

Heart rhythm disorders

Characteristics, diagnosis, and treatment

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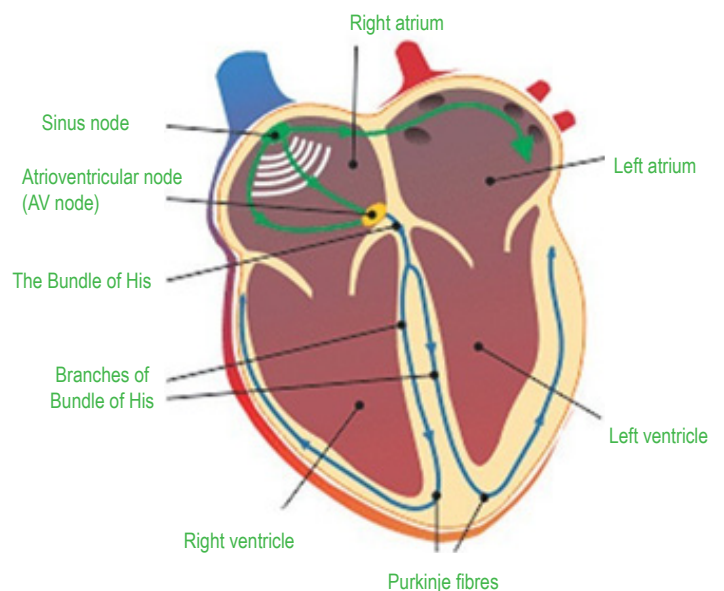
Characteristics

Heart rate

The heart is a muscle activated by an electrical system which enables it to contract (systole) and relax (diastole), and thereby functions as a pump which supplies blood to the whole body. At rest, the rhythm of the heart is normally regular and ranges from 60 to 80 **beats** per minute (**bpm**). This is called the heart rate. This rate accelerates upon exertion.

How the heart's electrical system works

The heart is divided into four parts: two atria and two ventricles. The excitation current begins at a specific point at the top of the right atrium called, the **sinoatrial node (SA node) or sinus node**. After circulating through the atria, causing them to contract, the current reaches a relay between the atria and the ventricles called the **atrioventricular node or AV node**. From there, the electrical current flows through the **bundle of His and its right and left branches, then into the Purkinje fibres** and is dispersed in the ventricular walls extending to the apex of the heart, resulting in ventricular contraction.



The various types of rhythm disorder

When this electrical mechanism malfunctions, the heart starts beating too slowly or too fast, at regular, irregular intervals or anarchic rhythms.

This is what is known as a heart rhythm disorder:

- ▶ if the heart beats too fast (more than 100 bpm), we refer to it as **tachycardia**,
- ▶ if the heart beats too slowly (less than 50 bpm), it is called **bradycardia**,
- ▶ if the heart beats irregularly, we refer to it as **arrhythmia**.

These disorders occur very frequently and are most often benign. Four out of five people have or will one day experience extra systoles.

However, in special circumstances, they can be serious. Each year, 40,000 individuals die of cardiac arrest, most often due to ventricular fibrillation.

What are the causes?

Many rhythm disorders are secondary to an underlying heart disease:

- ▶ damage to the heart muscle itself (by cardiomyopathy or after a heart attack) can affect the heart's electrical function;
- ▶ valvulopathy (damage to a heart valve), because of the leakage or obstacle it constitutes, can cause dilation of heart chambers (notably of the left atrium in cases of mitral valve stenosis) and promote the development of a rhythm disorder, initially intermittent and subsequently permanent (atrial fibrillation).

Extra-cardiac events can also cause rhythm disorders:

- ▶ **Acute alcohol consumption** may cause atrial fibrillation.
- ▶ **Bronchopulmonary diseases** (chronic obstructive lung disease) and hyperthyroidism can also cause atrial rhythm disorders.
- ▶ **Metabolic disorders:** such as **the excessive loss of potassium** in urine or stools (due to long-term diuretic treatment, laxatives, diarrhoea, etc.) can potentially cause severe ventricular rhythm disorders (known as «torsades de pointes»). Patients undergoing such treatment should have regular tests to monitor their blood ion levels (potassium) and their renal function.
- ▶ The same precautions should be taken with patients on cardiac glycosides

Some rhythm disorders cannot be attributed to any **cardiac or extra-cardiac cause**.

