

Arrhythmias

Normal Heartbeat

Each heartbeat begins in a specialized area of the right atrium called the sinus node. The sinus node starts each heartbeat by generating a small amount of electricity, which spreads into the muscle cells of the atria. This causes these upper chambers to contract.

Next, the electrical activity moves into the junction between the atria and ventricles. (The ventricles are the heart's main pumping chambers.) This area is called the atrioventricular node or A-V node. The A-V node acts as a relay station. It takes the signal coming from the atria, delays it slightly, then passes it into the ventricles, which causes them to beat. When the ventricles beat, they pump blood throughout the body. This creates a pulse that can be felt at several places in the body.

The brain tells the sinus node how fast to beat; it can speed up during exercise or in times of stress and slow down when resting or sleeping. A normal fast heartbeat is called sinus tachycardia. Normal slow heartbeat is called sinus bradycardia.

Diagnosis

Arrhythmias are abnormalities of the heart rate and rhythm (sometimes felt as palpitations). They can be divided into two broad categories: fast and slow heart rates. Some cause few or minimal symptoms. Others produce more serious symptoms of lightheadedness, dizziness and fainting.

Some patients with otherwise normal hearts can have abnormal electrical pathways in their hearts that cause arrhythmias. Patients with underlying problems in the function and structure of the heart are more prone to heart rhythm problems. As patients who've had successful heart surgery live longer, doctors are diagnosing more heart rhythm abnormalities.

A heart rhythm abnormality is evaluated in ways much like those used to evaluate other health problems. The history of your symptoms, including sensation of your heart beating fast, dizziness and fainting are very important.

Your doctor can use several tests to diagnose an arrhythmia. The first is usually an electrocardiogram (ECG or EKG). An ECG machine records your heart's electrical activity. The tracings can be recorded on paper or a computer disk. However, EKGs are only a brief snapshot of your heart rhythm and may not detect the actual arrhythmia.

The tests used to diagnose arrhythmias include exercise testing, Holter monitoring, event recorders and electrophysiologic studies.

Types of Heart Rhythm Abnormalities

Fast Heart Rhythms

1. Supraventricular Tachycardia (SVT)

This is the most common type of abnormal tachycardia in young adults. The fast heart rate — often over 150 beats a minute — starts in the heart's upper chambers or in the upper part of the electrical conduction system. Symptoms include palpitations, chest pains, upset stomach, decreased appetite, lightheadedness or weakness. Some people can learn techniques to slow down their heart rate. Straining, such as closing the nose and mouth and trying to breathe out, may work. This is known as a Valsalva maneuver. Once the rhythm returns to normal, proper therapy with drugs can usually prevent future episodes. Patients often need an EP study with radiofrequency ablation to cure the problem.

2. Atrial Tachycardia (including flutter or fibrillation)

Atrial tachycardia, sometimes called atrial flutter or atrial fibrillation, is a particular type of SVT. This is a fast heart rate that starts in the heart's upper chambers and is conducted to the lower chambers. It's common after surgery that involves the atria (upper chambers), especially the Mustard, Senning and Fontan operations and in conditions that cause the atria to enlarge (most commonly from leakage or blockage or the mitral or tricuspid valves inside the heart). Besides a fast heart rate, other symptoms are fatigue, dizziness, lightheadedness and fainting. It usually requires treatment with medications or radiofrequency ablation.

3. Ventricular Tachycardia

This is a fast heart rate that starts in the heart's lower chambers. It usually results from serious heart disease and often requires prompt or emergency treatment. Symptoms can be mild but generally are severe. They include dizziness, lightheadedness and fainting. Treatment options include medication, radiofrequency ablation and implanting a device (defibrillator) that shocks the heart into a normal rhythm or surgery.

Slow Heart Rhythms

1. Sinus Node Dysfunction

The sinus node is where the heartbeat starts. If this is damaged, usually during surgery, sick sinus syndrome can result. The heartbeat is slow and may not increase appropriately with exercise. Patients may have no symptoms or may have fatigue, exercise intolerance, dizziness or fainting. An artificial pacemaker can be implanted if treatment is needed.

