





changing and growing with you





PACEMAKER/ IMPLANTABLE CARDIOVERTER DEFIBRILLATOR (ICD) Insertion

SINGLE-CHAMBER PACEMAKER

Superior Vena Cava

> Left Subclavian Vein

Right Atrium •

Tricuspid Valve -

Right Ventricle

PROCEDURE OVERVIEW

What is a pacemaker/implantable cardioverter defibrillator (ICD) insertion? A pacemaker/implantable cardioverter defibrillator (ICD) insertion is a procedure in which a pacemaker and/or an ICD is inserted to assist in regulating problems with the heart rate (pacemaker) or heart rhythm (ICD).

Pacemaker: When a problem develops with the heart's rhythm, such as a slow rhythm, a pacemaker may be selected for treatment. A pacemaker is a small electronic device composed of three parts: a generator, one or more leads, and an electrode on each lead. A pacemaker signals the heart to beat when the heartbeat is too slow.

A generator is the "brain" of the pacemaker device. It is a small metal case that contains electronic circuitry and a battery. The lead (or leads) is an insulated wire that is connected to the generator on one end, with the other end placed inside one of the heart's chambers. The electrode on the end of the lead touches the heart wall. In most pacemakers, the lead senses the heart's electrical activity. This information is relayed to the generator by the lead.

If the heart's rate is slower than the programmed limit, an electrical impulse is sent through the lead to the electrode and the pacemaker's electrical impulse causes the heart to beat at a faster rate.

When the heart is beating at a rate faster than the programmed limit, the pacemaker will monitor the heart rate, but will not pace, (force a beat). No electrical impulses will be sent to the heart unless the heart's natural rate falls below the pacemaker's low limit.

A new type of pacemaker, called a biventricular pacemaker, is currently used in the treatment of congestive heart failure. Sometimes in heart failure, the two ventricles (lower heart chambers) do not pump together in a normal manner. When this happens, less blood is pumped by the heart. A biventricular pacemaker paces both ventricles at the same time, increasing the amount of blood pumped by the heart. This type of treatment is called cardiac resynchronization therapy.

Implantable cardioverter defibrillator (ICD): An implantable cardioverter defibrillator (ICD) looks very similar to a pacemaker, except that it is slightly larger and is designed to deliver an electrical shock to the heart when the heart rate becomes dangerously fast, or "fibrillates."

An ICD senses when the heart is beating too fast and delivers an electrical shock to convert the fast rhythm to a normal rhythm. Some devices combine a pacemaker and ICD in one unit for persons who need both functions.



The ICD has another type of treatment for certain fast rhythms called anti-tachycardia pacing (ATP). When ATP is used, a fast pacing impulse is sent to correct the rhythm. After the shock is delivered, a "back-up" pacing mode is used if needed for a short while.

The procedure for inserting a pacemaker or an ICD is the same. The procedure generally is performed in a cardiac catheterization lab.

Other related procedures that may be used to assess the heart include resting and exercise electrocardiogram (ECG), Holter monitor, signal-averaged ECG, cardiac catheterization, chest x-ray, computed tomography (CT scan) of the chest, echocardiography, electrophysiology studies, magnetic resonance imaging (MRI) of the heart, myocardial perfusion scans, and radionuclide angiography.



The heart's electrical conduction system: The heart is, in the simplest terms, a pump made up of muscle tissue. Like all pumps, the heart requires a source of energy in order to function. The heart's pumping energy comes from an indwelling electrical conduction system.

An electrical stimulus is generated by the sinus node (also called the sinoatrial node, or SA node), which is a small mass of specialized tissue located in the right atrium (right upper chamber) of the heart. The sinus node generates an electrical stimulus regularly at 60 to 100 times per minute under normal conditions. This electrical stimulus travels down through the conduction pathways (similar to the way electricity flows through power lines from the power plant to your house) and causes the heart's chambers to contract and pump out blood. The right and left atria (the two upper chambers of the heart) are stimulated first and contract a short period of time before the right and left ventricles (the two lower chambers of the heart). The electrical impulse travels from the sinus node to the atrioventricular (AV) node, where it stops for a very short period, then continues down the conduction pathways via the "bundle of His" into the ventricles. The bundle of His divides into right and left pathways to provide electrical stimulation to both ventricles.

What is an ECG?

The electrical activity of the heart is measured by an electrocardiogram (ECG or EKG). By placing electrodes at specific locations on the body (chest, arms, and legs), a tracing of the electrical activity can be obtained. Changes in an ECG from the normal tracing can indicate one or more of several heart-related conditions.

Dysrhythmias/arrhythmias (abnormal heart rhythms) are diagnosed by methods such as EKG, Holter monitoring, signal-average EKG, or electrophysiological studies. These symptoms may be treated with medication or procedures such as a cardiac ablation (removal of a location in the heart that is causing a dysrhythmia by freezing or radiofrequency)



REASONS FOR THE PROCEDURE

A pacemaker may be inserted in order to provide stimulation for a faster heart rate when the heart is beating too slowly, and when other treatment methods, such as medication, have not improved the heart rate.

