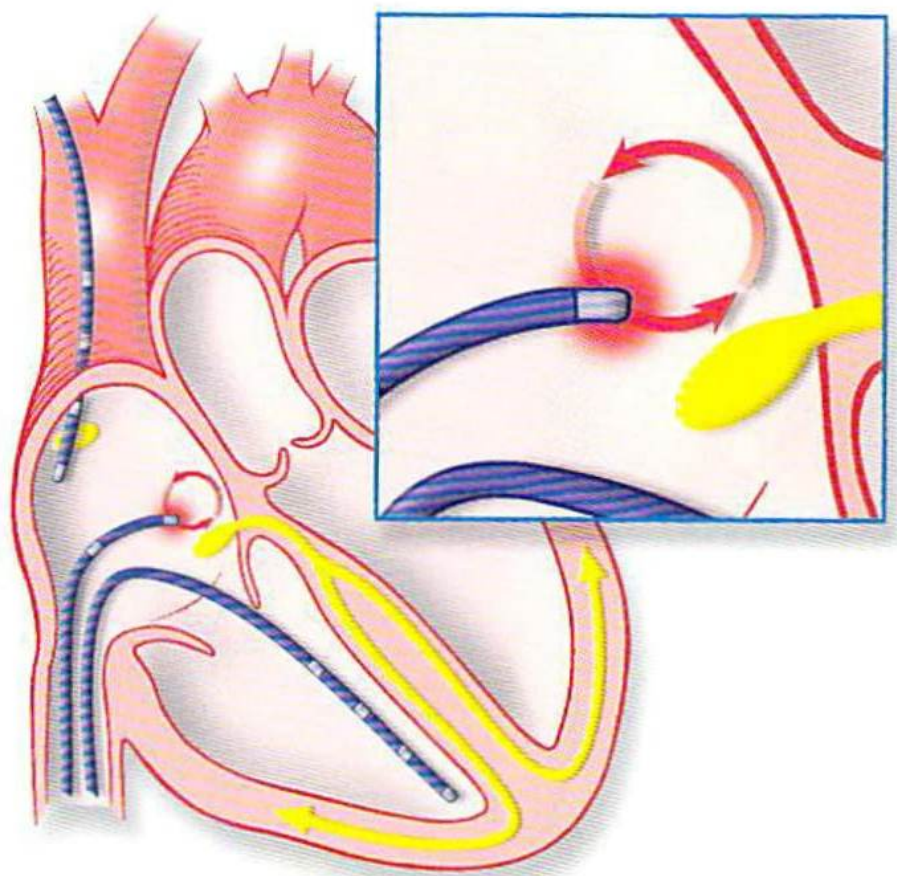



Catheter Ablation



A Patient's Guide

This booklet is not intended to replace professional medical care. Only your doctor can diagnose and treat medical problems.



Your doctor has recommended that you have catheter ablation to correct an abnormal heart rhythm. Now, you probably have questions and concerns about this procedure. This booklet can help answer many of your questions.

What Is Catheter Ablation?

Catheter ablation is a non-surgical procedure used to **ablate** (destroy) parts of an abnormal electrical pathway that is causing a heart rhythm problem.

During catheter ablation, doctors insert an electrode catheter (a long, flexible wire) into the heart. They place the catheter so that it lies near the abnormal pathway. Then they pass heat energy through it. The tip of the catheter heats up and destroys the small area of heart tissue where the abnormal pathway is.

Why Is Catheter Ablation Important?

Catheter ablation is a very effective treatment for some abnormal rapid heart rhythms.

Catheter ablation is a relatively low-risk procedure that may permanently cure the heart rhythm problem you have been having. It may allow you to avoid a lifetime of medications and to lead a more active and productive life.

How the Heart Works

Before discussing the details of catheter ablation, it helps to understand how the heart works.

The Heart as a Pump

The heart is a hollow organ made of strong muscle that constantly pumps blood throughout the body.

The heart has four chambers: two chambers on the left side and two on the right. The upper chamber on each side, called an **atrium**, receives and collects blood. The lower chamber on each side, called a **ventricle**, pumps blood out of the heart.

The four heart chambers work together to contract (squeeze) and pump blood. As it circulates, blood delivers oxygen and nutrients throughout the body.

The Heart's Electrical System

The heart has an electrical system that produces tiny electrical impulses. These impulses travel from the upper to the lower chambers and tell the chambers to contract and pump blood.

The heart's electrical impulses normally begin at the sinoatrial node, or **SA node**. This cluster of special cells, also known as the heart's natural pacemaker, is located at the top of the right atrium. It produces electrical impulses at regular intervals and sets the proper rhythm for the heartbeat.