2. Complete Atrioventricular Block (complete heart block)

Complete heart block occurs when the electrical signal can't pass normally from the heart's upper to lower chambers. If the A-V node is damaged during surgery, complete heart block may result. Sometimes complete heart block occurs spontaneously without surgery. An artificial pacemaker can restore normal heart rate and rhythm.

Treatment

Medication

Many rhythm disorders, especially tachycardias, respond to medications. Several drugs are available and more are being developed. These can't cure an arrhythmia, but they can improve symptoms by preventing episodes from starting, slowing the heart rate during an episode or shortening how long an episode lasts.

Sometimes several drugs must be tried before the right one is found. All medications have side effects, including drugs used to treat arrhythmias. Many side effects aren't serious and go away when the dose is changed or the medication stopped. Some side effects are very serious and may require that you be admitted to the hospital to start the medication. A common side effect of many anti-arrhythmic medications is a slow heart rate. If the medicine must be taken to prevent fast heart rate problems, a pacemaker may be necessary. Because of the side effects, it's very important to take the medicine exactly as the doctor prescribes it. It may be necessary to monitor the amount of the drug in the blood. Your doctor can decide if these blood tests are needed.

One risk of chronic heart rhythm abnormalities is blood clots forming in the heart, especially its upper chambers. If a clot breaks off, it can be carried to other parts of the body, such as the lung or brain, and cause serious problems. Anticoagulants (medication to help prevent blood clots) are given to prevent this from happening.

Radiofrequency Ablation

Radiofrequency ablation is done during an intracardiac electrophysiologic procedure. A catheter is positioned directly over the area causing the tachycardia. Then the catheter's tip is heated by radiofrequency waves to alter a small area of the heart. This stops electrical current from passing through the tissue. Sometimes this procedure must be repeated to cure the arrhythmia. Its success is directly related to the cause of the arrhythmia and the complexity of the underlying congenital heart disease. In most patients with congenital heart disease, these procedures should be performed in centers with special expertise. The success rate can be as high as 90 percent for supraventricular tachycardia.

Surgery

Surgery is sometimes done to interrupt abnormal electrical conduction. This procedure is usually combined with surgery to correct other heart abnormalities.

Pacemakers and Implanted Defibrillators

A variety of rhythm disorders can be controlled with artificial pacemakers. Slow heart rates (bradycardias) are the most common reasons to use a pacemaker. A pacemaker consists of a generator which is a small device (1 to 2 ounces, 1.5" x 1.5" x 0.25") placed in a pocket under the skin and connected to the heart with one or two thin wires. It sends small, painless amounts of electricity to the heart to make it beat.

Pacemakers are inserted during a simple operation. The wires are inserted into the heart through veins in the shoulder and the pacemaker is placed under the skin just below the collarbone. Sometimes the wires must be placed on the outside of the heart through a small operation and the pacemaker generator placed in the abdomen.

Once you have a pacemaker, you'll need regular checkups to check its battery and make sure the wires are working properly. Pacemaker batteries usually last for many years. Most people with pacemakers can enjoy normal activities.

Patients who have very fast heart rhythms accompanied by serious symptoms, such as fainting, may need an implanted defibrillator (implanted cardioverter-defibrillator, ICD). This device (about 2" x 3" x 0.75") is placed just beneath the collarbone or in the abdomen. It's connected to the heart with one or two thin wires. When a fast heart rhythm develops, the device detects it and shocks the heart to correct the rhythm.

Once you have an ICD, you'll need regular checkups to make sure the battery and wires are working properly.

It's very safe to be around microwave ovens and usual home electrical appliances. Your doctor can tell you if you need to avoid other electrical equipment and how to minimize your risk. Certain medical tests, such as magnetic resonance imaging (MRI), or treatments that use electrical pulses (TENS), aren't recommended for people with pacemakers or defibrillators. However, newer devices and MRI machines that are compatible are being developed.