

**UNDERSTANDING ARRHYTHMIAS:
IMPORTANT INFORMATION FOR
PATIENTS AND FAMILIES**



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INTRODUCTION



You may have just received information about a heart condition, known as an arrhythmia, that has left you feeling confused and perhaps a little anxious. This brochure is intended to give you a better understanding of arrhythmias and treatment options. If you have any questions, please talk to your doctor. You can also go to the Web sites listed in this brochure for more information.

Arrhythmia

A disruption in the heart's normal electrical system which causes an abnormal or irregular heart beat for no apparent reason.

Tachycardia

A type of arrhythmia where the heart beats too fast.

Bradycardia

A type of arrhythmia where the heart beats too slowly.

Atrial flutter

A type of tachycardia which causes the atria to beat faster than the ventricles.

HOW YOUR HEART WORKS

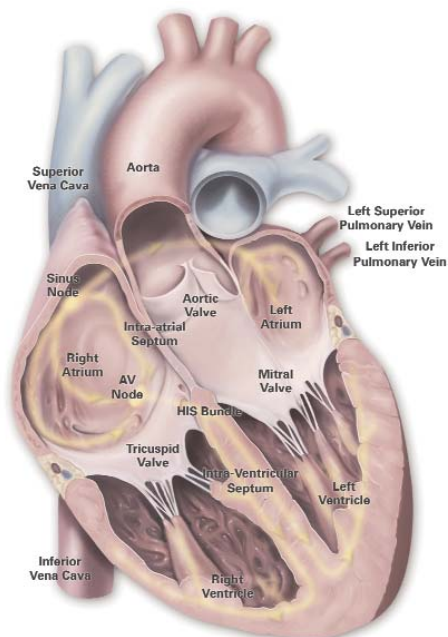
The heart's physical structure

The heart is a muscle about the size of a clenched fist that is located under the rib cage and between the lungs. It is divided into a left side and a right side by a muscular wall called the septum. Each side has two chambers; the upper chambers are called atria (the plural of atrium) and the lower chambers are called ventricles. The atria and ventricles are connected by valves which act as one-way portals which open, to allow blood to travel from the atria to the ventricles, and then close, to prevent the blood from flowing backward.

The heart at work

The atria and ventricles work together as a team to pump blood through the heart. The right atrium receives oxygen-depleted blood from the body and pushes it through the tricuspid valve into the right ventricle and then out to the lungs. Oxygen-rich blood is returned from the lungs to the left atrium, which pushes it through the mitral valve into the left ventricle and then out to the body. After the body has used all of the oxygen, the blood returns to the heart and the cycle repeats.

A reasonable estimate for the number of heartbeats in a lifetime is about three billion.





The heart's electrical system

A heart beat is the pumping action that moves blood into, through, and away from the heart. It is controlled by a network of special, conductive cells that make up the heart's electrical system. A heart beat is triggered by a small bundle of cells found in the right atrium called the sinus node. The sinus node releases a signal causing the atria to contract. The signal travels on to the AV node, a cluster of cells located in the center of the heart between the atria and ventricles. The AV node slows the electrical signal before it enters the ventricles. This allows the atria time to push its blood into the ventricles, before the ventricles begin to contract. Finally, the electrical signal reaches the His-Purkinje Network, a group of fibers that tell the ventricles to contract, moving the blood out to the lungs or body. In a normal heart, this sequence occurs 60 to 100 times per minute, hence, a normal heart "beats" at a rate of 60 to 100 times per minute.

Changes in heart beat rate brought about by variations in activity, diet, medication and age are normal and common. Strenuous exercise may cause the heart rate to increase to 160 to 180 beats per minute. Being startled or frightened may cause the heart rate to increase as well. These situations all cause the heart to beat faster than its normal "resting" rate, but pose no danger.

Atrium (Atria is the plural of atrium)

The top two chambers of the heart. The atria receive blood from the body (right atrium) and the lungs (left atrium) and pump it into the ventricles of the heart.

