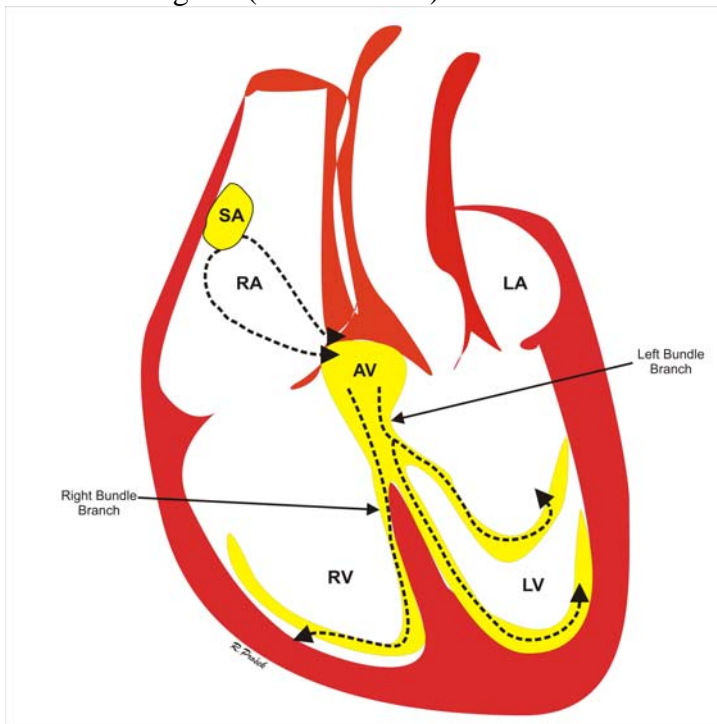


# Atrial Fibrillation

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## WHAT MAKES A NORMAL HEART BEAT?

The heart is a large muscle with four chambers. There are two top chambers (left and right) called the atria and two bottom chambers (left and right) called the ventricles. These chambers fill with blood from the body and then contract to circulate or deliver poorly oxygenated blood to the lungs (right side) or well-oxygenated blood to the rest of the body's tissues (left side). The heart muscles contract after they are stimulated by an electrical impulse. A small area of special tissue in the right atrium called the sinoatrial (SA) node starts an electrical impulse (it's like the heart's spark plug) that will eventually travel down special electrical tracts (AV node, Bundle Branches, Purkinje Fibers – the heart's "wiring") within the heart and cause the heart muscle to contract (Figure 2). The electrical impulses cause the heart to contract in a coordinated fashion: the atria contract first and push blood into the ventricles; then the ventricles contract and push blood to either the lungs or the rest of the body. This electrical impulse can be recorded on an electrocardiogram (ECG or EKG).



**Figure 2.** Graphic representation of a normal electrical impulse starting in the sinoatrial node (SA) and traveling through the right atrium (RA) and left atrium (LA), through the AV node and right and left bundle branches to cause a coordinated contraction of the heart muscle. RV=right ventricle, LV=left ventricle.

## WHAT IS ATRIAL FIBRILLATION?

Atrial fibrillation (sometimes called “A fib”) is an arrhythmia, an irregularity of the heart’s rhythm. Instead of the SA node (the “spark plug”) starting and coordinating the electrical signal, many areas within the atria send out electrical impulses in a rapid, disorganized manner. This whirlwind of electrical impulses or wavelets spreads over the atrial tissue causing the atrial muscle to quiver or fibrillate, instead of contracting in an organized, structured manner (Figure 3). Only a fraction of the electrical impulses are able to travel across the AV node and down through the heart’s normal conduction system (the “wiring”) to make the ventricles contract. The pattern with which all these abnormal atrial impulses are conducted through the AV node is irregular making the ventricles beat irregularly.

