia - bradycardia rhythm disturbance (sick sinus syndrome)**
- ☑ **"Vagal" atrial fibrillation, sometimes in conditioned athletes**

Why May Atrial Fibrillation Be Harmful?

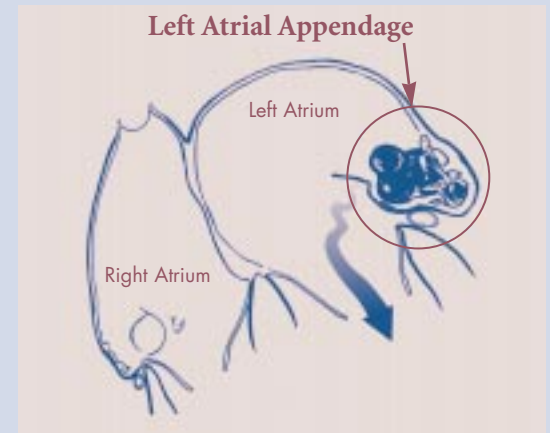
While atrial fibrillation itself may not be immediately life-threatening, there are several reasons why it still should be treated:

- ☑ **Decrease symptoms and increase activity tolerance**
- ☑ **Decrease the risk of stroke**
- ☑ **Prevent the progression to chronic atrial fibrillation**
- ☑ **Prevent the wearing out of the ventricular heart muscle**

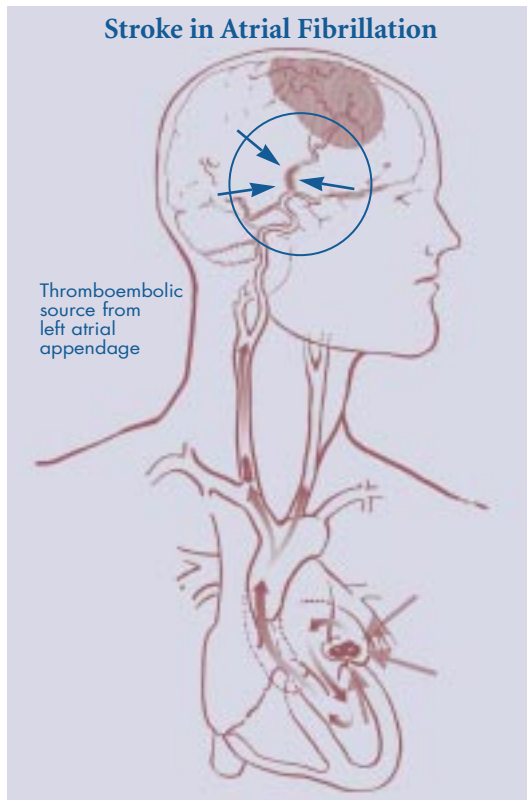
Even if your symptoms are barely noticeable, atrial fibrillation may have serious consequences when left untreated. People with atrial fibrillation have mortality rates twice as high as those with normal sinus rhythm, even with all other cardiac risk factors being the same. Studies have shown that prolonged episodes of atrial fibrillation lasting several months or longer can cause weakening and "stretching" of the heart muscle, reducing the ability of your atria to contract. **Congestive heart failure** occurs when there is extra volume of blood backing up in your system due to the heart's inability to contract effectively and create enough of a forward flow. The physiologic stretching of the heart chambers can also lead to decreased ability of your conduction system to maintain a normal sinus rhythm, known as the electrophysiologic **"remodeling"**. This remodeling process is known to begin after just a few hours of being in atrial fibrillation.

Perhaps the most serious complication of any patient developing atrial fibrillation is **stroke**. As discussed earlier, during atrial fibrillation, the quivering atria are very inefficient at pumping blood to the ventricle. As a result, some blood remains in the atrium too long, and clots (**thrombi**) can begin to form in this stagnant blood.

If a clot (**embolus**) breaks loose and is carried into the blood stream, it can travel anywhere in your body, blocking blood flow to your arms, legs, internal organs, etc. The risk of such an embolic event is almost 18 times greater in people with atrial fibrillation than in the general public. The most devastating complication occurs when a clot is carried into the arteries serving your brain, causing an **embolic stroke**. The American Heart Association estimates that 80,000 strokes per year in the U.S. are related to atrial fibrillation. Patients who suffer from atrial fibrillation are five times more likely to experience a stroke than those with normal heart rhythms.