Certain factors promote the appearance of rhythm disorders:

- ▶ old age;
- ▶ high blood pressure, anaemia, thyroid disease, high fever;
- ▶ cardiac stimulants including coffee abuse, nicotine, alcohol, certain medications and drugs;
- ▶ disturbances in the ion balance circulating in the blood (specifically calcium and potassium). This is what is known as fluid and electrolyte imbalance as it is the ion's positive or negative charge that controls the electrical pulse;
- ▶ psychological factors such as depression or stress;
- ▶ a sudden climate change, especially in the elderly.

Mild heart rhythm disorders do not generally reduce an individual's life span. It is nevertheless important to adhere to a few simple guidelines and to maintain an appropriate and stress-free level of physical activity.

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How are heart rhythm disorders diagnosed?

1. Symptoms to be aware of

Depending on the individual, rhythm disorders may not be felt at all, or on the contrary cause uncomfortable and alarming symptoms.

The following tables list the most frequent symptoms described for each condition.

| Mechanism | Signs and explanations | Extra systoles |
|--|--|----------------|
| Premature heartbeat due to abnormal electrical excitation emerging from the atrium (atrial extra systole), or the ventricle (ventricular extra systole). | This is the most common rhythm disorder. The extra systoles are most frequently asymptomatic electrical impulses, however, they can be perceived as an incipient abnormal sensation of shock or of a skipped beat followed by an unpleasant feeling of a pause in the heartbeat. | |
| | Ventricular extra systoles are benign in a healthy heart, but require careful consideration in a weak heart. | |

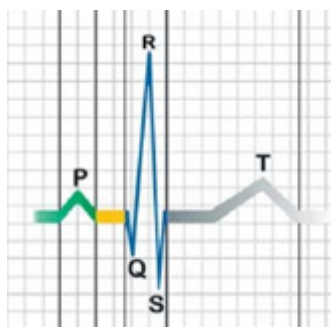
| Mechanism | Signs and explanations | Tachycardia (fast heart rate) |
|--|---|-------------------------------|
| Sinus tachycardia | A simple inappropriate acceleration of the normal heart rate, in response to an emotion in an anxious subject. Although the acceleration of the heartbeat may be sudden its normalisation is invariably gradual. Benign. | |
| Atrial tachycardia: atrial flutter | Abnormal electrical circuit generating 300 bpm in the atria, with transmission to the ventricle every second beat, causing a permanent and regular tachycardia of 150 bpm. Often responsible for shortness of breath or heart failure. Favourable indication for ablation treatment. | |
| Paroxysmal tachycardia or Bouveret-Hoffmann syndrome | Involves an abnormal electrical circuit between the atria and ventricles from birth. Palpitation attacks begin and end abruptly, with regular and very rapid tachycardia of up to 200 bpm. Can be associated with dizziness or fainting spells and chest pain. If recurrent, is amenable to ablation treatment. | |
| Ventricular tachycardia | Are always symptomatic sometimes with severe manifestations (acute heart failure, loss of consciousness or cardiac arrest), predominantly in cases with pre-existing heart disease, specifically with a previous history of myocardial infarction. This represents an absolute medical EMERGENCY. | |

