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# CARDIOLOGY PATIENT PAGE

## Atrial Fibrillation

Johan E.P. Waktare, MB, ChB, MRCP

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**A**trial fibrillation (AF) is the most common cardiac arrhythmia and affects nearly 1% of the population. Its prevalence increases with increasing age; it is relatively infrequent in those under 40 years old, but occurs in up to 5% of those over 80 years of age.

### Normal Heart Electrical Activity and What Goes Wrong in AF

The heart is essentially a large muscular pump that drives blood around the body. To do this effectively, the heart's chambers must be precisely controlled electrically (Figure 1). The normal heartbeat begins with the natural pacemaker (the sinoatrial [SA] node) in the top right heart chamber (the right atrium). Activity spreads across the atria, causing them to contract. The contraction of the atria propels extra blood into the ventricles, which are the main pumping chambers. The electrical signal is delayed by about one tenth of a second by a special structure called the atrioventricular (AV) node, and then spreads rapidly across the ventricles to make them contract. Extra filling of the ventricles by the atria is not vital, but does serve to "prime the ventricular pump" and improve overall heart function.

Normal heart rhythm is termed sinus rhythm. Most people have a resting heart rate of between 60 and 80 beats per minute (Figure 2). In AF, the atria contract rapidly and irregularly at rates of 400 to 600 beats per minute. Fortunately, the AV node will not allow many signals through to the ventricles; only about 1 or 2 out of every 3 atrial beats passes to the ventricles. The ventricles beat too fast, however, at rates of 110 to 180 beats per minute.

### Who Gets AF and Patterns of AF

Cardiac disorders such as coronary heart disease, heart valve problems, and heart failure predispose patients to AF, but it

can occur in people with otherwise normal hearts. Indeed, about half of younger patients with AF have no associated cardiac disorders. AF can occur with different patterns. Examples of case histories are given below to illustrate the wide clinical spectrum of AF.

### *Paroxysmal AF*

In paroxysmal AF, the heart changes from sinus rhythm to AF for episodes lasting anywhere from seconds to days. The patient may only have 1 episode a year or be in AF most of the time, but the essential feature is that most episodes terminate spontaneously.

#### *Case Report: Paroxysmal AF in a Young Patient With No Other Heart Condition*

Patient A had no cardiac problems until she began to suffer episodes of palpitations at the age of 35. She stated that these were so bad that she thought she was going to die. Paroxysmal AF was diagnosed and drug treatment instituted. Her attacks are now much less frequent and less severe. Currently she is content to continue with drug therapy, but her cardiologist has explained that if the attacks worsen, she could be offered an ablation to try to cure the condition.

### *Persistent AF*

Persistent AF does not stop spontaneously, but sinus rhythm can be restored by medical intervention in the form of medication or, more commonly, by an electrical shock to the heart (DC cardioversion).

#### *Case Report: The Vague Symptoms of Persistent AF*

Patient B had a severe, persistent chest infection. He became breathless walking on the smallest incline. At a routine check for his high blood pressure, his physician discovered the patient was in persistent AF. He was given anticoagulants and scheduled for a cardioversion. The cardioversion was successful, but after several days the patient showed no improvement. His physician explained that he had relapsed into AF and needed extra treatment with an antiarrhythmic medication and another cardioversion. After the second cardioversion, his effort capacity was back to normal, and 6 months later he had stopped taking the coumadin, although his

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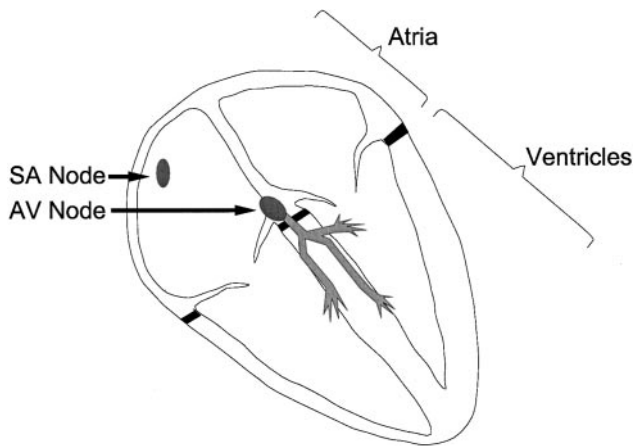
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**Figure 1.** The atria contain the heart's natural pacemaker, the SA node, and are the part of the heart affected by atrial fibrillation. The ventricles are the muscular part of the heart that actually pump the blood. They are electrically isolated from the atria, and the only way the electrical signal can reach them is via the AV node.

physician recommended that he stay on the antiarrhythmic medication for at least 2 years.

#### **Permanent AF**

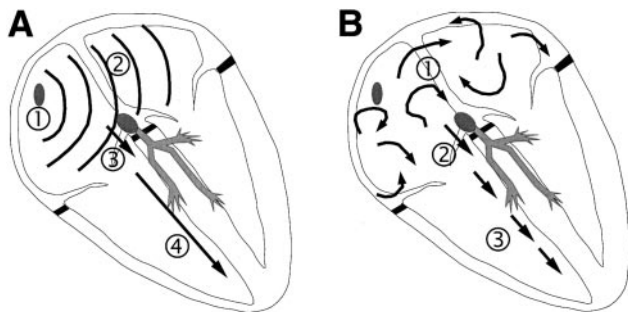
Permanent AF is present all the time, and restoring sinus rhythm is either not possible or is not deemed appropriate.