An ICD may be inserted in order to provide fast pacing (ATP), cardioversion (small shock), or defibrillation (larger shock) when the heart beats too fast.

Problems with the heart rhythm may cause difficulties because the heart is unable to pump an adequate amount of blood to the body. If the heart rate is too slow, the blood is pumped too slowly. If the heart rate is too fast or too irregular, the heart chambers are unable to fill up with enough blood to pump out with each beat. When the body does not receive enough blood, symptoms such as fatigue, shortness of breath, palpitations, dizziness, fainting, and/or chest pain may occur. Some examples of rhythm problems for which a pacemaker or ICD might be inserted include:

- atrial fibrillation occurs when the atria beat irregularly and too fast
- ventricular fibrillation occurs when the ventricles beat irregularly and too fast
- bradycardia occurs when the heart beats too slow
- tachycardia occurs when the heart beats too fast
- heart block occurs when the electrical signal is delayed after leaving the SA node; there are several types of heart blocks, and each one has a distinctive ECG tracing

Some of these rhythms are life-threatening. Some rhythms occur naturally, while some may be a complication from other health issues or caused by invasive procedures. Some rhythms may occur periodically in the beginning and worsen over time. There may be other reasons for your physician to recommend a pacemaker or ICD insertion.

RISKS OF THE PROCEDURE

Possible risks of pacemaker or ICD insertion include, but are not limited to, the following:

- bleeding from the incision or catheter insertion site
- damage to the vessel at the catheter insertion site
- infection of the incision or catheter site
- pneumothorax air becomes trapped in the pleural space causing the lung to collapse

If you are pregnant or suspect that you may be pregnant, you should notify your physician. If you are lactating, or breastfeeding, you should notify your physician. Patients who are allergic to or sensitive to medications or latex should notify their physician.

For some patients, having to lie still on the procedure table for the length of the procedure may cause some discomfort or pain.

There may be other risks depending upon your specific medical condition. Be sure to discuss any concerns with your physician prior to the procedure.

BEFORE THE PROCEDURE

- Your physician will explain the procedure to you and offer you the opportunity to ask any questions that you might have about the procedure.
- You will be asked to sign a consent form that gives your permission to do the test. Read the form carefully and ask questions if something is not clear.
- You will need to fast for a certain period of time prior to the procedure. Your physician will notify you how long to fast, usually overnight.
- If you are pregnant or suspect that you are pregnant, you should notify your physician.
- Notify your physician if you are sensitive to or are allergic to any medications, iodine, latex, tape, or anesthetic agents (local and general).
- Notify your physician of all medications (prescription and over-the-counter) and herbal supplements that you are taking.
- Notify your physician if you have heart valve disease, as you may need to receive an antibiotic prior to the procedure.
- Notify your physician if you have a history of bleeding disorders or if you are taking any anticoagulant (blood-thinning) medications, aspirin, or other medications that affect blood clotting. It may be necessary for you to stop some of these medications prior to the procedure.



- Your physician may request a blood test prior to the procedure to determine how long it takes your blood to clot. Other blood tests may be done as well.
- You may receive a sedative prior to the procedure to help you relax. If a sedative is given, you will need someone to drive you home afterwards.
- The upper chest may be shaved or clipped prior to the procedure.
- Based upon your medical condition, your physician may request other specific preparation.

DURING THE PROCEDURE

Chest X-ray with Implanted Pacemaker

A pacemaker or implanted cardioverter defibrillator may be performed on an outpatient basis or as part of your stay in a hospital. Procedures may vary depending on your condition and your physician's practices.

Generally, a pacemaker or ICD insertion follows this process:

1. You will be asked to remove any jewelry or other objects that may interfere with the procedure.

2. You will be asked to remove your clothing and will be given a gown to wear.

3. You will be asked to empty your bladder prior to the procedure.

4. An intravenous (IV) line will be started in your hand or arm prior to the procedure for injection of medication and to administer IV fluids, if needed.

5. You will be placed in a supine (on your back) position on the procedure table.

6. You will be connected to an electrocardiogram (ECG or EKG) monitor that records the electrical activity of the heart and monitors the heart during the procedure using small, adhesive electrodes. Your vital signs (heart rate, blood pressure, breathing rate, and oxygenation level) will be monitored during the procedure.

7. Large electrode pads will be placed on the front and back of the chest.

8. You will receive a sedative medication in your IV before the procedure to help you relax. However, you will likely remain awake during the procedure.



9. The pacemaker or ICD insertion site will be cleansed with antiseptic soap.

10. Sterile towels and a sheet will be placed around this area.

11. A local anesthetic will be injected into the skin at the insertion site.

12. Once the anesthetic has taken effect, the physician will make a small incision at the insertion site.

13. A sheath, or introducer, is inserted into a blood vessel, usually under the collarbone. The sheath is a plastic tube through which the pacer/ICD lead wire will be inserted into the blood vessel and advanced into the heart.

