

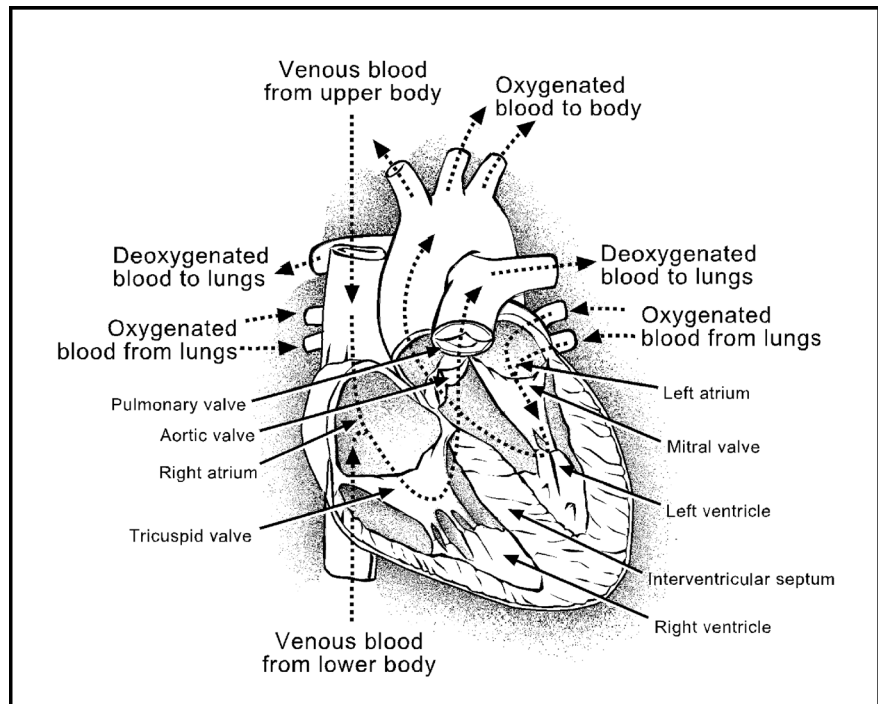


Electrophysiology

Arrhythmias

The pumping action of the heart is controlled by an electrical system inside the heart itself. Special cells in the heart send out electrical currents that stimulate the heart muscle and cause it to contract. These electric impulses can be recorded during an electrocardiogram (ECG). The rhythm of the heartbeat is usually regular. A very slow, rapid or irregular rhythm caused by a “timing problem” in the heart’s electrical system is called an *arrhythmia*.

If an arrhythmia occurs, it is important to determine what area of the heart is involved. Most times, arrhythmias are divided into two major categories, those that come from the ventricles (lower pumping chambers) and those that come from the atria (above the ventricles).



Blood flow through the four chambers of the heart.

Premature Ventricular Contractions (PVCs)

PVCs are the most common type of arrhythmia. They occur when an area in the heart's ventricle fires early or out of turn. These premature beats are often referred to as "skipped" or "extra" beats. If PVCs become frequent or occur in groups, palpitations or a fluttering feeling may result. If this occurs, call your doctor.

PVCs may be brought on by too much caffeine, tobacco, or alcohol. They may also accompany nervousness or fatigue.

Tachycardia

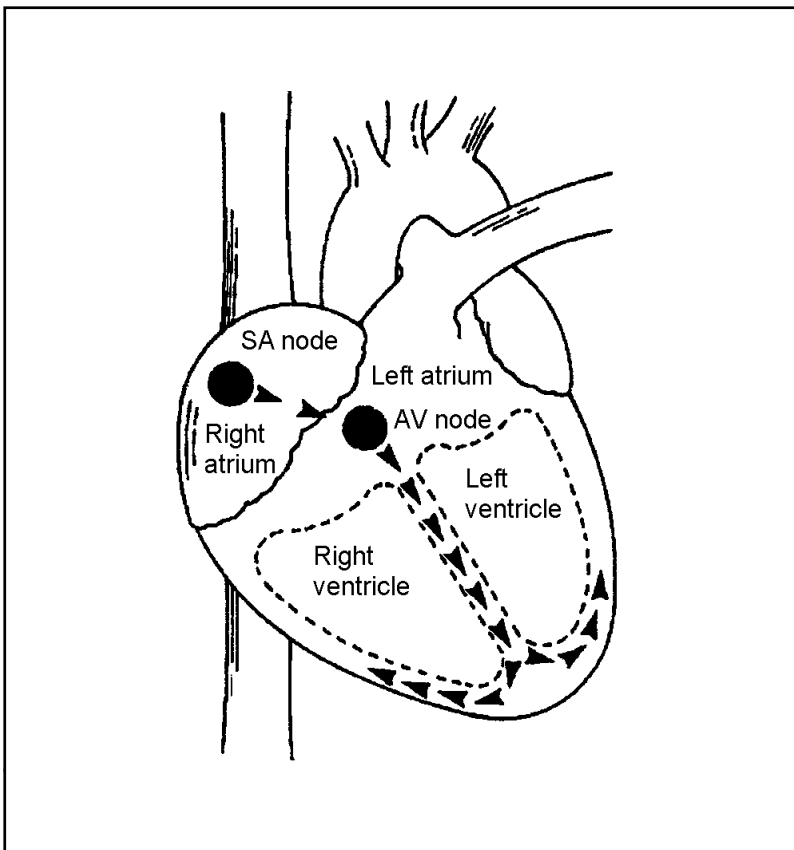
Tachycardia (rapid heart beat) may start above the ventricles, producing *supra ventricular tachycardia* (SVT) or, within the ventricles, producing *ventricular tachycardia* (VT). Patients with tachycardia may have symptoms such as:

- Lightheadedness
- Dizziness
- Palpitations
- Chest discomfort
- Sweating

Medical treatment may be needed if these episodes are prolonged, occur often, or involve very rapid heart rates. Treatment of tachycardia depends on the cause of the rapid heartbeat. Certain characteristics of the tachycardia will show whether medications, an implanted device, diagnostic studies, or surgery are needed.

There are many types of SVTs. Among them are:

- ***Atrial fibrillation/flutter*** – An abnormal, usually irregular rapid rhythm, which starts in the upper chambers of the heart.
- ***Ectopic atrial tachycardia (EAT)*** – A rapid rhythm starting from a single focus in the atrium, not the sinoatrial (SA) node.
- ***Atrioventricular nodal re-entry tachycardia (AVNRT)*** – A fast rhythm resulting from the presence of a "short circuit" near the atrioventricular (AV) node, which allows a circular rhythm pattern to occur.
- ***Wolff-Parkinson White syndrome*** – An abnormally fast rhythm that occurs when an electrical pathway uses both the normal AV node and an abnormal extra pathway connecting the atria and ventricles.



Electrical pathways through the heart.

Ventricular Fibrillation (VF)

Ventricular fibrillation, also known as cardiac arrest, sudden cardiac death, or VF arrest, is a chaotic electrical pattern that causes the heart to fibrillate, or quiver. As a result, your heart suddenly stops pumping blood, causing you to lose consciousness. This condition requires immediate cardiopulmonary resuscitation (CPR) until the delivery of an electric shock (defibrillation) can restore the normal heartbeat. Ventricular fibrillation should not be confused with the term “heart attack,” which has its own meaning.

EP Studies

An electrophysiology study (EP study) is a test used to check the electrical function of the heart. This is done by measuring the electrical signals inside the heart. EP studies are done to diagnose arrhythmias, check the effectiveness of antiarrhythmic drugs, and sometimes to treat arrhythmia.

The technique used for the EP study is similar to that used for a heart catheterization. It requires insertion of two or more catheters (long,

narrow, flexible tubes that detect electrical signals) into a blood vessel in the groin and/or shoulder.

Before the Study

The night before the EP study, no food or drink is allowed after midnight, except for sips of water with scheduled medications. Routine blood tests will be taken, as well as blood levels of any antiarrhythmic medications you may be taking.

During the EP Study

The EP lab is usually cool, and you will notice several large pieces of monitoring equipment. While lying on your back, you will be connected to two cardiac monitors, an ECG machine, and an oxygen monitoring device.

The EP study is done under sterile conditions. You will be covered with sterile drapes, exposing only the area where the catheters will be inserted. Prior to that, the insertion sites will be shaved and prepped with an antiseptic solution. A machine called a fluoroscope (X-ray) will be placed over you so the doctor can guide the catheters into the heart. Tell the doctor or nurse if there is **any** possibility that you may be pregnant.

You will be given medication to make you comfortable during the procedure. Before the catheters are inserted, a local anesthetic is given to numb the skin around the blood vessel. Patients often describe this insertion as “feeling like a bee sting.”

After the anesthetic has taken effect, you should feel only a slight sensation of pressure where the doctor is working. Your doctor will use the fluoroscope to carefully guide the catheters to the heart. Most patients do not feel the presence of the catheter in the heart.

Once the catheter is positioned in the heart, measurement of the heart’s electrical activity will begin. One of the catheters will be used as a pacemaker to control your heart rhythm. You may feel your heart beating faster when the doctor turns on the pacemaker. This may cause your arrhythmia to occur. This rhythm may return to normal on its own, or it may require electrical pacing to interrupt the rhythm, or an electric shock (defibrillation) to restore the heart’s normal rhythm. If your arrhythmia is triggered, you may feel the same symptoms you experienced in the past.

If you feel any pain, chest pressure, nausea, or dizziness, please tell your doctor. Keep in mind, you are in a controlled environment where highly skilled doctors and nurses will treat these symptoms right away.