AV node

Part of the heart's electrical system. The AV node is a cluster of cells located in the center of the heart between the atria and ventricles that slows the electrical signal before it enters the ventricles.

Mitral valve

The portal which controls flow of blood between the left atrium and left ventricle.

Sinus node

Part of the heart's electrical system. The sinus node is a bundle of cells located at the top of the right atrium. It is the source of the signal that triggers the heart to beat.

Septum

The muscular wall that separates the left and right sides of the heart.

Tricuspid valve

The portal which controls flow of blood between the right atrium and right ventricle.

Ventricles

The two lower, more muscular chambers of the heart. The ventricles pump blood to the lungs and to the body.

UNDERSTANDING ARRHYTHMIAS

What is an arrhythmia?

An arrhythmia is a disruption in the heart's normal electrical system which causes an abnormal or irregular heart beat for no apparent reason. Anyone can develop an arrhythmia, even a young person without a previous heart condition. However, arrhythmias are most common in people over 65 who have heart damage caused by a heart attack, cardiac surgery or other conditions. There are many types of arrhythmias, including:

- Heartbeats that are too slow (bradycardia)
- Heartbeats that are too fast (tachycardia)
- Extra beats
- Skipped beats
- Beats coming from abnormal areas of the heart

What are the symptoms?

Some arrhythmias may occur without any symptoms. Others may cause noticeable symptoms, such as:

- Fainting
- Dizziness, sensation of light-headedness
- Sensation of your heart fluttering (palpitations)
- Sensation of a missed or extra heart beat
- Weakness
- Fatigue
- Shortness of breath
- Chest pain

Can arrhythmias be felt?

Symptoms of arrhythmias can vary widely from person to person. An arrhythmia may last for a few minutes, a few hours, a few days, even a few weeks at a time. Some people feel no symptoms at all. Most commonly, patients report feeling a rapid heart beat, often described as a "fluttering" sensation. Depending on the severity of your arrhythmia, that may be the only symptom you experience. Others may experience shortness of breath, fatigue, dizziness or fainting.

TYPES OF ARRHYTHMIAS

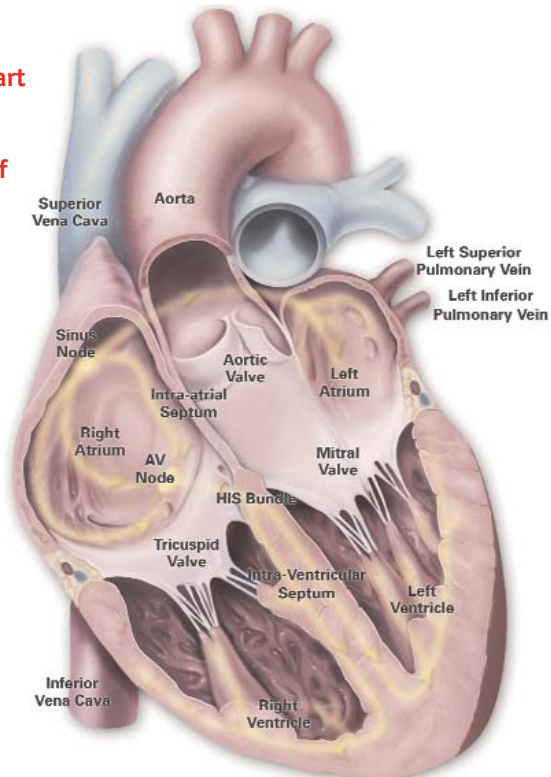


Types of arrhythmias

Our discussion focuses on arrhythmias that cause heartbeats that are too fast. This category of arrhythmia is called tachycardia. There are several different types of tachycardia, which are categorized by where they originate in the heart.

- **Supraventricular Tachycardia (SVT)** is a general term describing any rapid heart rate originating above the ventricles (the lower chambers of the heart). The most common SVTs are described below.
 - **Atrial fibrillation (AF or AFib)** is the most common SVT, affecting more than 2 million people in the United States. During AF, the heartbeat produced by the atria is *irregular and rapid*, sometimes up to 4 times faster than normal. This impairs the heart's ability to efficiently pump blood and increases the risk of developing blood clots which can cause a transient ischemic attack (TIA) or stroke.