Stroke in Atrial Fibrillation



While atrial fibrillation itself is usually not an immediate life-threatening and debilitating disease, it deserves careful monitoring and treatment to eradicate symptoms and to prevent its potentially devastating complications.

How is atrial fibrillation diagnosed?

Electrocardiogram (EKG or ECG)

is a routine cardiac investigational procedure which can give us valuable information on the rhythm of your heart, its electrical conduction, muscle mass, presence of arrhythmia, ischemia or infarction and even electrical disturbance and drug effects.

An ECG works because the same electrical currents that circulate in your heart can actually be picked up as signals from your chest. If your atrial fibrillation is “chronic”, it is readily seen on the ECG. The wavy baseline replacing the distinct atrial contractions (representing fibrillating activity in the atria) with the irregular, often rapid ventricular response makes atrial fibrillation a fairly easy arrhythmia to diagnose.

If your atrial fibrillation is “paroxysmal”, you may have sporadic episodes of atrial fibrillation from as often as a few times a day to as rarely as once every few weeks to even months. An EKG is not particularly helpful if you happen to be in normal sinus rhythm at the time of the recording.



To capture the arrhythmia so that it can be treated properly, your doctor may elect to place you on an **ambulatory** or **Holter monitor**. This is a small box that records your electrocardio-gram continuously for 24 or more hours. The box is attached to your body with wires that connect to electrodes placed on your skin. You will be given a diary card, on which you should write the time and description of any symptoms or other significant activities. After you return the box, the recording is played back into a special analysis machine and your rhythm can be interpreted.

An **event recorder** is the more appropriate recording device if your episodes of atrial fibrillation are even less frequent and cannot be captured in a given 24 hour recording. This recorder can be carried in your pocket or a purse and can be lent to you for two to four weeks at a time. At the onset of your symptoms, press the device against your chest and push the button which starts recording your heart rhythm. Alternatively, some event records are worn on your wrist like a watch. In either case, you dial a telephone number to transmit the recorded rhythm to a receiving station. The receiving station prints out the copy of the rhythm, which can be interpreted by your doctor or a trained technologist.



Echocardiogram, often referred to as an “echo”, is a non-invasive procedure that gives us very important information about the structure of the heart. It uses an ultrasound to image the moving heart muscle, the structure and the functions of the heart valves, and the flow of blood inside the heart and vessels.

The transducer placed on the chest transmits and receives the reflected ultrasound, thus creating the image. Being able to view the heart in this way is especially useful in the diagnosis and grading of the severity of valvular and congenital heart diseases, measuring the size of the heart chambers, and assessing the presence of clots. To get an even better view of the heart, especially the left atrium, the probe is sometimes placed in the esophagus and imaging is effectively performed from the back of the heart. This procedure, called **transesophageal echocardiography** or “**TEE**”, is usually done under mild sedation and the throat is made numb with an anesthetic spray.

Chest X-ray is another diagnostic test which is sometimes included in the work-up phase of atrial fibrillation. The X-ray gives us information about the size and the configuration of the heart, great vessels, and the lungs. Some contributing factors to arrhythmias, such as structural abnormalities in your heart or an acute infection or a blood clot in your lung, can be initially identified with this simple test. Certain **blood tests** also provide important information about thyroid function, electrolyte balance, and any ongoing heart muscle damage, which are all potentially correctable contributing factors in arrhythmias.

Other tests which are sometimes used to obtain information about the heart are **cardiac magnetic resonance (MRI)** and **chest computed tomography (CT)** scan. **Magnetic source imaging** measures the magnetic field your heart generates, which can serve as a key to the source of the arrhythmia.