| Mechanism | Signs and explanations | Fibrillation (irregular heartbeat) |
|--|--|------------------------------------|
| Very rapid (400-700 bpm) and unsynchronised heartbeat causing immediate paralysis of the affected heart chamber. | Atrial fibrillations occur in the atria. Atrial paralysis can promote the development of a blood clot, thereby increasing the risk of arterial embolism (migration of the clot into the circulation). The heart rate (of ventricles) is irregular and often rapid, which can lead to heart failure. | |
| Complete arrhythmia caused by atrial fibrillation (AF) | AF episodes, often occurring at the night. This is known as paroxysmal AF. The individual feels a sudden acceleration and irregular heartbeat. Sometimes he/she feels dizzy. The episode ends gradually. In some cases, AF becomes permanent. | |
| Ventricular fibrillation | Loss of all synchronised electrical activity in the ventricle, resulting in complete mechanical heart failure with immediate cardiac arrest. Failure to intervene within 5 minutes may result in death (due to cardiac arrest) or irreversible brain damage. The only treatment option is an external electrical shock: Life-threatening EMERGENCY. | |

| Mechanism | Signs and explanations | Bradycardia (slow heart beat) |
|--|--|-------------------------------|
| Sinus bradycardia | Slow, steady heart rate, well tolerated. Normal occurrence in conditioned athletes. Not to be overlooked | |
| Bradycardia caused by sinus dysfunction or sino-atrial block | Permanent or transient slowing (brief pauses) of the atrial heart rate, caused by a deficiency in the heart's pacemaker (sinus node). The condition is often asymptomatic, in which case it requires no treatment, alternatively it may cause fatigue, shortness of breath, dizziness or even a brief loss of consciousness. When it is associated with symptoms, a pacemaker to stimulate the atrium is indicated. | |
| Bradycardias caused by atrioventricular block | Permanent or transient (paroxysmal block) slowing of ventricular rhythm, caused by a block in transmission of electrical impulses in the nodal tissue between atria and ventricles. Most often symptomatic: asthenia, shortness of breath, heart failure, loss of consciousness and in exceptional circumstances cardiac arrest. A pacemaker to stimulate the ventricles is indicated. | |

2. Confirmatory tests

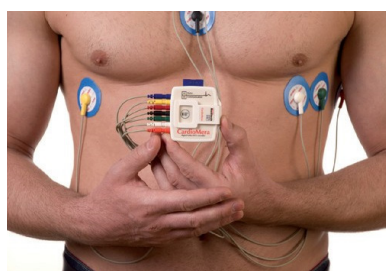
The electrical activity of the heart is recorded with an electrocardiogram (ECG), a fundamental test in the diagnosis of cardiac rhythm disorders. Some disorders however present as isolated events and therefore cannot be detected by ECG, and require alternative testing.



The resting electrocardiogram (ECG)

The electrical activity of the heart is recorded with an electrocardiogram (ECG), a fundamental test in the diagnosis of cardiac rhythm disorders. Some disorders however present as isolated events and

therefore cannot be detected by ECG, and require alternative testing.



The Holter monitor: records ECG over a 24-hour period

The electrode cables connect to a portable monitor which records and stores the heart's electrical activity for a period of 24 to

48 hours. This enables the physician to correlate the symptoms reported by the patient with the electrical trace. Records can be taken «on demand» with the patient manually activating the monitor when symptoms are felt.

The patient is encouraged to engage in normal daily activities throughout the monitoring period. The device, comparable in size to a mobile phone is continuously worn on a belt.



The stress test

This test is ideal to detect and analyse a rhythm disorder which exclusively occurs during physical activity. The patient exercises,

under medical supervision, either on a treadmill or on a stationary exercise bike, steadily increasing the level of activity in an age-appropriate manner. Heart rate, blood pressure and ECG are recorded whilst exercising.

Cardiac electrophysiology testing (EP test)

Electrophysiology tests are more complex because they are invasive (and therefore require local anaesthesia). This ECG

records signals collected by **electrodes placed inside the heart**. They are used to accurately study the electrical conduction system of nodal tissue, as well as to trigger tachycardia and analyse its mechanism.

Why do you need an electrophysiology test?

An electrophysiology test requires the placement of a single or multiple probes, though incisions in one or more veins in the groin region, and sometimes the neck. This probe, or catheter, will then record the electrical activity of specific parts of the heart and identify any potential anomalies. This is a diagnostic test which enables a detailed analysis of intra cardiac electrical activity. The probes are positioned at predefined sites and record the internal electrical activity of the heart. These probes can also be used to stimulate defined sectors of the heart to evaluate potential abnormal heart rhythms or to assess the efficacy of specific medications.