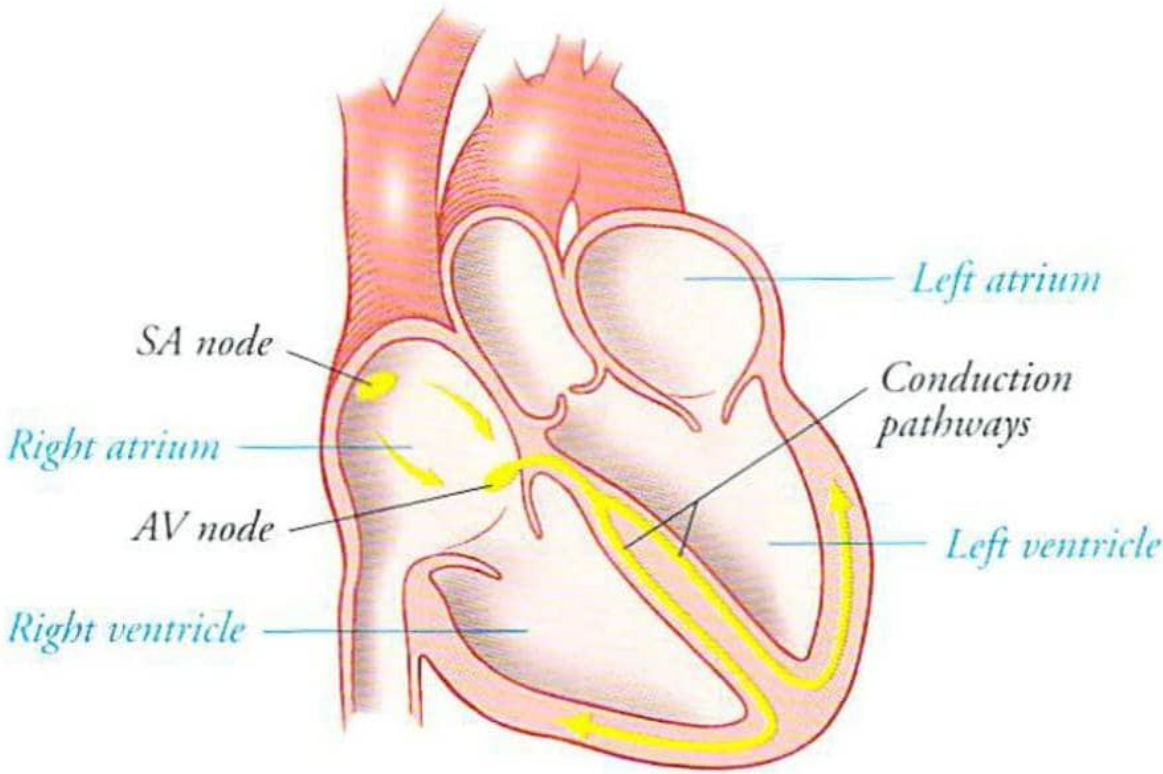
Each electrical impulse spreads throughout the atria (plural of atrium), causing them to contract and pump blood into the ventricles.



From the atria, the electrical impulse reaches the atrioventricular node, or **AV node**, which is located between the atria and the ventricles. The AV node slows down each electrical impulse before it passes through to the ventricles.

The impulse then travels to the ventricles through **conduction pathways**. The impulse stimulates the ventricles, causing them to contract and pump blood out of the heart.

At rest, the SA node normally starts 60 to 100 beats a minute. When you are physically active or excited, your body needs more blood flow. A healthy SA node responds to these changes in the body by increasing the **heart rate** (the number of beats per minute).



Why Is Catheter Ablation Done?

Sometimes, the heart's electrical system doesn't work properly. This can cause abnormal heart rhythms, called **arrhythmias**. During an arrhythmia, the heart may beat too fast, too slowly, or irregularly.

Catheter ablation is used to destroy parts of an abnormal electrical pathway that is causing a rapid (fast) heart rhythm, called tachycardia.

Understanding Tachycardias

Tachycardias occur when the heart beats too fast. Common symptoms include palpitations, dizziness, syncope (fainting spells), chest pain, and shortness of breath. Some tachycardias can be life-threatening. Others may not be noticed.

Most cases of tachycardia are caused by an abnormal pathway, called a **re-entry circuit**. If an electrical impulse enters this pathway, it may start traveling in a circle. This can make the heart contract each time the impulse travels through the pathway. The result is a very rapid heart rhythm.