At UCSF, we are exploring the use of other, more advanced, diagnostic tools. For example, the recognition of “**focal triggers**” at the start of atrial fibrillation may have very important implications for treatment, as discussed below. We are developing ways to distinguish these various types of atrial fibrillation in ways not possible using standard ECGs. One such test is called **body surface mapping**. This test is like an ECG, but it uses 64 leads or electrodes. This allows us to better understand where an arrhythmia might originate. Another tool is an **esophageal recording**. In this test, the patient swallows a small electrode or a tube that sits comfortably in the esophagus. The esophagus is located right behind the left atrium, which is an important possible source of atrial fibrillation triggers. This test allows us to pick up much more specific signals about the electrical activity in this area than the standard recordings that measure the overall electrical activities of the heart. The esophageal recording may be done briefly, or the electrode may be hooked up to a Holter monitor for longer recording period. These wires can be worn quite comfortably for a day or more.

In addition to all of these non-invasive tests, the ultimate test of the heart's electrical system involves placing small tubes or catheters into the heart under X-ray guidance. This is known as a cardiac **electrophysiology (EP) study**. During an EP study, detailed recordings of the electrical signal in your heart can be obtained. Think of it as recording an ECG from directly inside the heart. We can track how the waves move through your heart, a process called **mapping**. We can also find out if your heart is prone to certain types of arrhythmias by stimulating the heart at various rates and from various sites. In many cases, we can directly administer treatment through the same catheters. For example, catheter ablation is a method wherein we can make a small burn at a specific site and actually cure many types of arrhythmias. Some cases of atrial fibrillation can now be treated with catheter ablation, as will be discussed further below.

How Is Atrial Fibrillation Treated?

Currently the primary goals of atrial fibrillation therapy are as follows:

- ☑ **Restoration of normal sinus rhythm, if possible**
- ☑ **Controlling the rate of ventricular response to atrial fibrillation, assuming sinus rhythm cannot be restored**
- ☑ **Prevention of stroke with blood thinning (anticoagulation) therapy**
- ☑ **Prevention and treatment of complications and side-effects sometimes associated with treatment**
- ☑ **Reducing the risk factors and treating any underlying diseases.**

Unfortunately, each of these therapies for atrial fibrillation involves certain potential risks and side effects. Like everything in medical care, you and your doctor will carefully balance the risks of the treatment, the risks of atrial fibrillation, and the benefits of therapy.

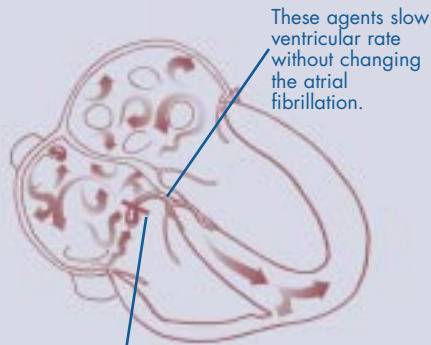
Medications Used To Treat Atrial Fibrillation

Some patients will need medications only for a limited time if a correctable cause for atrial fibrillation is identified and treated. Most individuals, however, will need medication on a regular basis either to control the continuing arrhythmia or to prevent recurrence. Your doctor will choose a medical regimen tailored to your individual needs and your response to the drug. Since your response to any given medicine is difficult to predict, you will very likely need dose adjustments or a switch to another medication depending on your response. All medications have possible side effects and precautionary notes which you will need to discuss with your doctor or pharmacist. Once you have been started on a regimen, you should take your medications exactly as directed. Never change the dose or discontinue them without your doctor's supervision.

There are three types of medications that your doctor will choose from, usually in combinations of at least one from each category.

Medications to slow the heart rate - These medications will not prevent or stop the fibrillation, but will slow the heart rate to a more normal range. The widely used **digoxin**, usually the initially prescribed medicine, belongs in this category. It is actually one of the oldest medicines known, being derived from the foxglove plant. (Don't try to eat the leaves of that plant: In uncontrolled doses, foxglove can be poisonous!)

Actions of AV Nodal Blocking Drugs



Propagation of impulses through the AV Node is slowed. The AV Node is not "ready" to conduct as often, so fewer impulses are conducted to the ventricles.