Performing an electrophysiology test

1. This test requires the patient to fast before the examination. The patient lies down on an X-ray examination table in a specially equipped room.
2. The physician injects a local anaesthetic around the vessel to be punctured; the examination itself is not painful; cardiac pacing tests are usually carried out.
3. To avoid significant bleeding, a compression dressing may be applied for several hours after the test. Depending on the size of the catheter used, the patient may have to remain lying down for an extended period, but never beyond 24 hours. During this time, all movement of the punctured leg must be avoided. The whole medical team will do its utmost to make this examination more bearable

What are the risks of electrophysiology testing?

As with any medical test involving an invasive procedure, electrophysiology testing is not devoid of risk. However, it provides information which cannot be obtained, with equivalent certainty, by any other means, as current medical practice stands.

Complications are rare (approximately 1.5%) as this test has been common practice since the early 70s.

- ▶ Although formation of a haematoma at the site of the puncture is not unusual, other local vascular complications are very rare. In some exceptional circumstances puncture injury to an artery may require local surgical treatment.
- ▶ Other rare complications may include: stroke, pulmonary embolism, cardiac perforation, pneumothorax, thrombosis, complete atrioventricular heart block requiring the fitting of a pacemaker or even death.

Every possible precaution is taken prior to, during and after the examination to minimise these risks.

What outcomes can be expected?

The analysis of data collected during electrophysiology testing improves our understanding of your individual condition and therefore enables us to make an informed decision in regard to your treatment. Depending on the data collected, the cardiologist may either suggest:

1. no treatment at all,
2. specific medication,
3. the fitting of a pacemaker,
4. a surgical procedure,
5. intra-cardiac radiofrequency ablation,
6. placement of an implantable cardioverter-defibrillator.

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What are the treatment options for rhythm disorders?

1. Medicinal treatments:

Anti-arrhythmic agents

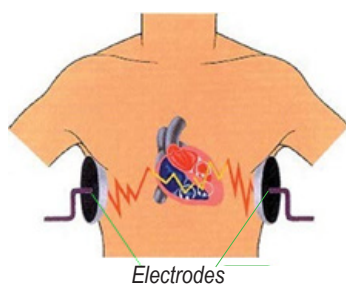
Anti-arrhythmic agents can either prevent seizures or disrupt arrhythmic episodes. These are often taken in tablet or capsule form for previously diagnosed conditions but may be injected if necessary in an emergency. Alternatives to anti-arrhythmic medications may be prescribed to prevent specific complications (i.e. anticoagulants to prevent thromboembolisms), or to treat the ailing heart.

2. Discharge of an «electric» shock

Defibrillation: saves lives!

This approach is reserved for life-threatening emergencies due to cardiac arrest by ventricular fibrillation.

It dispenses a strong current to synchronise all the electrical activity of the heart, by way of two electrodes placed on the chest. Semi-automatic portable defibrillators, which are very easy to implement, are provided in some public places. Potentially life-saving first-aid treatment must be administered as soon as possible: cardiac massage and assisted ventilation (mouth-to-mouth), whilst waiting for a defibrillator to be brought to the scene (by the ambulance service, paramedics, fire fighters etc.).



Synchronised electrical cardioversion

It is based on the same principle as defibrillation but the procedure is carried out in a hospital setting to treat a rapid rhythm disorder, specifically an atrial fibrillation which has resisted prior medical treatment. It initially requires taking anticoagulants to prevent the development of a blood clot and its migration.

Carried out under a light general anaesthesia, the shock of 200 to 360 joules is not felt and a return home the same day can be envisaged.