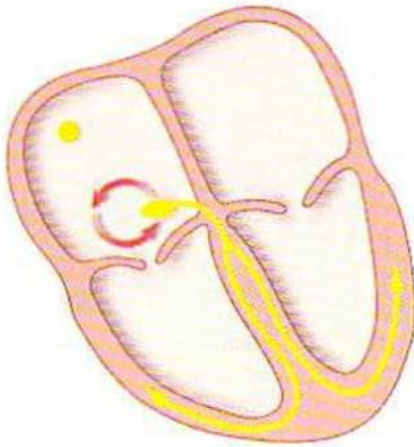
Re-entry circuit

An electrical impulse has entered the abnormal pathway to form a circuit. If the impulse continues to travel in a circle, it can cause a very rapid heart rhythm.

Here are a few examples of tachycardias that may be treated with catheter ablation.

■ *AV Nodal Re-entrant Tachycardia*

A re-entry circuit exists in or next to the AV node and may cause attacks of tachycardia. An attack can last from less than a minute to as long as a few hours. This condition often occurs in young or middle-age adults who do not have heart disease.

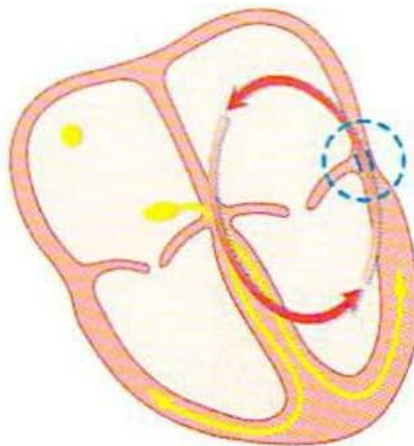


AV nodal re-entrant tachycardia

An electrical impulse has entered the extra pathway in or next to the AV node. The impulse travels in a circle and makes the heart contract with each cycle. This causes a rhythm that is very rapid and regular.

■ *Tachycardia Caused by an Accessory Pathway*

In this condition, sometimes called WPW Syndrome, an abnormal “bridge” of tissue, called an **accessory pathway**, connects the atria and ventricles. This extra pathway may cause extremely rapid heart rhythms. In some cases, these rhythms can be life-threatening.

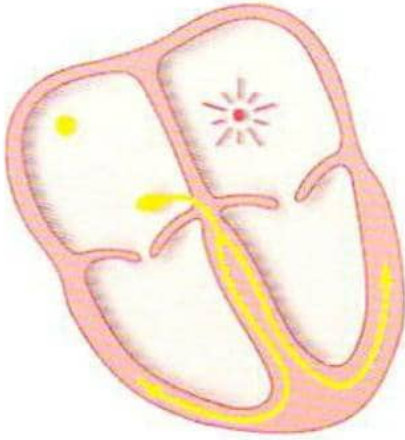


Tachycardia caused by an accessory pathway

An impulse has traveled from the atria to the ventricles, and then up through the accessory pathway back to the atria. If the impulse continues to travel in a circle, it can cause an extremely rapid heart rhythm. This rhythm can be dangerous.

■ *Focal Atrial Tachycardia*

An abnormal site, or **focus**, in one of the atria fires electrical impulses rapidly. Focal atrial tachycardia often occurs in people with heart or lung disease.



Focal atrial tachycardia

An abnormal site in one of the atria fires electrical impulses rapidly. These impulses then travel through the AV node and down the conduction pathways. The heart rhythm is rapid and usually regular.

■ *Atrial Fibrillation*

Multiple waves of electrical activity flow across the atria, causing them to fibrillate (quiver). The heart rhythm is irregular, erratic, and usually rapid. Atrial fibrillation may occur once in a while, or all the time (chronic). Sometimes, it can cause a stroke.



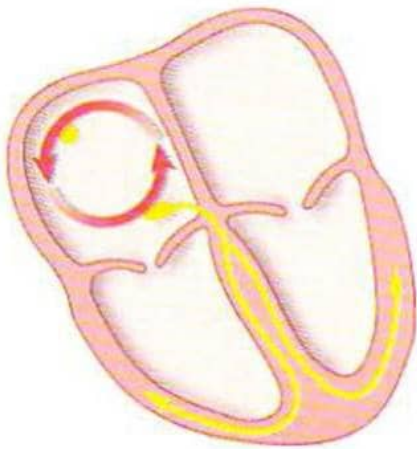
Atrial fibrillation

Multiple waves of electrical activity flow across the atria. The AV node allows only some of these waves to travel down the conduction pathways. The heart rhythm is irregular, erratic, and usually rapid.



■ *Atrial Flutter*

A re-entry circuit in the right atrium causes attacks of tachycardia. As in atrial fibrillation, the atria beat very fast. Unlike fibrillation, however, the heart rhythm tends to be mostly regular.