Digoxin works well to keep the heart rate down when you are sedentary, but does not help when your heart rate speeds up with exercise or excitement. Another group of medications in this category called **beta-blockers**, such as metoprolol, propranolol, or atenolol, are commonly used alone or in combination with digoxin to keep the heart rate down during exertion. **Calcium channel blockers** such as verapamil or diltiazem are also often used in combination therapy for the same purpose. All of these medications work by suppressing the flow of electrical impulses through the AV node, thereby slowing down the rate of ventricular contractions. The name on your pill bottle may differ from these because drugs commonly have a chemical name and a trade name, given by its manufacturer.

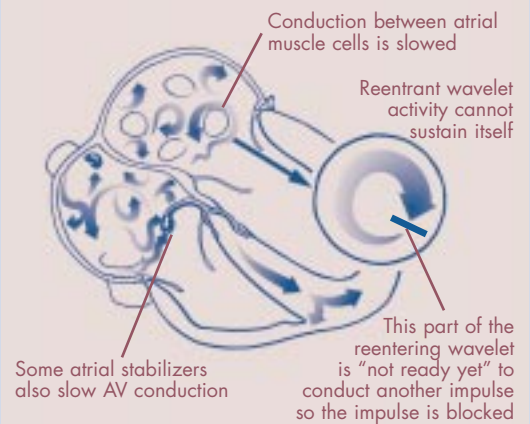
For example, "Lanoxin" is a commonly used trade name for digoxin. Ask your pharmacist if you have questions about a specific drug's name.

Medications to stabilize the heart rhythm -

These medications are used to restore and maintain the normal sinus rhythm by stabilizing the electrical activity of the heart muscle cells. This process of restoring sinus rhythm with drugs is referred to as **chemical cardioversion**. With this method, conversion back into normal sinus rhythm is achieved in about 50% of patients. Some of the most commonly used drugs include quinidine, procainamide, flecainide, disopyramide, propafenone, amiodarone, and sotalol. Some drugs are taken as pills, others such as ibutilide, are given intravenously. Amiodarone and sotalol also help to slow the heart rate. Many of these drugs are known to cause serious and life-threatening heart rhythm disturbances in the susceptible individuals with other cardiac problems. As a precaution, your doctor may wish to begin treatment with one of these drugs in the hospital for close monitoring.

Medications to "thin" the blood - These medications are intended to reduce your risk of blood clot formation and stroke (anticoagulation therapy). If you are a diabetic, have high blood pressure, or have an enlarged heart, your risk of stroke with atrial fibrillation is particularly high. For those over 65 years of age, anticoagulation therapy using a medicine called **warfarin** has become the customary treatment for prevention of stroke. This therapy does not completely eliminate your risk, but will reduce it by over 50%. Patients taking this drug must be closely monitored with regular blood tests to continuously assess the amount of blood thinning. A level too low would keep you at risk for developing clots, and a level too high will put you at risk for bleeding. The blood pressure must also be kept under control. Taking extra precautions in the activities of daily living (shaving, playing contact sports, etc.) is another adjustment that you will need to make in your life, due to the increased risk of bleeding. The benefit of using warfarin to prevent blood clot formation

Actions of Atrial Stabilizing Drugs



needs to be balanced against the bleeding risks if you have high blood pressure, are elderly or unsteady with a history of falling, which can result in serious bleeding. Your doctor may choose to treat you with **aspirin** therapy instead, a milder form of blood thinner. It may not, however, be as effective as warfarin in the prevention of embolic strokes. You will need to consult your physician or pharmacist regarding the use of analgesics other than aspirin when you are on anticoagulation therapy. There is debate on the treatment of choice for younger patients with "lone" atrial fibrillation, but we often recommend one aspirin a day, just to be on the safe side.

Electrical Cardioversion

You may be a candidate for the "electrical" therapy, or the **DC cardioversion (direct current cardioversion)** if you have persistent atrial fibrillation. This is the use of an electrical current through the chest wall while you are under short-acting anesthesia to "reset" the electrical pattern from atrial fibrillation to normal sinus rhythm. Initially, electrical cardioversion is successful in 70- 80% of patients. When the first attempt at DC cardioversion fails, it may be successful after the addition of antiarrhythmic medication. The success rate is decreased with increasing age, longer duration of atrial fibrillation (>3 days), mitral valve stenosis, and enlarged heart chamber size. With those factors, there is about 50-60% chance that your atrial fibrillation may continue to be recurrent and you may find yourself having to go through this procedure repeatedly. This may still be preferable to staying in atrial fibrillation.



