TEST

Intracardiac electrophysiology study

An invasive test that records and stimulates electrical signals inside the heart.

WHAT IT MEASURES
How heart signals travel and trigger abnormal rhythms

SAMPLE
None; catheter electrodes record signals inside the heart

FASTING NEEDED?
Sometimes, usually before sedation; follow your centre's instructions

HOW LONG IT TAKES
About one to four hours, longer if treatment follows

RESULTS IN
Initial findings immediately; final report varies by electrophysiology laboratory

USED FOR
Diagnosing arrhythmias, assessing risk, and guiding treatment

MAIN LIMITATION
Intermittent arrhythmias may not be triggered during the study

Overview

An intracardiac electrophysiology study, usually called an EPS, examines the heart's electrical system from inside the heart. It is an invasive test performed in a specialist electrophysiology laboratory.

Thin, flexible tubes called catheters are passed through a blood vessel, usually from the groin, and guided into the heart. Electrodes at their tips record electrical signals. They can also deliver carefully timed impulses to see how the heart responds.

An EPS can show where an abnormal rhythm starts, how electrical signals travel, and whether a rhythm can be triggered. This information may help explain symptoms, assess the risk from certain rhythm disorders, or guide treatment.

An EPS is not the same as catheter ablation. An EPS gathers information; ablation treats abnormal heart tissue using heat, freezing, or another energy source. Both may be performed during the same appointment if this has been discussed and you have consented.

Why the test is ordered

Your cardiology team may recommend an EPS when less invasive tests have not provided enough information or when detailed electrical mapping is needed.

Reasons can include:

Palpitations alone do not always require an EPS. An electrocardiogram, wearable monitor, event monitor, or implantable loop recorder may be a more suitable first test because these record the heart during everyday life.

- Identifying the cause of a documented fast heart rhythm
- Locating an extra electrical pathway in the heart
- Investigating fainting when a heart rhythm problem is suspected
- Assessing how well electrical signals pass through the heart
- Evaluating the risk of certain dangerous ventricular rhythms
- Planning or guiding catheter ablation
- Checking whether a treatment has corrected a known rhythm problem

Who should have the test

An EPS is not a routine screening test. It is considered when the result is likely to change diagnosis, risk assessment, or treatment.

It may be appropriate if you have a known or strongly suspected arrhythmia, particularly when doctors need to identify its exact source. It may also be used in selected people with unexplained fainting, abnormal electrical conduction, an extra pathway, or structural heart disease.

The decision should take account of your symptoms, previous heart recordings, other medical conditions, and what would happen after each possible result. Pregnancy, bleeding problems, kidney disease, allergies, implanted heart devices, and previous reactions to sedation may affect planning.

How to prepare

Follow the instructions from your electrophysiology centre. Preparation is not identical everywhere, especially when sedation or a same-day ablation is planned.

You may be asked not to eat or drink for several hours. Clear-liquid rules can differ, so use the times in your appointment letter rather than a general fasting rule.

Give the team a current list of medicines and supplements. Medicines that control heart rhythm can make an arrhythmia harder to trigger. Blood thinners like warfarin or apixaban affect bleeding risk. Do not stop either type unless the specialist team gives you specific instructions.

Tell the team if you:

Arrange transport home if sedation is planned. You may also need someone to stay with you for a period afterward, according to the centre's instructions.

- Could be pregnant
- Have kidney problems or diabetes
- Take blood-thinning or heart-rhythm medicines
- Have allergies to medicines, adhesives, latex, or contrast dye
- Have an infection, fever, or new illness
- Have previously reacted badly to sedation or anaesthesia

What happens during the test

You will change into a hospital gown and have monitoring pads placed on your chest. A small intravenous line is usually inserted for medicines and fluids.

The skin over the catheter entry site is cleaned and numbed with local anaesthetic. Sedation may help you relax, although some studies use deeper sedation or general anaesthesia. You may feel pressure during catheter placement, but tell the team if you have pain.

The doctor inserts one or more catheters into a vein, commonly in the groin. Imaging and electrical mapping help guide them into position. X-rays may be used, although modern mapping systems can reduce the amount needed.

The catheters record signals from different areas of the heart. The team then sends programmed electrical impulses to change the heartbeat and try to reproduce the suspected arrhythmia. Medicines may also be given to make a rhythm easier to start or stop.

You may notice brief palpitations or a racing heartbeat. If a sustained rhythm is triggered, the team can usually stop it with pacing, medicine, or an electrical shock if needed.

Once testing is complete, the catheters are removed and pressure is applied to the entry site. If an arrhythmia is identified, ablation may be performed during the same session when this

was planned and consented to beforehand.

Understanding your results

There is no single normal EPS result. The study produces electrical recordings, timing measurements, pacing responses, and observations about whether an arrhythmia could be started and stopped.

The report may describe:

If the suspected rhythm is reproduced, the electrical pattern may identify its mechanism and guide treatment. If no rhythm is triggered, this can be reassuring in some situations, but it does not always rule out an intermittent arrhythmia.