#### *Case Report: Ablate and Pace for Permanent AF*

Patient C was elderly and had suffered from AF for many years. She had been cardioverted, but after consulting her physician, she decided to accept permanent AF. The problem was that her heart rate was still too fast despite rate limiting drugs. Her physician recommended AV nodal ablation and pacemaker implantation. After these procedures she felt much better. She is still taking coumadin but she has stopped all the other medication, and she reports that she feels better than she has for years.

#### **Is AF Bad for You?**

For most people, AF causes unpleasant symptoms but causes no harm. Complications can arise in some patients, but the



**Figure 2.** A, Sinus rhythm. During normal sinus rhythm, the heartbeat is a single carefully coordinated process beginning in the SA node (1). The electrical signal spreads across the atria (2) and via the AV node (3) to the ventricles (4). B, Atrial fibrillation. When patients are in AF, the atria are constantly activating in a chaotic way because of multiple electrical signals firing at 400 to 600 beats per minute (1). The AV node (2) filters out most of these extra signals but still usually allows more beats to reach the ventricles than normal (3).

risk of this occurring is greatly reduced by appropriate treatment.

#### **Adverse Symptoms**

Most, but not all, patients feel unwell with AF. It is not fully understood why the symptomatic impact is so variable. Palpitations (a sensation of a rapid and irregular heart beat) are the most frequent symptoms in those with paroxysmal AF. This can cause the patient to worry that they will have a heart attack or that their heart will stop. This rarely occurs, but urgent medical advice should be sought for any new cardiac symptom so that a precise diagnosis can be made. Those with persistent or permanent AF tend to notice palpitations less, perhaps because the heartbeat is constantly irregular. The switching back and forth between regular and irregular rhythms is what causes palpitations in many patients. When AF is persistent or permanent, patients more often suffer non-specific symptoms like poor effort tolerance, breathlessness on exertion, and lack of energy.

#### **Stroke**

The quivering atria beat too rapidly to contract effectively, and with time they tend to enlarge. Both of these factors can lead to blood clots forming within the atria, and if these break loose they may lodge in other parts of the circulation. The most common site for this is the brain, and this results in a stroke.

#### **Heart failure**

If the ventricles are allowed to beat rapidly for prolonged periods, they can weaken, and heart failure ensues. This is a rare complication, as most patients seek treatment before heart failure occurs. However, AF is a less efficient rhythm than sinus rhythm and can worsen preexisting heart failure.

#### **Treatments Available for AF**

AF is a very diverse condition effecting a wide range of patients, so there are few generalizations about what treatment is needed. With recent advances in drug and interventional treatments, a satisfactory outcome is now usually eventually obtained in most patients.

#### **DC Cardioversion**

DC cardioversion is used to restore sinus rhythm in those with persistent AF. A brief general anesthetic is given intravenously and a defibrillator (the electrical shocking device used to treat cardiac arrest) is used to put the heart back into normal rhythm. The treatment is highly effective, with over 90% of patients reverting to sinus rhythm. Over the ensuing hours, days, and months, however, patients may relapse into AF.

#### **Rate Limiting Drugs**

Rate limiting drugs limit the number of impulses transmitted through the AV node (Figure 2) and slow the heart rate to make the patient more comfortable.

#### **Antiarrhythmic Drugs**

In patients with paroxysmal AF, antiarrhythmic drugs reduce the frequency and duration of AF episodes. In those with persistent AF, they are administered primarily to prevent AF recurring after a DC cardioversion.

***Anticoagulant and Antiplatelet Drugs***

Anticoagulant and antiplatelet medications thin the blood and make it less prone to clotting, thereby reducing the risk of stroke. Coumadin (warfarin) is the usual medication used but is not suitable or necessary for all patients. In these cases, aspirin or clopidogrel may be used, but if the risk of stroke is very small, no treatment may be recommended.

***Pacemakers***

Those patients whose natural pacemaker (SA node) is failing become prone to AF, and implanting a pacemaker can have the beneficial side effect of reducing the chance that AF will occur. Pacemakers can be used in combination with ablation of the AV node to treat AF. Ablation refers to a medical procedure where a very small (1 to 2 mm) portion of the heart's electrical conduction system (for example, the AV node) is eliminated in a carefully controlled fashion. This so-called "ablate and pace" strategy is usually highly effective at improving symptoms, but has drawbacks such as life-long requirement for anticoagulation and for pacemaker treatment.

***Radiofrequency Ablation and Surgery***

Over the last 10 years, ablation has emerged as the optimal treatment for most forms of rapid heart rhythm, but its use in curing AF is very recent. As opposed to ablation of the AV node, the technique of radiofrequency ablation here refers to selective elimination of one or more sites in the atria to reduce the chance that AF will occur. Procedures for AF are currently prolonged and complex, and success rates only modest. It is therefore not always the best option; however, when it works, the AF is cured completely. Surgical approaches for curing AF are also considered in some cases.

***Reassurance and Explanation***

The importance of reassurance and explanation cannot be over-emphasized. Relatively simple treatment reduces enormously the risk of harm for those with persistent or permanent AF. Patients with infrequent episodes of short-lived paroxysmal AF may need no other treatment than proper evaluation followed by reassurance that the condition is benign. Finally, those with AF that is difficult to control need to be involved in decisions regarding which of the emerging treatments should be used and be reassured that, with time, satisfactory control of the AF can be achieved.