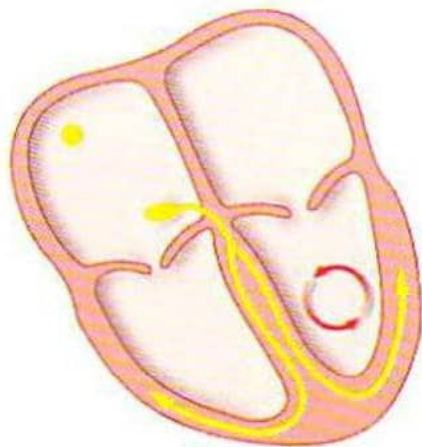


Atrial flutter

A re-entry circuit in the right atrium causes the atria to beat very rapidly. The AV node allows only some of the electrical impulses to travel down the conduction pathways to the ventricles. The heart rhythm is usually rapid and mostly regular.

■ *Ventricular Tachycardia*

One or more re-entry circuits exist in the ventricles, usually in an area of the heart muscle that has been damaged by heart attack or disease. This can cause a very rapid heart rhythm. Because the ventricles do most of the pumping, tachycardias that start in the ventricles are usually more dangerous. An attack of ventricular tachycardia may lead to cardiac arrest.



Ventricular tachycardia

An electrical impulse enters the abnormal pathway in the ventricle. This impulse travels in a circle and causes the heart to contract with each cycle. The heart rhythm is rapid and mostly regular.

How Doctors Treat Tachycardias

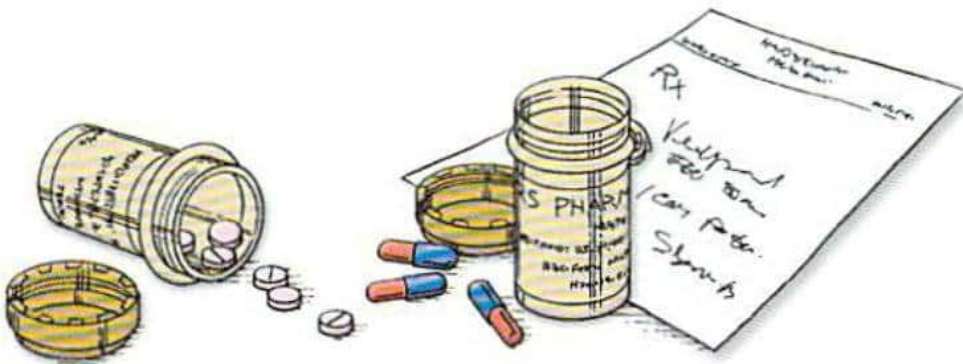
The treatment your doctor recommends will depend on the kind of tachycardia you have, how severe your symptoms are, and whether you have other problems with your heart.

The most common treatments for tachycardias are antiarrhythmic drugs, an implantable defibrillator, and catheter ablation.

◆ *Antiarrhythmic Drugs*

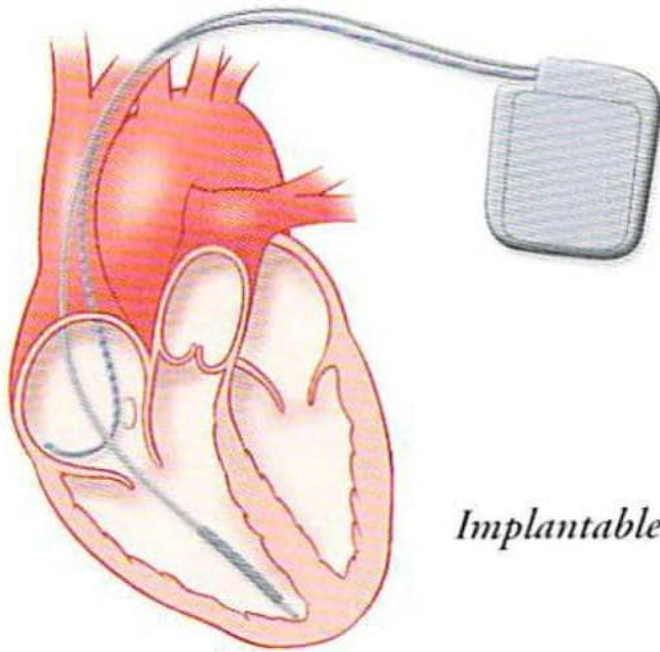
Medications can help restore a normal heart rhythm and prevent tachycardias from recurring.

Although medications are used to treat tachycardias, they *may not work well* or they *may cause side effects*. In addition, they *must be taken indefinitely*.