3. Internal «electric» treatments:

Radiofrequency ablation

For tachycardia and atrial fibrillation: this technique uses a high frequency current (acting as an electric scalpel) to suppress specific types of tachycardias (heart rate acceleration). The current is directed to the internal surface of the heart chambers with a catheter (an electric wire in a plastic sheath). The terminal of this catheter is then directed to produce a very small burn (0.5 cm²) at the site previously identified to be responsible for triggering the rhythm disorder.

Some tachycardias can be treated by very limited repeat applications, whilst others, such as atrial flutter, require multiple applications of the current. The catheter which transmits the radiofrequency ablation current, is used in combination with other catheters to locate the target region with ultimate precision.

Implantable Cardioverter Defibrillator (ICD)

An implantable cardioverter defibrillator (ICD) may be recommended to you if you are in one of the two following situations:

- ▶ you have a heart condition which places you at risk for sudden cardiac death in relation to the onset of serious heart rhythm disturbances (arrhythmia) over the coming months or years. These disturbances are due to the erratic acceleration of the heart rate and can sometimes be fatal if not treated in time.
- ▶ you have just been diagnosed with severe arrhythmia. The risk of a recurrence is high despite the treatment that may be offered to you and can lead to sudden death.

International scientific studies have shown that in such cases the implantation of an ICD increases the probability of survival compared to those with a similar condition who have not had an ICD fitted.

In addition, in the event of heart failure and under certain criteria, it is possible that the implantation of an ICD which also has a function known as “resynchronisation” may be beneficial. Resynchronisation reduces the signs of heart failure in approximately 70% of patients with implants.

An ICD is a small battery-powered device that can monitor your heart rhythm continuously, detect any abnormal heartbeats and treat them either by delivering pacing which will be unnoticed, or by an internal electric shock.

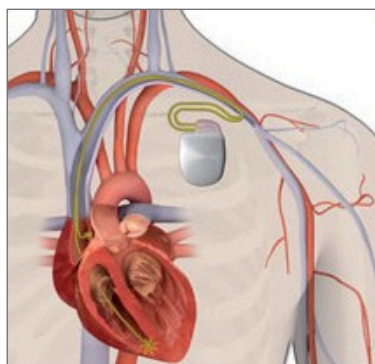
In addition, the device acts as a pacemaker (maintaining the heart rate should it slow down excessively) and has an extremely developed “memory” function.

Implantation of the automatic cardioverter-defibrillator

Before implantation, a series of thorough examinations confirm that this treatment option is suited to the patient’s profile.

The cardioverter-defibrillator is either implanted, in the shoulder region, under the pectoral muscle or in the abdomen, under general anaesthetic; it is connected to the heart by one or more electrodes introduced through the venous route.

Prior to the implantation procedure, you will need to fast and carry out pre-operative preparations (including an antiseptic shower). Please advise us of any allergies to antibiotics or injected iodine-based contrast agents prior to the procedure. The procedure will be carried out in a specially equipped room.



The electrode lead(s) is (are) put into place through a vein(s) in the area where the device is to be implanted. They are then positioned in the heart cavities using x-ray monitoring.

During the procedure, it is sometimes necessary to trigger cardiac arrhythmias and generate shocks via the ICD in order to ensure that the device is working properly.

In some cases, we may suggest that a subcutaneous defibrillator connected to a subcutaneous lead also be fitted. In this case, no material is inside your heart or vessels. The device is implanted in the left side of your chest and the single lead is placed in the subcutaneous tissue usually on the left side of your sternum by way of one or two additional small incisions.

After the procedure, tests and regular monitoring are carried out in order to check the device is working properly and that there are no complications. This monitoring is not a substitute for but a complement to regular check-ups with your referring cardiologist. In some cases, additional monitoring may be carried out remotely (no need to attend an appointment) thanks to a special device (this is known as telecardiology). You will be given a **card showing that you are fitted with a defibrillator. It will give details of the make of the ICD, the date it was fitted and the Centre’s contact information.**

What are the risks of a cardioverter defibrillator?