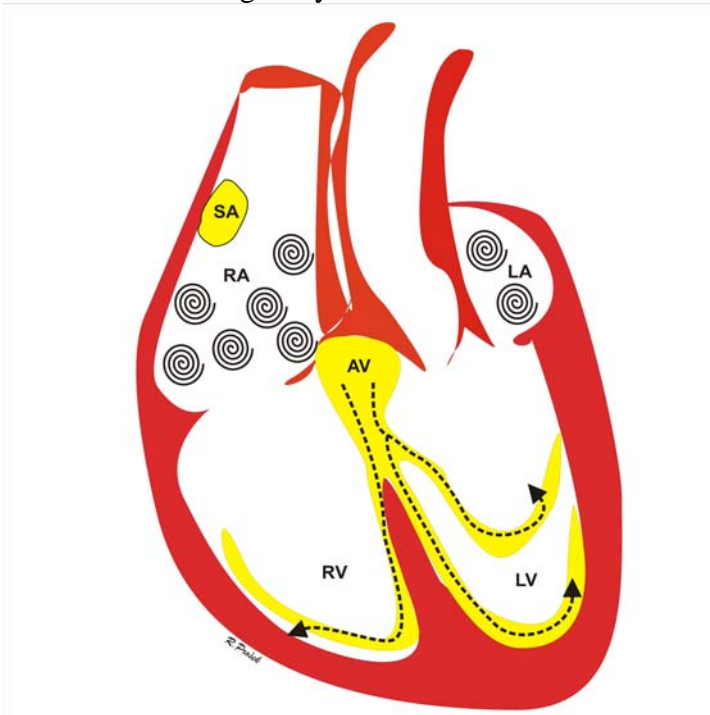


Figure 3. Graphic representation of atrial fibrillation with whirlwind of electrical impulses forming in the right (RA) and left atria (LA) instead a single organized impulse from the sinoatrial (SA) node causing the atrial muscle to fibrillate (quiver) instead of an organized contraction to fill the right (RV) and left ventricles (LV).

## WHAT CAUSES ATRIAL FIBRILLATION?

In humans, atrial fibrillation can occur for no apparent reason (often in athletes or older people). This is because the size of our hearts is large enough to allow such abnormal rhythms to develop (we also see this in horses, which have large hearts). However, most pets have much smaller hearts than humans, so for atrial fibrillation to occur in your pet, the atrial chambers must usually be bigger than normal. This enlargement of the atrial chambers occurs with many types of heart disease, such as mitral valve disease or cardiomyopathy. Generally, the smaller the pet, the more significant the heart disease must be to cause atrial fibrillation. Thus, atrial fibrillation is much less common in cats than in dogs.

Occasionally, giant and large breed dogs develop atrial fibrillation without any other heart disease. This is termed “lone atrial fibrillation” and occurs because the natural size of their left and right atria is similar to the heart size of humans (who, as we mentioned earlier, can also get “lone atrial fibrillation”). .

### **HOW IS ATRIAL FIBRILLATION DIAGNOSED?**

Often, the first idea that a pet has atrial fibrillation is when your veterinarian detects an erratic heart rhythm during auscultation with a stethoscope. Many veterinarians describe the sound as “bongo drums” or “shoes in a dryer.” Your pet’s pulse quality may also be irregular. However, to confirm the diagnosis an electrocardiogram (ECG) needs to be performed (because other arrhythmias can sound like atrial fibrillation). There are specific ECG criteria which must be met prior to making the diagnosis of atrial fibrillation.

At times, a pet with heart disease may suddenly become weaker, or have a relapse of heart failure upon development of atrial fibrillation, prompting you to visit with your veterinarian. Again, the veterinarian will auscultate the abnormal rhythm and diagnose atrial fibrillation via an ECG examination.

In giant breeds with lone atrial fibrillation, the arrhythmia may be detected on routine examination – often the owners are unaware that any problem exists. Some dogs may develop mild exercise intolerance when they develop atrial fibrillation.

### **WHAT HAPPENS WHEN A PET DEVELOPS ATRIAL FIBRILLATION?**

People with lone atrial fibrillation usually require treatment to re-establish a normal heart rhythm, because they usually have exercise intolerance or shortness of breath, symptoms of palpitations, and are at an increased risk of having a stroke. However, dogs with lone atrial fibrillation rarely show exercise intolerance or shortness of breath, and do not suffer from strokes, so treatment is rarely required. Their heart rate remains normal in most cases.

However, in a pet with serious heart disease, atrial fibrillation causes a worsening of clinical signs, and can further damage the heart. Cardiac output, or the amount of blood pumped out of the heart to the rest of the body, is reduced and often congestive heart failure develops or recurs. These pets usually have very fast heart rate (more than 200 beats per min) which, if not controlled, can lead to additional heart muscle damage and dysfunction.

### **HOW IS ATRIAL FIBRILLATION TREATED?**

Treatment of atrial fibrillation in people is aimed at re-establishing and maintaining a normal rhythm, because this greatly reduces the risk of strokes. This can be done by delivering a “shock” to the heart (termed “electrocardioversion”), or by using

antiarrhythmic drugs. Recent studies in people suggest that re-establishing a normal rhythm is not essential and medical therapy may be sufficient if clinical signs are tolerable or absent.

In pets, cardioversion is generally not feasible. Several studies have examined electrocardioversion or chemical cardioversion in dogs with lone atrial fibrillation – none has shown consistent success. Newer studies are being conducted that may ultimately provide a technique that allows a normal rhythm to be established in these pets.

Pets with severe heart disease are not candidates for cardioversion. In these pets, a normal rhythm can never be re-established. Instead, the veterinarian attempts to reduce the high heart rate with antiarrhythmic drugs. By reducing the heart rate (which is often more than 200 beats per minute), the veterinarian allows the heart to pump more efficiently, and prevents some of the damage that the high heart rate can produce. Additionally, the clinical signs associated with the development of atrial fibrillation (that is, congestive heart failure) resolve when the rate is controlled. The drugs that decrease the heart rate need to be given indefinitely to maintain rate control and will generally be added to drugs already being administered.