

Electrophysiology (EP) Study

Highly trained specialists perform EP studies in a specially designed EP lab outfitted with advanced technology and equipment.



Normally, electricity flows throughout the heart in a regular, measured pattern. This electrical system brings about coordinated heart muscle contractions. A problem anywhere along the electrical pathway causes an arrhythmia, or heart rhythm disturbance. By accurately diagnosing the precise cause of an arrhythmia, it is possible to select the best possible treatment.

Why an EP study?

While electrocardiograms (ECGs or EKGs) are important tests of the heart's electrical system, they provide only a brief snapshot of the heart's electrical activity. Arrhythmias can be unpredictable and intermittent, which makes it unlikely that an electrocardiogram will capture the underlying electrical pathway problem. Even tests that stretch over longer time periods, such as Holter monitoring, may not capture an event.

During an EP study, a specially trained cardiac specialist may provoke arrhythmia events and collect data about the flow of electricity during actual events. As a result, EP studies can diagnose the cause and precise location of the arrhythmia. This detailed electrical flow information provides valuable

The Value of an EP Study

An electrophysiology, or EP, study provides information that is key to diagnosing and treating arrhythmias. Although it is more invasive than an electrocardiogram (ECG) or echocardiogram, and involves provoking arrhythmias, the test produces data that makes it possible to :

- Diagnose the source of arrhythmia symptoms
- Evaluate the effectiveness of certain medications in controlling the heart rhythm disorder
- Predict the risk of a future cardiac event, such as Sudden Cardiac Death
- Assess the need for an implantable device (a pacemaker or ICD) or treatment procedure (radiofrequency catheter ablation)

diagnostic and, therefore, treatment information.

EP studies most often are recommended for patients with symptoms suggesting heart rhythm disorders or for people who may be at risk for Sudden Cardiac Death (cardiac arrest).

An overview of the procedure

While ECGs are non-invasive, an EP study is somewhat invasive. The study is performed after giving local anesthesia and conscious sedation (twilight sleep) to keep the patient as comfortable as possible. The procedure involves inserting several catheters – narrow, flexible tubes – attached to electricity-monitoring electrodes, into a blood vessel in the groin or neck, and advancing the catheters up into the heart. The journey from entry point to heart muscle is navigated by images created by a fluoroscope, an x-ray-like machine that provides continuous, “live” images of the catheter and heart muscle.

Once the catheter reaches the heart, electrodes at its tip gather data and a variety of electrical measurements are made. These data pinpoint the location of the faulty electrical site. During this “electrical mapping,” the cardiac arrhythmia specialist, an electrophysiologist, may instigate, through pacing (the use of tiny

electrical impulses), some of the very arrhythmias that are the crux of the problem. The events are safe, given the range of experts and resources close at hand, and are necessary to make the correct diagnosis and track down the precise location of the problematic tissue causing the arrhythmia.

Once the correct diagnosis has been established, the electrophysiologist will decide how best to treat the arrhythmia, by medications, catheter ablation (burning the source of arrhythmia), or by placing a pacemaker or implantable cardioverter device (ICD).

Throughout the EP study, the patient is sedated but awake and remains still. Patients rarely report pain, more often describing what they feel as discomfort. Some watch the procedure on monitors and occasionally ask questions. Others sleep. The procedure usually takes about two hours. The patient remains still for four to six hours afterward to ensure the blood vessel puncture sites heal properly. Once mobile again, patients may feel stiff and achy from lying still for hours.

Who performs the test and where?

Since potentially dangerous arrhythmias are provoked during an EP study, it is crucial that specialized staff is present to handle all situations. A physician electrophysiolo-

gist, with advanced training in the diagnosis and treatment of heart rhythm problems, performs the EP study. The electrophysiologist leads a team of specially trained health care professionals, technicians and nurses, who assist during the procedure. The team performs the EP study in an electrophysiology laboratory, or EP lab, a well-equipped, controlled clinical environment usually located within a hospital. As a result, the test is quite safe and complications are rare.

The Importance of the Flow of Electricity

Each heart has its own normal rhythm brought about by the seamless flow of electrical impulses throughout the organ. This electrical flow begins in the heart’s natural “pacemaker” (also known as the sinoatrial node or sinus node) in the upper right heart chamber, the right atrium. The electricity flows through the upper chambers (atria), crosses the bridge between upper and lower chambers (atrioventricular node) and travels to the lower chambers (ventricles).

The passage of electricity culminates in a carefully coordinated contraction of heart muscle that pumps blood through the human body. Problems in the precise flow of electricity are the cause of arrhythmias.