◆ *Implantable Cardioverter Defibrillator*

An implantable cardioverter defibrillator, also called an **ICD**, is a small electronic device that's placed inside the body so it can monitor the heartbeat at all times. If the ICD senses a dangerous rapid heart rhythm, it delivers one or more impulses or shocks to the heart and restores a normal rhythm.



Implantable defibrillator

An ICD can be a very effective treatment for certain kinds of dangerous arrhythmias, such as ventricular tachycardia. However, it *requires surgery*, and it *does not cure* the problem that's causing your arrhythmia.

◆ *Catheter Ablation*

Catheter ablation, as we have seen, is used to destroy parts of an abnormal electrical pathway that's causing a rapid heart rhythm. It is a fairly *low-risk procedure* that can take the place of surgery in many cases. And it *may permanently cure* your tachycardia.

Catheter ablation is an excellent treatment option for people who have had symptoms from tachycardia, especially if medications haven't helped the problem. It is also an option for people who cannot take, or wish not to take, medications because of side effects or the way they interfere with quality of life.

Preparing for Catheter Ablation

Unless you are already in the hospital, you will most likely be asked to arrive in the morning on the day of the procedure, or perhaps the night before.

You may have several routine tests, such as an ECG, x-rays, and blood tests. (These tests may be done a few days before the procedure.)

The doctor will review your medical history and examine you. (You may see the doctor at the office several days before the procedure.)

The doctor or nurse will talk with you about the procedure and its purpose, benefits, and risks. This is a good time to ask questions and, most important, to share any concerns you may have. You will then be asked to sign a consent form.

A nurse will shave and cleanse the area where the catheters will be inserted. This is usually at the groin (the fold between the thigh and abdomen). In some cases, it may be at the arm, shoulder, or neck. Shaving and cleansing makes it easier to insert the catheters and helps to prevent infection.

An intravenous (IV) line will be inserted into a vein in your arm. This line allows drugs to be injected directly into the vein, if they are needed. To help you relax, you'll be given a sedative.

Before the Procedure

- Generally, you'll be asked **not to eat or drink anything** for 6 to 8 hours before the procedure. This helps prevent nausea. You may have small sips of water with your medications.
- Check with your doctor several days before the procedure. You may be asked to **stop some medications** (such as antiarrhythmic drugs) for 2 or 3 days before the procedure.
- **Make arrangements** with a friend or family member to drive you to and from the hospital. You won't be permitted to drive home after the procedure, since you may be sedated.
- **Pack a small bag for your hospital stay.** You may want to include a robe, slippers, pajamas or nightgown, and toiletries.
- **Bring a list of the names and dosages of all the medications** you are taking.
- **Tell the doctor or nurse** if you have had any reactions to medications or anesthesia, or if you have a history of bleeding problems.
- Because the procedure can take several hours, **be sure to empty your bladder** beforehand. There will also be a bedpan or a urinal, should you need it during the procedure. (In some cases, a urinary catheter may be inserted to drain your bladder during the procedure.)