If you need to be cardioverted more than once, there is a good chance you will need to remain on antiarrhythmic medication indefinitely to try to help maintain a normal sinus rhythm. A new technique, developed in part at UCSF, is **internal defibrillation** in which a much lower energy cardioversion is needed. This is done by the use of a special catheters placed directly in the heart. While this is a more invasive form of therapy, it has been proven to be an effective method for conversion to normal sinus rhythm even when the external method is not successful. It also allows us to map the electrical waves inside the heart and get a better understanding of what pattern of atrial fibrillation is present in the atrium in a way not possible using external shocks.



Conversion to sinus rhythm may present a special risk for stroke in patients with atrial fibrillation. In preparation for the DC cardioversion, you may need to have the **transesophageal echocardiography (TEE)**. As described earlier, this technique involves imaging the heart using a special probe placed in the esophagus while you are under light anesthesia. Your doctor may have you take warfarin for 3 to 4 weeks prior to the cardioversion. This therapy will allow blood clots already formed in the atria to be removed by the body's natural clot dissolving factors, thus minimizing the risk of embolic stroke during or shortly after cardioversion. Warfarin therapy is usually continued for at least 4 weeks after the procedure as the atrial contraction capability slowly recovers.

When Medications Don't Work For You . . .

You may try many medications only to find that the symptoms of your atrial fibrillation remain intolerable even if the heart rate is under control. You may find that the side effects caused by the medications make you feel so uncomfortable that it becomes difficult to comply with your medical regimen on a long-term basis. You may encounter such serious side effect as organ toxicity, ventricular arrhythmia, or heart failure, forcing your doctor to discontinue them. After taking the same medications for a long time, you may reach a point at which they don't work as well as they did when you first began taking them.

Other Options Are Available.

Non-pharmacologic approaches (i.e. treatments that reduce or avoid the need for drugs) to treating atrial fibrillation are growing, and many of them developed or are currently under development by Dr. Lesh and his colleagues at UCSF.

The most common treatment now available is **AV node ablation**. In this procedure, which is a part of an electrophysiology study, a small wire is introduced into the large veins and guided to the heart using fluoroscopy (X-ray camera). The normal electrical conduction system is interrupted by a small burn produced by the use of **RF catheter (radiofrequency catheter)** on the AV node. This will block the many electrical impulses in the atria from reaching the ventricles and effectively stops them from beating rapidly and irregularly. In almost all cases, RF catheter ablation causes a complete block of the AV node. A permanent **pacemaker** is then implanted to assist the heart to maintain an adequate heart rate. There are two basic kinds of pacemakers, the traditional single chamber (ventricular) pacemaker and the sequential dual chamber (atrio-ventricular, or "DDD") pacemaker.

Your doctor will pick the one most appropriate for you. Modern pacemakers are amazingly well engineered. For example, patients with paroxysmal atrial fibrillation can have a dual chamber pacemaker that uses features called mode-switching and rate-responsiveness. In so doing, such pacemakers attempt to provide the most physiologic mode of heart rate control. Dual chamber pacemakers are sometimes even effective in preventing recurrences of atrial fibrillation. When appropriate, fine-tuning and reprogramming of the pacemaker can be made quickly and non-invasively on an outpatient basis.

While AV node ablation can significantly reduce the symptoms associated with the arrhythmia, it must be stressed that this treatment does not cure atrial fibrillation. It is only that the ventricles are prevented from making the heart beat too rapidly and erratically. Many of the medications for atrial fibrillation can usually be stopped at this point, but the final decision is up to your doctor. The blood thinners will likely need to be continued because either your atria continue to fibrillate, or there is a high probability of the arrhythmia recurring.

In an even newer form of treatment, a pacemaker may be implanted without ablating the AV node in an attempt to keep you in sinus rhythm, sometimes by pacing from more than one location in the atrium.