The electrical signal which causes the heart to beat originates in the SA node - the natural pacemaker of the heart.



TYPES OF ARRHYTHMIAS

- **Atrial flutter (AFL)** is similar to atrial fibrillation in that it is characterized by a *rapid* heartbeat, sometimes up to 4 times faster than normal that originates in the atria. It differs from atrial fibrillation (AF) in that the heartbeat is *regular*, not irregular. Atrial flutter also carries the risk of developing blood clots, though not as great as with AF. With atrial flutter, the electrical signal becomes “trapped” in the right atrium. It repeatedly travels in a circular pattern inside the right atrium, only occasionally “escaping” through the AV node to the ventricles. This causes your atria to beat faster than the ventricles of your heart, at rates between 150 and 450 beats each minute.
- **Atrioventricular nodal re-entrant tachycardia (AVNRT)** is the second most common SVT. In a normal heart, there is a single electrical pathway, or “gate”, called an atrioventricular node (AV node) that controls the *timing* and *direction* of the electrical signal as it travels from the upper chambers (atria) to the lower chambers (ventricles) of the heart. With AVNRT, an *extra* electrical pathway forms which allows the electrical signal to travel *backward* through the “gate” (AV Node) at the same time, starting another heartbeat. During AVNRT the electrical signals continuously go around the 2 pathways in a circular pattern called re-entry. This can lead to a very fast heart rate of 160 to 220 beats per minute.
- **Atrioventricular reciprocating tachycardia (AVRT)** is similar to AVNRT in that an *extra* electrical pathway is formed that allows the electrical signal to travel *backward* from the ventricles to the atria. However, in AVRT the extra pathway *circumvents* the AV node, or “gate”. This extra pathway around the outside of the AV node is called an *accessory pathway*.
- **Ventricular Tachycardia (VT)** is a rapid heart rate (160 to 240 beats per minute) that originates in the ventricles. It may cause the heart to become unable to pump adequate blood throughout the body. VT most often occurs in patients with underlying structural heart disease, such as ischemic heart disease.
- **Ventricular Fibrillation (VF)** is a tachycardia which causes the ventricles to contract in an *irregular* and *very rapid* manner. The heart immediately loses its ability to pump blood throughout the body. VF causes immediate loss of consciousness, and is invariably fatal within minutes unless it is stopped (usually by using a defibrillator.)

Antiarrhythmic

A drug that helps the heart beat more normally.



Treatment Options

Several factors are considered in determining the appropriate method of treatment:

- The patient's age
- Overall health and personal and family medical history
- Medications the patient may be taking for other conditions
- Underlying diseases or conditions that may contribute to the arrhythmia
- The nature and severity of the arrhythmia and its symptoms

Your doctor will evaluate your individual case and recommend treatment(s) for your condition. Possible treatment options are:

Lifestyle changes

These may help improve or lessen the occurrence of your arrhythmia. They may include eating a more heart-healthy diet, limiting or eliminating the amount of caffeine you have, exercising regularly, and stopping smoking.

Medication

Two classes of medication are used to treat arrhythmias: antiarrhythmics, which control the rhythm of the heart, and beta blockers, which control the rate at which the heart beats. They may be used alone or along with other treatments.

Cardiac ablation

A procedure that neutralizes (or ablates) the specific cells in the heart that cause an arrhythmia.

Cardioversion

By delivering a controlled electric shock to the heart, defibrillators or cardioverters "shock" the heart back into a normal heart rhythm. During emergency situations, the shock may be delivered through an external device. More commonly, the device is implanted in the patient's chest. Sometimes, drugs are used to achieve cardioversion.