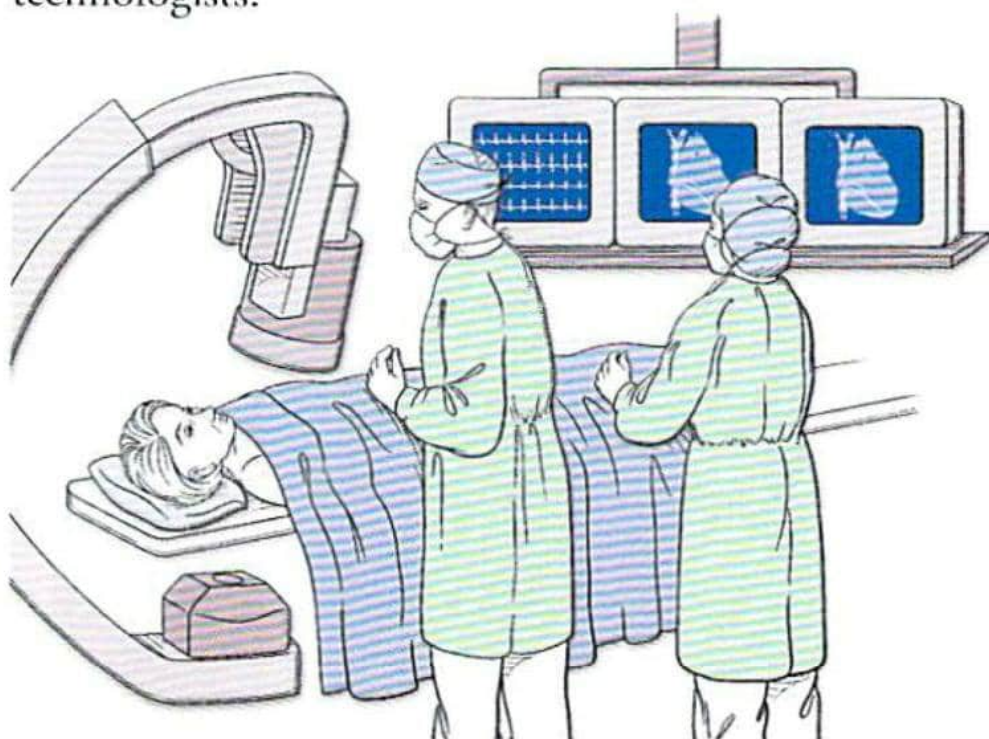
During Catheter Ablation

Before catheter ablation is performed, doctors need to do an electrophysiology study, or **EP study**, to help *diagnose* your arrhythmia. (Catheter ablation is done to *treat* the problem.)

The EP study and catheter ablation are alike in many ways. In fact, if you haven't already had an EP study, doctors may decide to do both procedures, one after the other, while you are in the EP lab. You will be told about this ahead of time.

You'll be taken to the EP lab in a wheelchair or on a movable bed. Then you'll be helped on to an x-ray table. The table has a large x-ray camera above it and television screens close by. There also are heart monitors and other instruments.

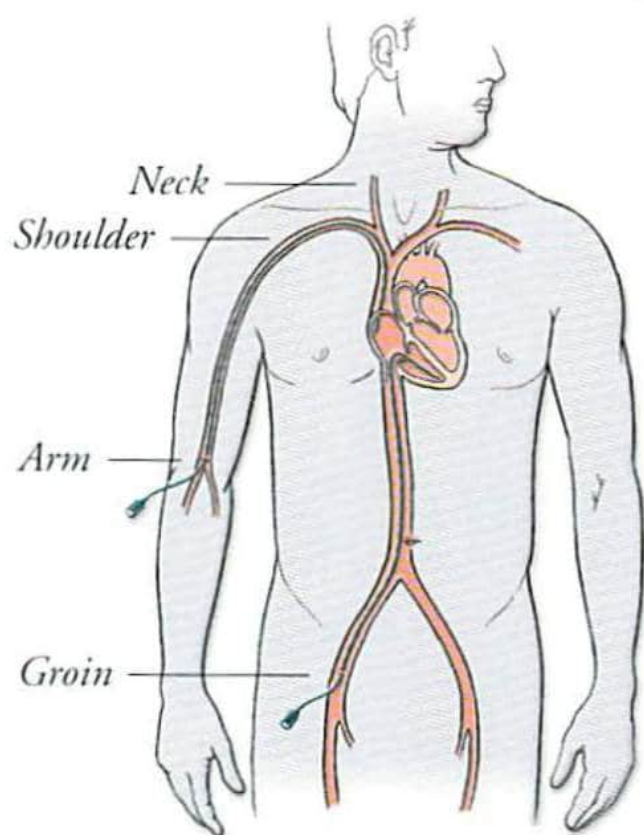
The EP lab team usually includes a specially trained doctor (electrophysiologist), an assistant, nurses, and technologists.



Once you are positioned on the x-ray table, you will be connected to several monitors and then covered with sterile sheets. The staff will be wearing sterile gowns, gloves, and possibly masks.

What Happens During the Procedure?

The site where the catheters will be inserted (usually the groin; sometimes the arm, shoulder, or neck) is cleansed with an antiseptic solution. A local anesthetic is then injected into the skin with a tiny needle to numb the area. This may cause a stinging sensation.



Possible sites where the catheters are inserted

A small incision is made in the skin, and a needle is used to puncture the blood vessel (usually a vein, occasionally an artery) where one or more catheters will be inserted.

The special **electrode catheters** used during the EP study are long, flexible wires that carry electrical impulses to and from the heart.

One or more catheters are inserted into the body and moved toward the heart, while the staff watches their progress on a television screen. The catheters are then put in place inside the heart chambers.