Perhaps the newest and most innovative type of device that can be implanted for patients with atrial fibrillation is a device called an **implanted atrial defibrillator** or **arrhythmia management device (AMD)**. These are devices that can sense when the heart goes into atrial fibrillation and give a low voltage shock or jolt of electricity via small permanent wires implanted in the heart to jump-start the normal rhythm again. New features are being added to these devices, such as the pacemaker capability to prevent atrial fibrillation from occurring. Patients who will benefit are those with infrequent but symptomatic long lasting episodes of atrial fibrillation despite maximal drug therapy.

Finally, it should be noted that because of the troubling nature of atrial fibrillation, many patients require more than one mode of treatment at the same time, something called **“hybrid therapy”**. For example, patients with the so-called **“tachy-brady syndrome”** may need a pacemaker for the slow heart rhythm and drug treatment for the atrial fibrillation. Another type of hybrid therapy involves making a combination of linear atrial lesions with a radiofrequency catheter with implanting an atrial defibrillator.

Can We Cure Atrial Fibrillation?

There are several types of cardiac arrhythmias that can now be routinely cured using catheter ablation. For example, a type of tachycardia (rapid heart beat) called the Wolff-Parkinson-White syndrome, which used to require life-long drugs or open heart surgery, can now be cured in a relatively simple, low-risk procedure that involves threading catheters into the heart from the groin.

Indeed, there is a surgical cure for atrial fibrillation. The **maze procedure** is an open heart surgery in which a "maze" of incisions are made in the atria, blocking the flow of excess electrical impulses within the chambers. This prevents the development of the chaotic atrial rhythm and allows only the impulse from the SA node to get to the AV node. The maze procedure has a high success rate for sustaining normal heart rhythms, but obviously comes with the risks and potential complications of having open heart surgery.

Currently, a much less invasive technique resembling the maze procedure is being investigated. **Linear ablation** involves making lesions in the right and/or left atrium by the use of a special radiofrequency catheter inserted from the groin. The goal of this therapy is the same as its surgical counterpart: To limit the amount of connected electrical activity in the atrial muscle so that the chaotic rhythm cannot develop or sustain itself.

Focal AF ablation, which involves catheter ablation for patients with a specific site for the beat which triggers the onset of atrial fibrillation, is being performed at UCSF. This is a particularly promising approach, as this may be a simpler type of procedure than that requiring linear lesions.

Multiple wandering wavelets



Reentrant wavelets block at barriers



Sole input to AV Node is through corridor of intact atrial muscle between SA Node and AV Node



Dr Lesh and his colleagues at the UCSF Atrial Arrhythmia Center can determine if you would be a candidate for either the linear ablation or focal ablation therapy for your atrial fibrillation.

A Few Words About Atrial Flutter

Another common arrhythmia of the upper chambers of the heart is called **atrial flutter**. It is related to atrial fibrillation in the sense that many patients will have both. Both of these arrhythmias involves the atrium, and risk factors for one may be risk factors for the other. However, it is a different disorder and should be treated as such. Remember that atrial fibrillation has many waves, like little tornadoes. Atrial flutter, on the other hand, occurs as the result of a single wave of reentry in the atrium, producing a pattern much more organized than atrial fibrillation. Atrial flutter is usually confined to the right atrium, while atrial fibrillation involves both right and left atrium. The rate in the atrium is about 250 to 300 beats per minute, but the AV node blocks many of the impulses, just as it does in atrial fibrillation. Like atrial fibrillation, patients with atrial flutter can have palpitations, shortness of breath, fatigue, etc., or no symptoms at all. They also may be at risk for stroke.

Treatment possibilities include electrical or chemical cardioversion and chronic drug treatment. An important mode of treatment, pioneered by Dr. Lesh and his colleagues at UCSF, is catheter ablation for atrial flutter. This consists of placing a small lesion in the bottom of the right atrium using standard catheter techniques as described earlier. The success rate is well over 90%. If you have atrial flutter, ask your doctor if you are a candidate for atrial flutter ablation.