Cardiac ablation

This is a minimally-invasive procedure that can be used in people with many types of arrhythmias. The procedure neutralizes (or ablates) the specific cells in your heart that cause your arrhythmia. It is a safe and widely used procedure, although some arrhythmias are more easily treated with catheter ablation than others. Your doctor is your best resource for information on treatment options for your arrhythmia.

MORE ABOUT CARDIAC ABLATION

Cardiac ablation is a procedure used to selectively neutralize specific cells in your heart that are causing your arrhythmia. This restores the normal electrical pathways of your heart and allows it to beat normally again. The procedure is performed by a cardiac specialist called an electrophysiologist (EP), who your doctor will refer you to.

Cardiac ablation is an important advancement in the treatment of arrhythmias. For many arrhythmias, it is a widely used procedure that is proven to be safe, effective, and long-lasting. While many energy sources are being investigated to perform catheter ablation procedures, radiofrequency (RF) electrical energy is most commonly used today. RF energy consists of high frequency radiowaves and has been used safely in surgical procedures for many years. When RF energy is delivered through catheters that are placed in your heart, it neutralizes the heart cells that are causing your arrhythmia.

Electrophysiologist

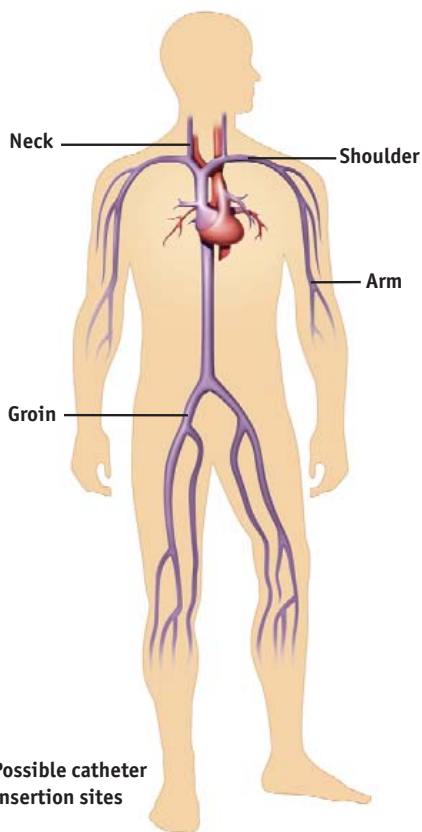
A cardiologist who is specially trained in the diagnosis and treatment of problems with the electrical systems of the heart.

What are the risks?

Any medical procedure that involves the heart and blood vessels has some potential risk. The most common risks with an ablation procedure include infection or bleeding. Your doctor will discuss all potential risks and answer any questions you may have regarding the safety of cardiac ablation.

Preparing for your ablation procedure

A few days prior to your ablation procedure, you will be scheduled for some routine





blood work. Be sure to let your doctor know all the medications you are taking and if you have allergies to any medications or to X-ray dye.

The night before your procedure, you may not have anything to eat or drink after midnight. Unless your doctor has advised you otherwise, you may take your medications on the morning of the ablation procedure with a sip of water.

At the Electrophysiology (EP) lab

Cardiac ablation procedures are performed in the Electrophysiology (EP) lab in the hospital. Specially trained EP nurses and technicians work with your electrophysiologist as a team to provide your care. When you arrive at the EP lab, you will change into a hospital gown and be assisted onto a padded X-ray table. A nurse will place ECG pads on the skin of your chest and back, allowing the doctor to monitor your heartbeat during the procedure. Your blood pressure and heart rate will be checked and monitored throughout the procedure.

An intravenous (IV) line will be started and you will be given a mild sedative to help you relax. You will be sleepy, but you will probably be awake during the procedure. This is called conscious sedation, which means you will be aware of your surroundings and be able to communicate with the staff, but not feel any pain.

A portion of both groin areas (on the inside of both legs) and possibly the right side of your neck will be cleaned and shaved in preparation for insertion of the catheters. Your doctor will numb the sites where catheters are to be placed in your body with a local anesthetic. You will feel a “prick” or “sting” as the local anesthetic is administered. Then you will be covered from your neck to your toes with a large, sterile sheet. Your doctor and the lab staff will wear masks, gowns and gloves to maintain sterile conditions during the procedure. The lights will be dimmed in the EP lab to make it easier for the lab staff and your doctor to see the monitors and X-ray screens.