As with any surgical procedure, the implantation of a cardioverter-defibrillator exposes the patient to the general risks associated with anaesthesia as well as to potential complications associated with infections and haemorrhaging. In extremely rare cases, these complications can be fatal. During the surgery, it may become necessary to place electrodes subcutaneously or in very exceptional circumstances to place electrodes in direct contact with the heart, this procedure may require opening of the rib cage. In the longer term, repeat surgery may be required to repair a system failure or to prevent externalisation of the implant. In any case, after a few years of operation, a repeat intervention, is necessary to replace the battery (on average after 3 to 5 years).

Some time after the implantation, a new procedure may be necessary in the event of device malfunction or dislodgement, lead breakage or due to an infection.



Permanent pacing of the left ventricle during the resynchronisation

process may also cause you to feel a muscular contraction or experience hiccups.

A procedure to replace the device is in any event necessary after a few years of functioning due to battery life duration (3 to 5 years on average).

For day-to-day activities, please read the advice provided in **chapter 4 “Living with arrhythmia”**.

The cardiac stimulator or pacemaker

Your heart condition requires the placement of a cardiac stimulator, also known as a pacemaker.

This is the standard treatment, reliable and efficient, for some heart disorders (most often marked by a substantially decreased heart rate) which cannot be controlled by the administration of drugs.

A pacemaker is a small box containing electronic circuits powered by a battery.

It monitors your heart rhythm continuously, detecting any abnormal rhythms and treating them by delivering unfelt pacing. Furthermore, the device usually keeps a record of information concerning its function and the heart rhythm.

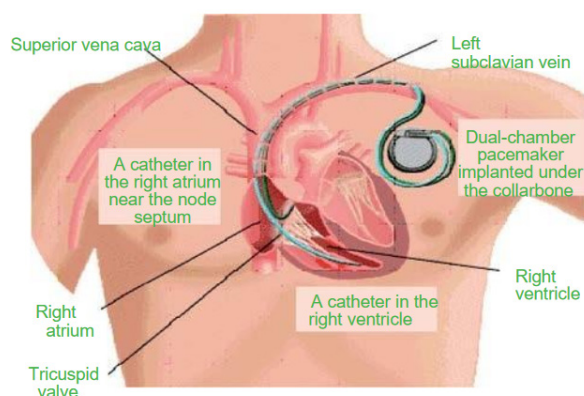
There are two categories of pacemaker, with leads or leadless.

The pacemaker with leads is sometimes also used for cardiac pacing in the treatment of heart failure.

Placement of a pacemaker with leads

The pacemaker is inserted below the right or left collarbone under local anaesthesia (rarely general) during a surgical procedure.

It is connected to the heart by one or two leads placed in the vein and positioned in the atrium and/or right ventricle. A third lead is



Dual-chamber pacemaker: position and connection with organs



sometimes implanted to resynchronise the left ventricle in some types of heart failure.

After the procedure, tests and regular monitoring are carried out in order to check the device is working properly. An initial check-up is carried out within three months of the procedure then on a regular basis (generally every 6 to 12 months) using a special computer called a programmer, which allows us to communicate with your pacemaker through the skin - a painless process - and to adjust the settings if necessary. In some cases, monitoring may also be carried out remotely via the telephone network.

You will be given a card showing that you are fitted with a pacemaker. After a few years (the length varies depending on the type of device and the way it is used), the device will need to be changed due to battery life.

Are there any risks involved in having a pacemaker with leads fitted?

As with any surgical procedure, the placement of a pacemaker carries an anaesthetic risk – variable depending on whether it is local or general anaesthesia – as well as potential infrequent but usually benign complications; these may sometimes be more serious and very exceptionally fatal.

Early complications include risk of bleeding (especially if you take anticoagulants), infection, blood vessel damage, fluid or blood effusion around the heart, pneumothorax (pleural effraction), cardiac rhythm disorders and lead dislodgement. Some of these complications may require early surgical reintervention. Please advise us of any allergies to antibiotics or injected iodine-based contrast agents prior to the procedure.

Some time after the intervention, the system may need to be re-programmed and further surgery may be necessary in the event of a system malfunction (failure or fragility of pacemaker and/or one or several leads), **exteriorization** of the pacer through the skin or infection.