Unfortunately, getting rid of atrial flutter with catheter ablation may not prevent atrial fibrillation. You may still need treatment for the atrial fibrillation if this is also a problem for you.

Acknowledgements

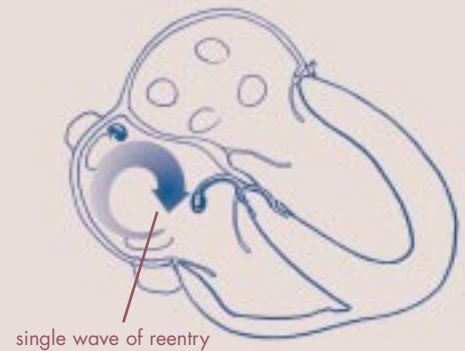
This booklet would not have been possible without the devotion of the medical and administrative staffs of the UCSF Section of Cardiac Electrophysiology and UCSF Stanford Health Care. In particular, we wish to thank the UCSF electrophysiology fellows and students for their input, especially John Kuruvilla and Peter Guerra, M.D. The electrophysiology faculty physicians and nursing staff were an important part of this effort and an essential part of our team of caregivers.

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Finally, we are exceedingly grateful to our patients whose many very relevant questions generated the substance of and motivation for not only this booklet, but much of our clinical and investigative efforts.

Atrial Flutter

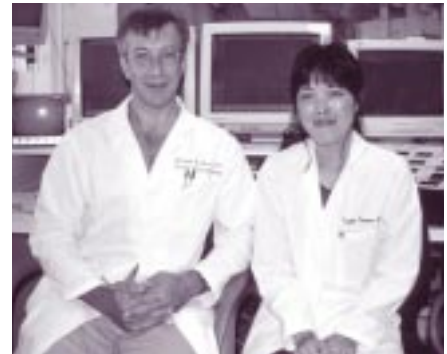


About the UCSF Atrial Arrhythmia Center

As the recognition of the deleterious health effects of atrial fibrillation grows, standard therapy is being reconsidered, and new therapies are being developed. The goal of the UCSF Atrial Arrhythmia Center, through basic and clinical research, is to fill the large void in our knowledge about patient-specific factors that lead to atrial fibrillation, and ways in which those factors might be beneficially altered on a patient-by-patient basis. As a patient, you can benefit from the efforts of Dr. Lesh and his colleagues at the Atrial Arrhythmia Center who are devoted to rapidly bringing new research insights to improvements in patient care.

Doctors from UCSF have been pioneers in developing expertise in the assessment of the heart's conduction systems, studying arrhythmias under controlled conditions with electrophysiology studies. We develop and participate in clinical trials with the National Institutes of Health, the Food and Drug Administration, and pharmaceutical and device companies to discover better treatments. This works to your advantage—many of the new investigative devices and medications that may be more effective than the traditional treatments could be available to you at UCSF.

At the UCSF Atrial Arrhythmia Center, there are many investigative protocols in progress for new procedures and devices for treating atrial fibrillation. We will work closely with your primary internist or cardiologist to find the best way to manage your atrial fibrillation.



Michael D. Lesh, S.M., M.D.
Kyoko Hattori, R.N., B.S.N.

For Further Information

Here are some of the recommended web sites if you are interested in further information:

**Our web site: www.ucsfcardiology.com/cardiology/ep
American Heart Association: www.amhrt.org
American Medical Association: www.ama-assn.org
American College of Cardiology: www.acc.org**

Suggestions? Comments? Would You Like To Be A Part Of Our Database?

Our goal is to serve the educational needs of you, our patient. If you have comments or suggestions for improvement to this booklet, we would be glad to hear from you. Call Kyoko Hattori, R.N., Atrial Fibrillation Nurse Coordinator, at (415) 502-2575, or better yet, send us an email at AF@ep4.ucsf.edu

Also, we would be delighted to keep your name on file so that we can get in touch with you when a new treatment that is appropriate for you becomes available. The data collection will involve answering some specific questions related to your atrial fibrillation and/or giving us a permission to obtain some information from your medical records. If you are interested in being a part of our database or need more information about our program, please call Kyoko, or send her an email at: AF@ep4.ucsf.edu.