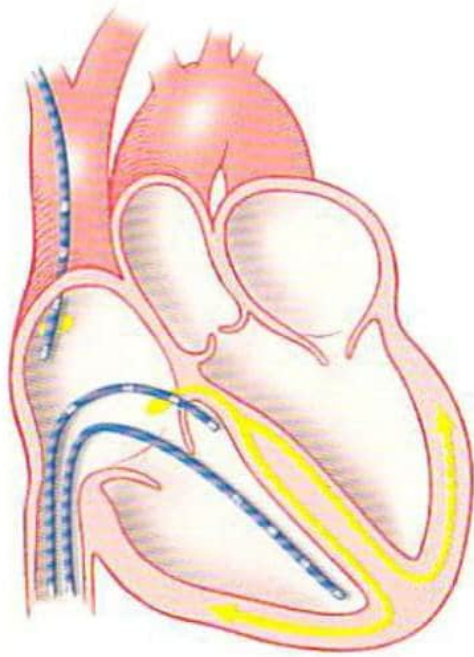
Electrophysiology (EP) Study

The EP study portion of the procedure is done to diagnose the abnormal pathway(s) in your heart's electrical system. In general terms, the EP study is performed by doing two basic things:

- *Recording Electrical Signals.* Electrode catheters sense electrical activity in areas of the heart and measure how fast these impulses travel.
- *Pacing the Heart.* Electrode catheters can also be used to deliver tiny electrical impulses to **pace** the heart (cause it to beat). By pacing the heart, doctors can **induce** (bring on) certain arrhythmias so that they can be watched in the EP lab.

Inducing arrhythmias in the EP lab *allows doctors to test how well antiarrhythmic drugs help your heart rhythm problem.*

The EP study also *helps determine the exact location of abnormal electrical pathways.* During the test, several electrode catheters are inserted into the heart to help pinpoint where the abnormal pathway is. This is called “**mapping.**”



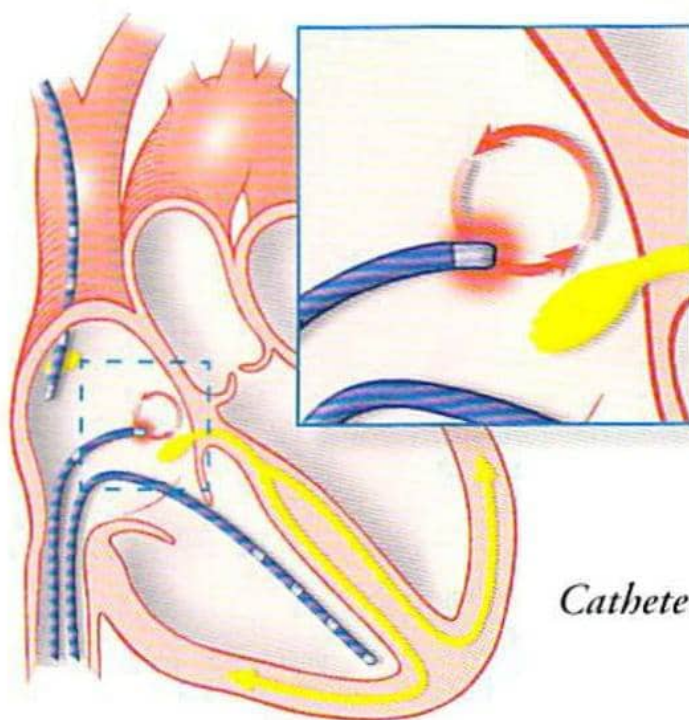
*Electrode catheters
inside the heart*

The EP study gives more accurate and more detailed information about your heart's electrical system than other diagnostic tests. The test results *can help your doctor decide which treatment would be best for you.*

Catheter Ablation

If the EP study shows that catheter ablation can best treat your heart rhythm problem, the doctors will do the ablation portion of the procedure while you are still in the EP lab.

During catheter ablation, doctors guide an **ablating electrode catheter** into the heart. They place the catheter so that it lies close to the abnormal electrical pathway that is causing the arrhythmia. Then they pass **radio-frequency energy** through the catheter.



Catheter ablation

The tip of the catheter heats up and destroys the small area of heart tissue that contains the abnormal electrical pathway (the rest of the heart muscle is unharmed). This causes a scar to form, and scar tissue cannot transmit electrical impulses. As a result, the pathway can no longer cause arrhythmias.

Here are a few examples of how catheter ablation is used to treat specific tachycardias.

- In **AV nodal re-entrant tachycardia** (see page 7), doctors first determine where the re-entry circuit is. Then they use an ablating catheter to destroy a part of the pathway that forms the circuit.
- In **tachycardia caused by an accessory pathway** (see page 7), doctors first do mapping to pinpoint where the accessory pathway lies. Then they use an ablating catheter to destroy the bridge of tissue where the accessory pathway is.