Placement of a leadless pacemaker

The leadless pacemaker avoids the need for connecting leads, the creation of a pocket in which to place the pacemaker and eliminates certain complications related to the implantation of a traditional (with leads) pacemaker.

It is a cylindrical capsule, inserted directly in the right ventricle percutaneously via the right or left femoral vein in the groin. During this procedure, a small incision is made at groin level, where a catheter is inserted in the femoral vein of the leg and then guided up to the heart.



During the procedure, a contrast agent may be injected into your heart so that x-ray images or films can be taken. The doctor then places the leadless pacemaker using a special catheter and attaches it to the heart muscle.

After the leadless pacemaker has been implanted, the doctor uses a programmer enabling him/her to communicate with your device through the skin – a painless procedure - to test the intra-cardiac pacemaker and if necessary make any adjustment to the basic settings. This procedure is identical to the one used for a pacemaker with leads.

At the end of the procedure, the leadless pacemaker is implanted in your heart, no other part of the system will remain in your body. The incision at groin level will be closed. The procedure may be carried out using various anaesthesia methods depending on the case. After the procedure, tests and regular monitoring are carried out in order to check the device is working properly. An initial check-up is carried out within three months of the procedure then on a regular basis (generally every 6 months) thanks to a programmer, which allows us to adjust the settings if necessary. You will be given a card showing that you are fitted with a pacemaker. After several years (length may vary depending on the way it is used), a new system will need to be fitted due to battery life duration.

The old pacemaker will either be left in place or removed using special equipment.

Are there any risks involved in having a leadless pacemaker fitted?

The implantation of a leadless pacemaker presents a low anaesthetic risk as well as potential rare complications. These are usually benign but can sometimes be more serious and in very exceptional circumstances, life-threatening. Early complications include the risk of bleeding (especially if you are taking anticoagulants) at the femoral artery puncture in the groin, blood vessel damage, cardiac rhythm disorder, fluid or blood effusion around the heart that may necessitate a puncture or emergency surgical cardiac repair (tamponade). Some of these problems, such as migration of the device, may require premature re-intervention. An allergy to an antibiotic or to injectable iodine-based contrast agents is possible. This must be reported prior to the procedure.

Some time after the procedure, it may be necessary to **reprogram** the system and re-intervention may be required in the event of a system malfunction (interruption of pacing, premature battery depletion or any other dysfunction), infection or dislodgement, the latter two complications being extremely rare.

Risks specific to changing the pacemaker with leads

Changing the pacemaker with leads may carry the following risks:

- ▶ 2 to 4% risk of infection: to mitigate this risk, an absorbable antibiotic-eluting envelope is placed over the pacemaker;

should you be allergic to antibiotics of the tetracycline or rifamycin family or to absorbable sutures, please notify us prior to the procedure.

- ▶ Haematoma, this risk depends on whether you are taking anticoagulants for which the dosage may need to be adapted or the treatment stopped prior to the procedure.
- ▶ Local discomfort.



Monitoring and follow-up after the placement of a defibrillator or leadless or traditional pacemaker

Just after the procedure:

- ▶ Monitor your wound and consult your doctor if you notice any changes (redness, swelling or discharge).
- ▶ Avoid moving your shoulder too energetically in order not to interfere with the healing process and to avoid the risk of electrode dislodgement.
- ▶ Do not wear any heavy items or tight-fitting clothes on the wound area.
- ▶ In some situations, it may be inadvisable to drive a car: ask your cardiologist for further information regarding your specific case.

A few weeks later:

- ▶ You can resume all activities but avoid sports with a risk of blows to the chest. Before resuming any activity, ask for your doctor's opinion.
- ▶ Driving heavy-goods vehicles or public transport is contraindicated.

For day-to-day activities, please **read the advice provided in chapter 4 "Living with arrhythmia"**.