Measured intervals and their meaning can vary by electrophysiology laboratory, age, sex, pregnancy status, medicines, and clinical context. Results are interpreted alongside your symptoms, ECGs, imaging, and previous rhythm recordings.

- Where an abnormal rhythm begins
- Whether an extra electrical pathway is present
- How quickly signals pass through the heart
- Whether conduction is delayed or blocked
- Which pacing pattern triggered an arrhythmia
- Whether an ablation successfully stopped the abnormal pathway

What affects the results

The main influence is whether the relevant rhythm occurs or can be triggered during the study. An arrhythmia that happens rarely may not appear under laboratory conditions.

Other influences include:

Kidney function usually does not directly change the electrical recordings. It can affect the choice of medicines and the use of contrast dye if contrast is needed.

- Heart-rhythm medicines: These may suppress an arrhythmia or change conduction times.
- Other heart medicines: Beta blockers and some calcium-channel blockers can slow electrical conduction.
- Sedation: Sedatives can alter heart rate and the nervous system's effect on the heart.

- Pacing protocol: Different stimulation sites and timing patterns may produce different responses.
- Electrolyte levels: Abnormal potassium, magnesium, or calcium can affect electrical activity.
- Acute illness: Fever, dehydration, pain, and stress can change heart rate and rhythm.
- Caffeine, nicotine, and stimulants like methylphenidate or lisdexamfetamine : These can influence heart rate, although their effect on a particular EPS is not predictable.
- Pregnancy: Pregnancy changes circulation and affects decisions about medicines and radiation exposure.
- Previous procedures or heart damage: Scar tissue can alter electrical pathways and mapping.

Accuracy and limitations

An EPS can define the source and pathway of an arrhythmia very precisely when that rhythm is successfully reproduced. It is especially useful when treatment requires exact electrical mapping.

Its accuracy is not described by one percentage because it is used for several different questions and pacing methods. How well it detects a problem depends on the suspected rhythm, underlying heart disease, medicines, and testing protocol.

The study can miss a genuine problem if the arrhythmia is intermittent or cannot be triggered. A normal study therefore does not guarantee that future palpitations or fainting are unrelated to heart rhythm.

The opposite can also happen. Aggressive pacing may trigger a rhythm that would not normally occur outside the laboratory. Doctors judge whether an induced rhythm matches your symptoms and previous ECG recordings rather than treating every triggered rhythm as meaningful.

An ambulatory ECG or implantable loop recorder may be better for capturing unpredictable symptoms during normal life. Heart imaging is better for examining structure, while genetic testing may be considered for selected inherited rhythm conditions. These tests answer different questions and may be used together.

Risks and complications

A small bruise, tenderness, or minor bleeding at the catheter site is common after the procedure. Some people feel light-headed because of fasting, sedation, or lying still.

Less common complications include damage to a blood vessel, infection, a blood clot, or an abnormal rhythm requiring urgent treatment. Rarely, a catheter can damage the heart wall or valve, cause fluid to collect around the heart, or contribute to a stroke or heart attack. Sedation can affect breathing or blood pressure.

The procedure may involve a small amount of radiation. Contrast dye is not always needed, but if it is used, allergic reactions or kidney effects are possible.

After going home, seek emergency help for severe chest pain, major breathing difficulty, fainting, stroke symptoms, or bleeding that does not stop with firm pressure. Rapidly increasing swelling at the catheter site also needs urgent assessment.

A small stable bruise or mild soreness usually needs routine follow-up rather than emergency care. Contact the procedure team promptly for increasing pain, redness, drainage, fever, new leg swelling, or repeated palpitations.

What happens next

You will be monitored while the sedation wears off. If the catheter entered through the groin, you may need to keep the leg straight for a period to reduce bleeding.

The doctor may discuss the main findings before you leave. A final report may follow after all recordings have been reviewed.

Your next step may be routine follow-up, a change in medicine, catheter ablation, a pacemaker or defibrillator discussion, or further monitoring. Sometimes no treatment is needed immediately.

Follow the written instructions about driving, work, bathing, wound care, exercise, and restarting medicines. Restrictions are often longer if ablation was performed or if there was a complication.

Common questions

Can I drink coffee before an EPS?

Not unless your instructions allow it. You may need to fast, and caffeine can affect heart rate. Ask the electrophysiology centre if the written instructions do not mention coffee.

Does the time of day matter?

Usually less than fasting, medicine timing, and the testing protocol. Take medicines only as instructed, even if the appointment changes your usual schedule.

Can I exercise beforehand?

Routine activity may be acceptable, but avoid arriving dehydrated or exhausted. Ask about strenuous exercise because it can temporarily alter heart rate and fluid balance.

Will I be awake?

Many people receive local anaesthetic and sedation and remain partly awake. Deeper sedation or general anaesthesia may be used depending on the procedure and centre.

Is an EPS the same as an ablation?

No. An EPS tests the heart's electrical system. Ablation treats tissue causing an abnormal rhythm, although it may follow immediately after the study.

Does a normal result rule out an arrhythmia?

No. An intermittent rhythm can be missed if it does not occur or cannot be triggered. Longer-term rhythm monitoring may still be useful.

Sources

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