Cardiac ablation catheters

The ablation procedure

Small, flexible tubes, called sheaths, will be inserted into the blood vessels of the insertion site(s). The doctor then inserts one or more catheters into the sheath. An X-ray machine (fluoroscope) provides images of your heart during the procedure to help your doctor accurately position the catheter(s). You should not feel the catheters being inserted into your heart.

MORE ABOUT CARDIAC ABLATION

Before your doctor can perform the actual ablation, he must identify the specific area of your heart where your arrhythmia is coming from. To do this, an electrical “map” of your heart is created. This is done by recording the electrical activity of your heart while your arrhythmia is active. You may experience palpitations in your chest during this time, but otherwise you will be resting comfortably.

Once your doctor has located the precise origin of your arrhythmia, a special ablation catheter will be inserted. The tip of the ablation catheter is placed next to the heart tissue in the targeted area. RF energy is delivered through the tip of the catheter to neutralize the problem cells, restoring the normal pathways of your heart, allowing it to beat normally.

Depending on the complexity of your arrhythmia, the procedure may take about an hour, or several hours. If you experience any chest discomfort or pressure during the procedure, be sure to inform the staff. Do not hesitate to ask any questions you may have, at any time. The lab staff will do everything possible to keep you comfortable.

In the recovery room

When the procedure is done, you will be moved to a recovery area. The catheters and sheaths will be removed and pressure will be applied to the sites for approximately 20 minutes, to control any bleeding that may occur. When bleeding has stopped, a bandage will be applied over the insertion area. Once you are stable, you will be transferred to a regular hospital room.

You will need to lie flat for at least 4 hours and maybe as long as 6 hours. It is important not to bend your legs so the insertion sites can begin to heal. A nurse will check your blood pressure and heart rate, and monitor the insertion sites at regular intervals. You will be allowed to eat. You will not be permitted to walk to the bathroom during this time and so a bedpan or urinal must be used. Call your nurse immediately if you have pain or notice any bleeding at the insertion sites.

Your doctor will visit you to discuss your ablation procedure and the results of treating your arrhythmia. At this time you will also discuss other things you should do or treatments you may need, if any. Most people are able to leave the hospital the same day, though in some cases an overnight stay may be necessary. You must have someone available to drive you home and stay with you that evening.





At home after the procedure

Recovery from a catheter ablation procedure is quick. Many people are able to resume most of their normal activities 24 hours after the procedure. As the insertion site heals, you may see some bruising and feel a small, hard lump. This is normal and will go away in a few days. If you experience any of the following, call your doctor.

- Bleeding at the insertion site
- Increased pain
- Any complaint of chest pain
- Shortness of breath
- Feeling cold, having swelling, or numbness on the arm or leg of the insertion site
- The bruising or lump at the insertion site gets larger
- Fever over 100° F
- Return of your arrhythmia symptoms

Want to know more?

Your best source of information is your doctor. If you would like more information about arrhythmia and cardiac ablation, there are many helpful resources available. Consider looking at the Web sites listed below:

American Heart Association
www.americanheart.org

Heart Rhythm Society
www.hrspatients.org

National Heart Foundation
www.ahaf.org

FREQUENTLY ASKED QUESTIONS

1. What are the symptoms of cardiac arrhythmias?

Depending upon the arrhythmia, symptoms will vary. Some patients may have no symptoms at all. Others may experience palpitations, shortness of breath, weakness, chest pain, sweating, dizziness, or fainting. Some patients with the condition atrial fibrillation (AF) may only experience a fluttering sensation in their heart. A lack of symptoms does not make an arrhythmia harmless. Conversely, a slight “racing” sensation, particularly during exercise, may not be cause for alarm. Your physician will ask you many questions about your symptoms to get a better understanding of your condition.