■ In **atrial fibrillation** (see page 8), doctors may use one of several ablation techniques to prevent a rapid heart rhythm. For example, doctors may:

- destroy the focus that is firing too rapidly and is triggering the fibrillation.
- create linear scars on the inside of the atria. This helps prevent abnormal electrical impulses from spreading to the atria.
- destroy the AV node *on purpose*, to prevent rapid electrical signals from reaching the ventricles. Because this often results in a slow heart rhythm, doctors also implant an artificial pacemaker. The pacemaker keeps the heart beating at a safe pace (see page 21).

■ In **ventricular tachycardia** (see page 9), doctors do mapping to determine the exact location of extra pathways. Then they use an ablating catheter to cause damage to multiple areas along those pathways. That way, electrical impulses can no longer pass through the extra pathways to trigger dangerous arrhythmias.

For patients who are at risk for sudden cardiac death, catheter ablation is often used along with an ICD (see page 10). Ablation makes tachycardia attacks happen less often. This, in turn, reduces the number of shocks a patient may receive from the ICD.

What You Can Expect

You will be given medication to help you relax and make you drowsy. You may be awake, or you may sleep through part or all of the procedure. The staff will be monitoring you at all times.

The procedure generally is *not painful*, although you may feel some pressure as the catheters are put in. You may also feel some discomfort from lying still for a long time.

During the procedure, doctors may pace your heart with tiny electrical impulses. You will not feel these impulses, but they may bring on the arrhythmia that has caused your symptoms in the past.

An arrhythmia brought on in the EP lab will often stop on its own. If a very fast rhythm does not stop, an electric shock may be delivered to the heart to restore a normal rhythm. You will not feel the shock because you will be sedated first.

The combined EP study and ablation procedure can take from 2 to 6 hours.

Is the Procedure Safe?

Because several catheters are inserted into the body, catheter ablation does have some risk. The *risk is small*, however, and the procedure is fairly safe.

Some people may have bleeding at the insertion site. Blood collects under the skin and causes swelling and/or bruising in the groin or arm.

More serious complications are rare. They include infection, blood clots, damage to the heart or blood vessels, collapsed lung, stroke, or heart attack. Death is very rare.

In some cases, there is a chance of damage to the AV node. This may result in a very slow heart rhythm. In that case, an artificial **pacemaker** may be needed. A pacemaker is a small device that is placed in the body. It sends tiny signals that keep the heart beating at the proper pace.

Most patients who have catheter ablation don't have serious complications. However, you should be aware of the risk involved. If you have any questions about your own risk, ask your doctor.

Potential Benefits

Catheter ablation is usually very effective. When it is used to treat some types of tachycardia, such as those caused by a re-entry circuit or an accessory pathway, the success rate is often better than 90 percent.

Catheter ablation is a relatively low-risk procedure that may cure your heart rhythm problem. It may allow you to avoid a lifetime of medications and to lead a more active and productive life.

After the Procedure

After the ablation procedure is over and the catheters have been removed, the doctor or nurse applies firm pressure to the insertion site for 10 to 20 minutes, to keep the site from bleeding.

Then you'll be taken to the recovery area or to your room. The nurse will apply a dressing or a small sandbag over the site.

You'll need to lie flat on your back for 4 to 6 hours, so that the insertion site can begin to heal properly. During that time, do not bend or lift the leg where the catheters were put in. To help prevent stiffness, you may move your foot or wiggle your toes.

The nurse will check your pulse and blood pressure often, and will also check the insertion site for bleeding. If you feel sudden pain at the site or if you notice bleeding, let the nurse know right away.

In most cases, your heart rhythm will be monitored overnight, to help determine how well the ablation worked. Usually, the doctor will visit you later that day or the next morning to talk about the results.

Most patients go home within a day or two after the procedure. Some patients may need to stay for more tests or treatments. Before you go home, you'll be given instructions about medications, activity, and follow-up care. When it's time to go, have a friend or family member drive you.

After You Go Home

- **Limit your activity** during the first couple of days at home. You can move about, but do not strain or lift heavy objects.
- **A bruise or a small lump** under the skin at the catheter insertion site is quite common. It should disappear within a few weeks.
- **Call your doctor or nurse** if the insertion site becomes painful or warm to the touch, the bruising or swelling increases, or you develop a fever that does not go away in 2 or 3 days.
- **Ask your doctor** when you can return to your normal activities, and whether there are things you should not do.
- For several weeks after your ablation, you may have **occasional skipped heartbeats**. You may also feel palpitations that last for 2 to 3 beats. These symptoms are common and will happen less often over time.
- **Call your doctor** if your rapid heart rhythm returns, or if you have dizzy spells, chest pain, or shortness of breath.
- Be sure to **check with your doctor or nurse about medications**—which ones to keep taking and which ones to stop.

Put your heart in the right place



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