

Medtronic

Life with a
Micra™ leadless
pacemaker



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Meet **Micra**

Micra™ is the world's smallest pacemaker¹ - it is completely self-contained within the heart and doesn't require a lead. Micra leaves no bump under the skin, no chest scar and provides the therapy needed without a visible or physical reminder of a medical device.



Actual size

Micra - Out of sight, out of mind

“ I know it’s here, but it’s not here ”

Micra patient

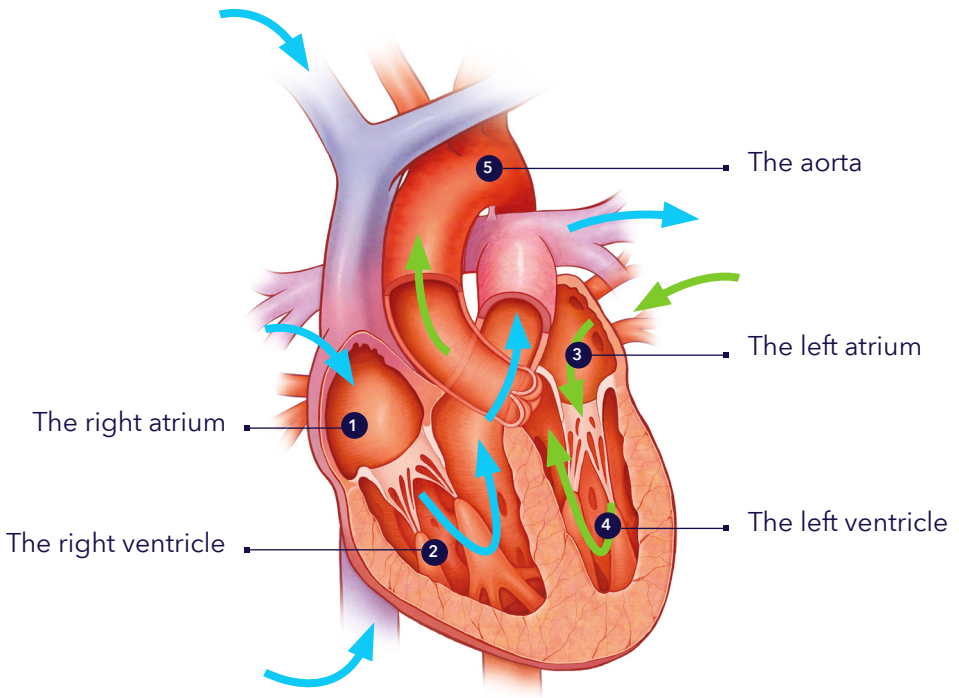
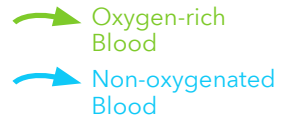


The heart

The heart is a fist-sized organ that acts as a pump to send oxygen-rich blood throughout the body. Regular, rhythmic electrical signals keep the heart pumping blood. The heart has four chambers:

- Two upper chambers - a right atrium and a left atrium
- Two lower chambers - a right ventricle and a left ventricle

The right atrium (1) takes in oxygen-depleted blood from the rest of the body and pushes it to the right ventricle (2) which then sends it to the lungs. The lungs oxygenate the blood which travels to the left atrium (3), and then onto the left ventricle (4), which pumps oxygen-rich blood to the rest of the body via the aorta (5).



What is Bradycardia?

Bradycardia is a condition in which the heart beats too slowly. A healthy heart beats **60 to 100 times per minute**, pumping about **280 liters of blood every hour**. With bradycardia, the heart beats fewer than 60 times per minute. At that rate, the heart is not able to pump enough oxygen-rich blood to the body during normal activity or exercise.

Symptoms of Bradycardia

When your heart beats too slowly, you may experience various symptoms. These symptoms help your doctor assess the severity of your heart condition and determine the appropriate treatment for you.

- Dizziness and fainting
- Chronic lack of energy
- Shortness of breath



Causes of Bradycardia

Bradycardia can occur for several reasons.

Some common causes of bradycardia include:

- Congenital heart disease (condition you were born with)
- Certain illnesses or heart medications
- Natural aging process
- Scar tissue from a heart attack
- Sick sinus syndrome, also called sinus node dysfunction (the heart's natural pacemaker is not working correctly)
- Heart block (the electrical impulse that travels from the upper to the lower chamber of the heart is irregular or blocked)

Diagnosis of Bradycardia

Only your doctor can determine if you have bradycardia and, if so, how far it has progressed. To rule out or confirm the diagnosis of bradycardia, one or several diagnostic tests may be ordered, depending on the suspected heart rhythm problem.

These test may include:

- Electrocardiogram (ECG)
- Exercise ECG or stress test (measures your heart rhythm while you're engaged in a physical activity)
- Holter or event monitor
- Insertable cardiac monitor
- External loop recorder
- Tilt table test
- Electrophysiology study (EP study)

Treating Bradycardia

Treatment strategies vary, depending on your bradycardia causes and symptoms. Your doctor might prescribe new medications, or adjust the doses of medications you are currently taking to restore your normal heart rate. If this fails to restore your normal heartbeat, a pacemaker can regulate your heart's rhythm. A pacemaker is designed to mimic the heart's natural rhythm. By sending an impulse when the heart's rhythm is slow or interrupted, it effectively regulates the heart rate automatically, freeing you to enjoy your regular activities.

How does a pacemaker work?

A pacemaker is designed to mimic the heart's natural rhythm when there are disturbances, such as pauses in the natural rhythm. The pacemaker has two main purposes - pacing and sensing.

Pacing - A pacemaker will send an electrical impulse to the heart when the heart's own rhythm is too slow or is interrupted. This electrical impulse starts a heartbeat.

Sensing - A pacemaker will also "sense" (monitor) the heart's natural electrical activity. When the pacemaker senses a natural heartbeat, it will not deliver a pacing pulse.

Traditional pacing system

Most pacemakers require a device (size of tea bag) to be surgically implanted under your skin in the upper chest. The system also requires a lead to be connected to the pacemaker and is threaded into the heart. The lead carries electrical signals from the pacemaker to your heart to help it beat regularly.

Micra leadless pacemaker

Micra is **93% smaller** than traditional pacemakers². It is comparable to the size of a large vitamin capsule and has a battery that typically lasts up to 17 years. How long your battery lasts depends on the model of the device and other factors, including the nature of your heart condition and how often your pacemaker provides therapy to your heart.^{3,4,7}



Traditional pacemaker and lead

Micra™ leadless pacemaker

Vitamin Pill



Unlike a standard pacemaker, Micra is implanted into the heart through a vein in your groin or neck and does not require a lead. Micra's miniaturized size and minimally invasive approach leaves **no visible sign of a medical device under the skin**. This can mean fewer post-implant activity restrictions and no obstructions to shoulder movement.

Is Micra for every patient?

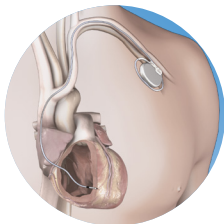
Micra is intended for patients with specific pacing needs. Ask your doctor if Micra is an option for you.

How is a traditional pacemaker system implanted?

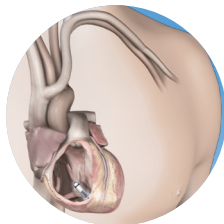
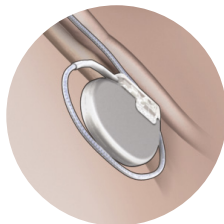
- A small incision, approximately 5 cm long is made in the upper chest
- A lead (thin insulated wires, like a spaghetti noodle) is guided through the vein into the heart
- Your doctor connects the lead to the pacemaker and programs the device
- The pacemaker is then inserted beneath the skin
- Your doctor tests the pacemaker to ensure it is working properly
- The incision is then closed

How is Micra implanted⁵?

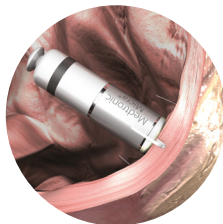
- Your doctor will insert a straw-like catheter system into a vein, typically near the upper thigh area of your leg or the lateral part of your neck.
- The catheter system moves the Micra into the right ventricle of the heart
- Micra is placed against the heart wall and secured with flexible tines (see image at the far right below)
- Your doctor tests the Micra to ensure it is working properly
- The catheter system is then removed



The traditional system



Micra™ the leadless pacemaker



After your procedure, you will be given a pacemaker identification card. Always carry it with you as it contains important information about your leadless pacemaker.

Replacement procedure

A new Micra is needed when battery power falls to a low level. Battery power is affected by many factors, including the nature of the heart condition. The estimated average battery life for a Micra device is approximately 10-17 years after it is implanted.^{3,4,7} Individual patient experience may vary. The battery power is checked at each Micra follow-up appointment. The doctor or nurse will notify you when you need a new pacemaker. When a new device is needed, the Micra device may be either simply turned off or removed from the body before a new Micra device or traditional pacemaker system is implanted. Your doctor will determine what is best for you.^{5,6}

Follow up care and monitoring

Your doctor will set follow-up appointments. During such follow-ups, you should not only mention the symptoms that may have occurred during action of the pacemaker, you should also take this opportunity to ask any questions you may have and talk about your concerns and potential fears.

The follow-up appointments enable your Micra to be thoroughly checked. During these check-ups, your doctor may:

- Monitor the battery status of the Micra
- Review and adjust (if needed) your Micra settings to ensure they are programmed appropriately for your medical needs

This is done through a programmer, a small computer kept at your doctor's office. Your doctor will use the programmer to retrieve information stored in your Micra.

Remote monitoring of your Micra

We understand it is important to stay connected to your care team from the comfort of your home or wherever you're traveling - remote monitoring* allows for this flexibility.

Today, millions of people implanted with heart devices are remotely monitored. Remote monitoring has been shown to:

- Communicate any heart rhythm and device changes which require attention
- Reduce hospitalisations and Emergency Room (ER) visits
- Increase Quality of Life
- Provide you with a sense of security and peace of mind

*Subject to local availability

How remote monitoring works

A small monitor is used to send information from your pacemaker to your clinic. Once received, your clinic can review your information on a secure website. Remote monitoring provides easy access to information that allows your doctor to:

- Manage your heart condition
- Monitor your leadless pacemaker
- Obtain information from your leadless pacemaker on an as-needed basis

Your Micra has built-in safeguards that protect your device and your device data to prevent any outside parties from accessing your device (often referred to as „hacking“). Your Micra encrypts any data that it sends to your clinic. Your Micra can only be programmed by your doctor using the programmer in their office.

MRI scan access

A magnetic resonance imaging (MRI) scan is a type of diagnostic that creates an internal view of the body. Traditionally, most pacemakers are not considered safe in an MRI environment because the MRI could change the settings, temporarily affect the normal operation of, or potentially damage the pacemaker. Micra is approved for use in the MRI environment, having a unique design developed so that under specific conditions, people may safely undergo MRI scans. Your doctor should discuss all potential benefits and risks of an MRI scan with you.

Micra: your daily life

As long as your doctor has no objections, you can resume all the activities you enjoyed before getting your Micra. Speak with your family and friends about your leadless pacemaker as it can make you feel more secure. Support groups and associations can be of valuable assistance.

Pacemakers are built with protective shields, so the majority of items that you use or come into contact with will not affect the normal operation of your Micra.





Commonly asked questions

Use of a cell phone

When talking on a mobile phone keep the phone's antenna about 6 inches/15 centimeters away from your Micra. We also recommend avoiding placing the mobile phone in a shirt or jacket pocket of the chest.

Activities and intimacy

The goal is for you to lead a normal life as soon as possible. Your Micra

will not keep you from most activities and hobbies (e.g., bowling, golfing, playing tennis, gardening, fishing, etc.). However you should always discuss your underlying condition with your doctor to confirm.

Most people are able to return to work after device implant. You and your doctor will make this decision. The timing will depend on many things, including the type of work you do.

Intimacy is a normal part of life. We understand people resume sexual activity when they feel comfortable.

Anti-theft detectors and airport security systems

Given the short duration of security screening, it is unlikely that your Micra will be affected by metal detectors (walk-through archways and hand-held wands) and full body imaging scanners (also called millimeter wave scanners and 3D imaging scanners) such as those found in airports. However, the metal case of a pacemaker could set off a metal detector. To minimize the risk of temporary interference with Micra while going through the security screening process, avoid touching metal surfaces around any screening equipment. Do not stop or linger in a walk-through archway; simply walk through the archway at a normal pace. If a hand-held wand is used, ask the security operator not to hold it over the pacemaker and not to wave it back and forth over the pacemaker. Requesting a hand search is also an alternative.

If you have concerns about these security screening methods, show your Micra ID card, request alternative screening and then follow the instructions of the security personnel. Flying is perfectly safe for people with a Micra, there are no issues with pressurization or altitude.

Travelling

Consult your doctor in advance of undertaking long journeys. They can provide you with the addresses of hospitals in the countries you are visiting in case you need to find a hospital in an emergency situation. They can also help you to find a cardiologist in these hospitals for a follow-up visit if needed.

Driving

People with a pacemaker may have a risk of sudden incapacitation that might cause harm while driving a car.

Talk to your doctor about the restrictions that may apply to you.

Can I drive an electric car with a Micra?

Yes, it's safe to drive an electric car following the recommendation to keep at least 30 cm between your device and the charging station.

Household appliances

Most household appliances are safe to use as long as they are properly maintained and in good working order. This includes microwave ovens, major appliances, electric blankets and heating pads.

Magnets

Even though most electromagnetic fields in the home environment will rarely affect the function of your Micra, it is recommended you keep any item containing magnets away (at least 6 inches/15 centimeters) from your device. You may not always know if an item has a magnet in it. However, if you use household items as they are intended, and they are properly maintained, they should have no effect on your device. This includes microwaves, kitchen appliances, cordless phones, radios, televisions, video games, CD players, hair dryers, electric shavers, electric toothbrushes, electric blankets, leaf blowers, lawn mowers, garage door openers, computers, children's toys and small shop tools.

Welding and chainsaws

Unlike most other household power tools, welding with currents above 160 amps may have a higher tendency to temporarily affect the normal function of your Micra.

It is recommended you avoid using welding currents above 160 amps.

Follow the safety precautions below to minimize the risk of interfering with your pacemaker while welding with currents under 160 amps.

- Work in a dry area with dry gloves and shoes

- Maintain a 2-foot (60 centimeter) distance between the welding arc and your device
- Keep the welding cables close together and as far away as possible from your heart device. Place the welding unit approximately 5 feet/1.5 meters from the work area
- Connect the ground clamp to the metal as close to the point of welding as possible. Arrange the work so the handle and rod will not contact the metal being welded if they are accidentally dropped
- Wait several seconds between attempts when having difficulty starting a weld
- Work in an area that offers firm footing and plenty of room for movement
- Work with an informed person who understands these suggestions

Since welding equipment may temporarily affect the normal operation of your Micra, any decision you make to use this equipment should be made in consultation with your heart doctor.

Your doctor can advise you as to the degree of risk these responses pose for your medical condition. Aprons or vests will not effectively shield your device from the electromagnetic energy generated by welding equipment.

The electromagnetic energy generated by a chainsaw is similar to other electric and gasoline powered tools. If electromagnetic interference occurs with your Micra and you experience symptoms such as becoming dizzy or lightheaded, a running chainsaw may present a higher risk of injury to you than other power tools.

Follow the safety precautions below to minimize the risk of interfering with your Micra while using a chainsaw:

- Maintain a 6-inch/15 centimeters distance between the motor of an electric chainsaw and your Micra. Also, be sure the equipment is properly grounded.
- Maintain a 12-inch/30 centimeters distance between the components of the ignition system of a gas-powered chainsaw and your Micra. Also, it is better to use one that is built with the spark plug located away from the hand grips
- Immediately stop cutting and turn off your chainsaw if you start feeling lightheaded or dizzy
- Do not work on the engine while it is running
- Do not touch the coil, distributor or spark plug cables of a running engine

Recommended precautions

The following tables provide a summary of recommended precautions for different categories:

- Household & Hobby Items
- Tools & Industrial Equipment
- