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Electrocardiography: Atrial Fibrillation

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Atrial fibrillation (AF) is the most common chronic arrhythmia. It causes significant symptoms and impairs both functional status and quality of life. The incidence and prevalence of AF increase with age. According to recent guidelines, the prevalence of AF rises from an estimated 0.4% to 1% in the general population to 8% in persons older than 80 years.[1]

Symptoms In atrial fibrillation, symptoms depend on the rate at which the ventricles are beating. A mild increase in the ventricular rate, less than about 120 beats per minute, may produce no symptoms. Higher rates cause unpleasant palpitations, feelings of lightheadedness or faintness, weakness, lack of energy, shortness of breath with effort, or chest discomfort.

Etiology The conditions most likely to produce atrial fibrillation are rheumatic heart disease, ischemic heart disease, hypertension, heart failure, thyrotoxicosis, valvular disease, cardiac surgery, advancing age, and left atrial enlargement.

ECG findings In AF, atrial activity is completely disorganized, and the atrioventricular (AV) node may be bombarded with more than 350 impulses per minute. No true P wave can be identified. Instead, the baseline appears flat or undulates slightly; this is known as a fibrillatory wave or F wave. Faced with this extraordinary blitz of atrial impulses, the AV node allows only occasional impulses to pass through at variable intervals, generating an irregularly irregular ventricular rate, usually between 75 and 180 beats per minute. However, slower and faster rates are often seen. The QRS complex is usually narrow, unless there is a bundle branch block.

Classification The American College of Cardiology/American Heart Association/European Society of Cardiology has developed a classification system for atrial fibrillation. The system applies to episodes of AF that are unrelated to a reversible cause. The various forms of AF are classified as follows:

· Nonvalvular AF occurs in the absence of rheumatic mitral valve disease, a prosthetic heart valve, or mitral valve repair.

· Valvular AF is associated with mitral stenosis, a prosthetic heart valve, or mitral valve repair.

· Paroxysmal AF consists of episodes that cease spontaneously in fewer than 7 days, usually fewer than 24 hours.

· Persistent AF fails to self-terminate within 7 days. Episodes may eventually terminate spontaneously, or they can be terminated by cardioversion.

· Recurrent AF is defined as two or more episodes that may be paroxysmal or persistent.

· Permanent AF lasts longer than 1 year, and cardioversion either has not been attempted or failed.

· Lone AF describes paroxysmal, persistent, or permanent AF in individuals without structural heart disease.[1]

Treatment The underlying principles of treating atrial fibrillation are to control the ventricular rate, restore a normal rhythm, treat the underlying disorder causing the arrhythmia, and prevent the formation of clots and emboli.

Slowing the heart rate Usually, the first step in treating AF is to slow the ventricular rate, so that the heart pumps blood more efficiently. First-line medications include a calcium channel blocker, a beta-blocker, or digoxin.

Restoring the rhythm Atrial fibrillation may spontaneously convert to a normal rhythm, or antiarrhythmic medications can be used, including amiodarone, flecainide, or sotalol. Cardioversion may be needed to restore a normal rhythm.

Preventing blood clots Most people with AF are at risk for developing clots and are given an anticoagulant, such as heparin or warfarin, to decrease the risk of stroke. However, sometimes the risks associated with anticoagulation, eg, risk of falling and bleeding disorders, outweigh the benefits, and no anticoagulation is given.
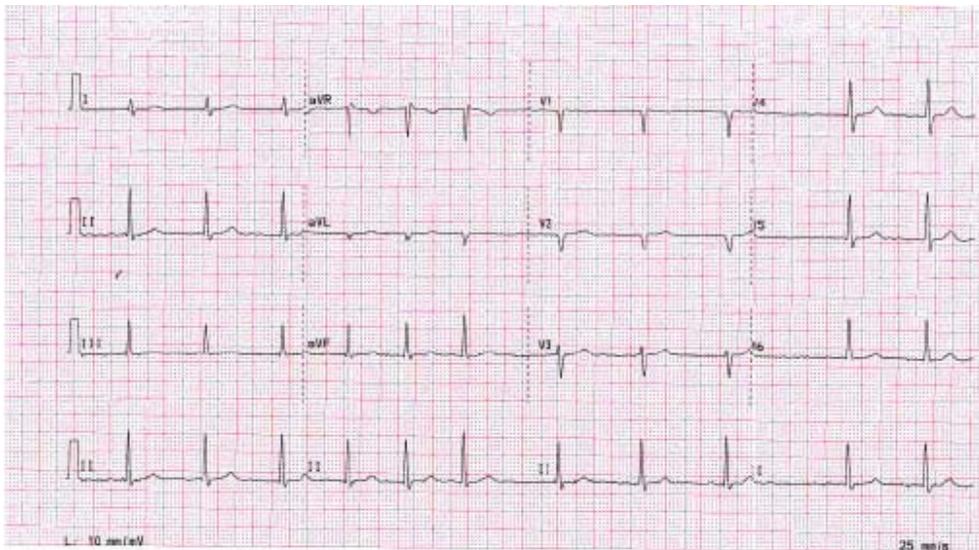

FIGURE 1. ECG of a patient 1 day after bypass surgery

A patient who is 1 day status post cardiac bypass surgery complains only of incision pain. **Step-by-step analysis** of his ECG (**Figure 1**) shows the following:

(1) Is the rhythm **regular**? It is not.

(2) Let's look at the **heart rate**. Since the rate is irregular, we cannot count the number of large boxes in the R-R interval. Instead, we need to count the number of QRS complexes occurring in 6 seconds (30 large boxes) and multiply by 10. If you start with the first QRS and count 30 boxes, there are eight QRS complexes, or $8 \times 10 = 80$; if you start at the last QRS and work backward 30 boxes, there are 7 QRS complexes ($7 \times 10 = 70$).

The heart rate is between 70 and 80 beats per minute.

(3) There are **no P waves.**

(4) There is **no PR interval**.

(5) The **QRS complex** spans less than two small boxes, making it normal.

(6) Is the **ST segment** neutral, elevated, or depressed? It is neutral; there is no ischemia.

(7) The **T waves** are normal.

(8) There are **no U waves**.

Atrial fibrillation is a common occurrence after bypass surgery. The patient was started on an amiodarone drip. After 6 hours, his heart had converted to normal sinus rhythm. **JAAPA**

DRUGS MENTIONED

Amiodarone (Cordarone, Nexterone, Pacerone, generics)

Digoxin (Lanoxin, generics)

Flecainide (Tambocor, generics)

Sotalol (Betapace, Sorine, generics)

REFERENCE

1. Fuster V, Lars E, Rydén DS, et al. ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Revise the 2001 Guidelines for the Management of Patients With Atrial Fibrillation).. *Circulation.* 2006;114:e257-e354. http://circ.ahajournals.org/cgi/content/full/114/7/e257. Accessed March 21, 2011.

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