2. Who is most vulnerable to cardiac arrhythmias?

Like other forms of cardiovascular disease, most arrhythmias occur less frequently in younger people. Their incidence increases with age. Older people often have atrial fibrillation. In fact, this is seen in 3% to 5% of Americans over 65 years old. However, supraventricular tachycardia (SVT), one of the most common atrial arrhythmias, frequently appears in younger people. Sometimes cardiac arrhythmias occur for unexplained reasons, or relate to particular inherited defects. But often they develop with the progression of other diseases affecting the heart.

3. How dangerous are cardiac arrhythmias?

The answer is complicated because cardiac arrhythmias take many forms. For example, SVT is not life threatening but may cause symptoms that alter a patient’s quality of life. Other atrial arrhythmias, such as atrial fibrillation, carry an increased risk of stroke. Ventricular arrhythmias are extremely dangerous and require immediate treatment.

4. Can medication control my arrhythmia?

Antiarrhythmic medication is helpful for many patients and is often considered as an initial therapy. Many patients are effectively treated through medication and do not experience any side effects. But since antiarrhythmic medications need to be taken for the rest of a patient’s life, side effects can occur over an extended time period. Side effects will vary among patients and can include the potential for worsening the existing arrhythmia or inducing secondary arrhythmias. Your physician will explain any potential side effects and will continue to monitor you closely.

5. What other treatments are available?

Treatments vary for different types of arrhythmias. SVT is often treated with radiofrequency (RF) ablation, a procedure where slender catheters are inserted into your heart and energy is delivered to disrupt the abnormal tissues. Ventricular arrhythmias often require the implantation of an implantable cardioverter defibrillator (ICD) to slow the dangerously fast rhythms. Ventricular tachycardia may also be treated with a specialized type of RF ablation called fluid-cooled ablation. Your physician may recommend that you



undergo an electrophysiology study (EP study) to better understand your arrhythmia.

6. How do I prepare for an electrophysiology study (EP study)?

Your physician will review any specialized instructions you should follow prior to your EP study. You won't be allowed to eat or drink anything for several hours prior to the procedure and you may have to stop taking certain medications. You may be admitted to the hospital the same day of the EP study and you will undergo preliminary blood tests, an X-ray and ECG. You will be brought to the electrophysiology laboratory, a specialized setting with testing equipment and staff to conduct the procedure. You may be given a sedative intravenously throughout the procedure to help you relax.

7. How is an EP study conducted?

Your physician or nurse will numb the site where catheters are inserted into your veins. This is typically done in one or both sides of your groin, or your neck in order to access the heart. Small hollow tubes called sheaths are inserted into the blood vessels using a needle puncture technique. These allow catheters to be inserted into your veins and guided up into your heart. You will most likely not feel the catheters as they are being guided because there are no nerve endings in the veins. An X-ray allows your doctor to see the catheters as they are advanced into your heart.

8. How uncomfortable are these procedures?

Most patients experience minimal discomfort during the EP study. Remember that your physician must stimulate your heart to reproduce symptoms in order to identify your arrhythmia. Thus, you may experience some of the same symptoms that occur as a result of your arrhythmia. These could include palpitations, light-headedness, or chest pain.

9. What are the risks of RF ablation?

RF ablation carries some risks, just as all medical procedures do. Less than 1% of procedures can result in serious complications. Your physician will review the risks with you prior to the procedure. In rare cases, the catheter ablation can damage a small part of the normal electrical system, requiring the implantation of a permanent pacemaker.

10. What can I expect after RF ablation?

After the electrophysiology study and RF procedure are completed, the catheters and sheaths will be removed. Firm pressure will be applied to the insertion site to prevent bleeding. Once the bleeding has stopped, you will be returned to your room to recover. Patients can expect to feel some minor discomfort and bruising at the site of the catheter insertion. Your heart rhythms will be monitored for several hours. Typically, this procedure is done on an outpatient basis. After discharge, your physician will want to keep close track of your progress and will discuss a follow-up visit.