14. It will be very important for you to remain still during the procedure so that the catheter placement will not be disturbed and to prevent damage to the insertion site.

15. The lead wire will be inserted through the introducer into the blood vessel. The physician will advance the lead wire through the blood vessel into the heart.

16. Once the lead wire is inside the heart, it will be tested to verify proper location and that it works. There may be one, two, or three lead wires inserted, depending on the type of device your physician has chosen for your condition. Fluoroscopy, (a special type of x-ray that will be displayed on a TV monitor), may be used to assist in testing the location of the leads.

17. Once the lead wire has been tested, an incision will be made close to the location of the catheter insertion (just under the collarbone). You will receive local anesthetic medication before the incision is made.

18. The pacemaker/ICD generator will be slipped under the skin through the incision after the lead wire is attached to the generator.

19. The ECG will be observed to ensure that the pacer is working correctly.

20. The skin incision will be closed with sutures, adhesive strips, or a special glue.

21. A sterile bandage/dressing will be applied.

AFTER THE PROCEDURE

In the hospital: After the procedure, you may be taken to the recovery room for observation or returned to your hospital room. A nurse will monitor your vital signs for a specified period of time.

- You should immediately inform your nurse if you feel any chest pain or tightness, or any other pain at the incision site. After the specified period of bed rest has been completed, you may get out of bed. The nurse will assist you the first time you get up, and will check your blood pressure while you are lying in bed, sitting, and standing.
- You should move slowly when getting up from the bed to avoid any dizziness from the period of bed rest.
- You will be able to eat or drink once you are completely awake.

The insertion site may be sore or painful, but pain medication may be administered if needed. Your physician will visit with you in your room while you are recovering. The physician will give you specific instructions and answer any questions you may have. Once your blood pressure, pulse, and breathing are stable and you are alert, you will be taken to your hospital room or discharged home.

If the procedure is performed on an outpatient basis, you may be allowed to leave after you have completed the recovery process. However, if there are concerns or problems with your rhythm, you may stay in the hospital for an additional day (or longer) for monitoring of the rhythm.

You should arrange to have someone drive you home from the hospital following your procedure.

At home: You should be able to return to your daily routine within a few days. Your physician will tell you if you will need to take more time in returning to your normal activities. In addition, you should not do any lifting or pulling on anything for a few weeks. You may be instructed not to lift your arms above your head for a period of time.

- You will most likely be able to resume your usual diet, unless your physician instructs you differently.
- It will be important to keep the insertion site clean and dry. You will be given specific bathing instructions.
- You will be given specific instructions about driving. If you had an ICD, you will not be able to drive until your physician gives you approval. Your physician will explain these limitations to you, if they are applicable to your situation.
- You will be given specific instructions about what to do if your ICD discharges a shock. For example, you may be instructed to call your physician, dial 911 or go to the nearest emergency room in the event of a shock from the ICD.

Ask your physician when you will be able to return to work. The nature of your occupation, your overall health status, and your progress will determine how soon you may return to work.

Notify your physician to report any of the following:

- fever and/or chills
- increased pain, redness, swelling, or bleeding or other drainage from the insertion site
- chest pain/pressure, nausea and/or vomiting, profuse sweating, dizziness and/or fainting
- palpitations

Your physician may give you additional or alternate instructions after the procedure, depending on your particular situation.

PACEMAKER/ICD PRECAUTIONS:

The following precautions should always be considered. Discuss the following in detail with your physician, or call the company that made your device:

- Always carry an ID card that states you are wearing a pacemaker or an ICD. In addition, you should wear a medical identification bracelet that states you have a pacemaker or ICD.
- Use caution when going through airport security detectors. Check with your physician about the safety of going through such detectors with your type of pacemaker. In particular, you may need to avoid being screened by hand-held detector devices, as these devices may affect your pacemaker.
- You should avoid large magnetic fields, including an MRI procedure.
- Abstain from diathermy (the use of heat in physical therapy to treat muscles).
- Turn off large motors, such as cars or boats, when working on them (they may temporarily "confuse" your device).
- Avoid certain high-voltage or radar machinery, such as radio or television transmitters, electric arc welders, high-tension wires, radar installations, or smelting furnaces.
- If you are having a surgical procedure performed by a surgeon or dentist, tell your surgeon or dentist that you have a pacemaker or ICD, so that electrocautery will not be used to control bleeding (the electrocautery device can change the pacemaker settings).
- You may have to take antibiotic medication before any medically invasive procedure to prevent infections that may affect the pacemaker.
- Always consult your physician if you have any questions concerning the use of certain equipment near your pacemaker.
- When involved in a physical, recreational, or sporting activity, you should avoid receiving a blow to the skin over the pacemaker or ICD. A blow to the chest near the pacemaker or ICD can affect its functioning. If you do receive a blow to that area, see your physician.
- Always consult your physician when you feel ill after an activity, or when you have questions about beginning a new activity.

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to diagnose or treat a health problem or disease, or replace the professional medical advice you receive from your physician.

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