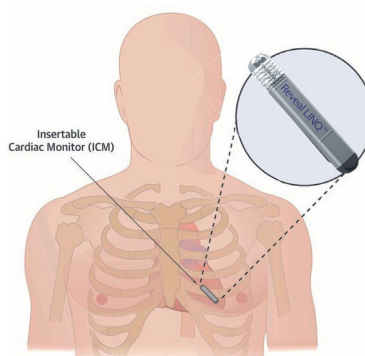
Implantable loop recorder or Reveal LINQ

Your heart condition requires the subcutaneous implantation of a cardiac loop recorder.

The cardiac loop recorder (or long-term Holter) is a small device which contains electronic circuits powered by a battery (whose average life is 2 to 3 years depending on the model).

It is able to monitor heart rhythm continuously and detect any abnormal heart rhythms (significantly reduced or increased heart rate) and correlates the symptoms (palpitations or malaise) with the heart rate.

The recorder is inserted subcutaneously under local anaesthesia under aseptic conditions. The site of implantation is chosen by you and



the cardiologist carrying out the procedure. Most often the device is placed along the left side of the sternum so that it can record heartbeats in the most efficient manner.

When the recorder becomes worn, it is removed by a small local surgical procedure.

The dressing is kept for 10 days.

Remote monitoring using a transmitter (telecardiology) may be suggested.

As with any surgical procedure, the implantation of a loop recorder carries a slight anaesthetic risk as it is a local anaesthesia. Rare complications may occur: allergy, local haemorrhage, haematoma, and infection. These complications are prevented by the preparation procedure which is explained to you.

4. Living with a rhythm disorder...

A healthy lifestyle

- ▶ If you smoke, quit as soon as possible!
- ▶ Exercise regularly, for example by walking for 30 minutes, 3 times a week.
- ▶ Moderate your intake of stimulants such as alcohol, tea, or coffee!
- ▶ Rest and relax whenever you need to! Take the time to live because fatigue and stress can aggravate rhythmic disorders.

Your medical follow-up

- ▶ Take your prescriptions diligently and **do not interrupt your treatment unless advised by your physician. Do not self-medicate**: some medications (such as laxatives) can promote rhythm disturbances or interfere with your treatment, don't hesitate to ask your doctor and/or pharmacist for advice.
- ▶ If a symptom persists or reappears (pain, shortness of breath, sensations of dizziness, feeling faint), **consult your physician at once!**
- ▶ **Check your pulse regularly.** If it is too slow, call your cardiologist. Your doctor will inform you of your optimal range!
- ▶ **Regular monitoring is necessary,** Keep to scheduled appointments.

If you have a pacemaker or a cardioverter-defibrillator...

- ▶ Always carry your pacemaker or defibrillator card on you.

Some practical advice

- ▶ **Notify health professionals prior to any treatment or examination** (radiologist, dentist, physiotherapist, nurse, etc.). You will not be able to have an MRI (magnetic resonance imaging) unless you have been fitted with an «MRI compatible» pacemaker and then only after confirmation from your cardiologist.
- ▶ Avoid passing through magnetic airport detectors and lingering near shops' anti-theft gates.
- ▶ Your pacemaker contains metal parts: They can trigger metal detection alarms at airports. Tell security personnel that you have a pacemaker and show your medical identification card. (Magnetic sticks used by airport security staff may temporarily affect your pacemaker, request to have a manual security check).
- ▶ Use your mobile phone with the hands-free kit or keep your mobile phone at a safe distance (at least 15 cm) from your pacemaker. Your cell phone is a source of electromagnetic waves which may affect the operation of your device.
- ▶ In general household appliances do not pose a risk (video, microwave, electric alarms, cordless telephone etc.) with one notable exception: induction cook tops.
- ▶ Avoid approaching too close to devices which emit electromagnetic waves (keep at arm's length): magnets, stereo speakers, metal detectors, industrial equipment, welding machines, induction cook tops, large generators, and transformers, amateur or CB radio equipment.
- ▶ And finally, for the crazy mechanics among you, don't lean over your running car engine!

Sources

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Pictures

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