After the information has been gathered, the catheters will be removed. To prevent bleeding, the doctor will apply firm pressure to the insertion site for about five minutes after the catheter has been removed.

After the EP Study

You will need to keep your leg straight and lie flat when the catheters are in the groin and for four to six hours after they have been removed. This will prevent bruising or bleeding. You may lie on either side, as long as you keep your leg straight.

Once you return to your room, your nurse will check often for bleeding at the catheter insertion site. Your heart rhythm and blood pressure will also be checked. Your doctor will come to talk with you and your family after the test. You will be allowed to eat and drink once the procedure is over.

Treatment for Arrhythmias

Medications

Medications that help control the heart's abnormal rhythm, called *antiarrhythmic drugs*, are used either alone or in combination with other treatments, such as surgery or an implanted device. If you receive antiarrhythmic drugs, a blood test to measure the amount of drug in your system may be done from time to time. Other tests (ECGs, Holter monitor recordings, chest X-rays, eye exams, breathing tests, etc.) may be done regularly to ensure the safety and effectiveness of the drugs you are taking.

Permanent Pacemaker

A permanent pacemaker is usually implanted to control a very slow heart rhythm. Under local anesthesia, a small incision is made just beneath the collarbone, usually on the left side. A pacemaker electrode, or soft wire, is inserted into a vein and then advanced to the lower chamber (right ventricle) of the heart. Some patients require an additional electrode for the right upper chamber (atrium). The electrode(s) is connected to a battery-powered pulse generator, which is placed under the skin. You will be awake during this procedure, which takes one to four hours to complete. Medication will be given to keep you comfortable.

After the pacemaker has been implanted, you will return to your room, where your heart rhythm will be monitored. To reduce the risk of dislodging the electrode, an arm sling and/or bed rest may be ordered. You may also be asked not to raise your arm greater than 90 degrees during your recovery phase.

Implantable Defibrillator System (IDS)

The implantable defibrillator system (IDS) is a device designed to treat life-threatening heart rhythms. It is used to treat patients with symptomatic or uncontrollable ventricular tachycardia and to protect patients who have had a cardiac arrest or ventricular fibrillation. When the defibrillator detects VT or ventricular fibrillation, it delivers electrical energy to your heart in an attempt to restore normal rhythm.

Defibrillators may vary in name because they are made by different companies. Devices from different companies have slightly different programming.

A defibrillator system has two main parts – a pulse generator and the lead system that connects the generator to your heart. The pulse generator monitors your heart rhythm. When it detects an arrhythmia, the pulse generator sends an electrical current to your heart to restore a more normal rhythm. The therapy used is either a pre-programmed pacing therapy, or an “internal” shock. The pulse generator is usually implanted under the skin or muscles below your left collarbone.

The IDS is implanted in the operating room under general anesthesia. During the procedure, your doctor will trigger your arrhythmia to ensure that the device will detect it and treat it correctly.

Patient follow-up involves having the defibrillator checked with a computer programmer in the cardiology diagnostic center every three or four months, depending on the type of defibrillator system. Call your doctor right away any time you receive a shock from your defibrillator.

Catheter Ablation Procedure

Patients with Wolff-Parkinson-White (WPW) syndrome and AVNRT have an accessory or extra pathway between the atrium and the ventricle, which may result in supra-ventricular tachycardias (SVTs), or very fast heartbeats. Medications may control these arrhythmias if they are not frequent.

Another treatment option for this ailment may be the catheter ablation procedure. Catheter ablation is done by using radio frequency energy to interrupt the extra pathway that allows tachycardia to occur.

An extra pathway can sometimes be detected on an ECG, though its exact location can only be determined from an EP study. Catheter ablation is similar to a baseline EP study. You will have catheters placed in your groin and in a vessel below your collarbone. These insertions are done so a special catheter, through which radio frequency waves are transmitted, can be directed to the precise location of the extra pathway. This will cause the area to “scar,”

Questions ?

Call 206-598-4300

Your questions are important. Call your doctor or health care provider if you have questions or concerns. UWMC Clinic staff are also available to help at any time.

Cardiology Clinic
206-598-4300

EP Lab
206-598-4555

After hours, call the 206-598-6190 and ask the paging operator to page the EPS fellow on call or EPS attending.

preventing impulses from traveling over this pathway. The procedure lasts about four to eight hours, and you will receive sedation to ensure your comfort.

After the procedure, a chest X-ray is taken, and often an echocardiogram will be done the next day. As with an EP study, you will remain flat in bed for four to six hours. You may feel drowsy when you return to your room. If desired, you may eat and drink liquids.

Your follow-up visit will be with your regular cardiologist. Call your doctor if you:

- Notice tachycardia
- Feel dizzy
- Feel lightheaded
- Feel like you might pass out

UNIVERSITY OF WASHINGTON
MEDICAL CENTER

UW Medicine

Cardiac Services

Box 356087

1959 N.E. Pacific St. Seattle, WA 98195
206-598-4300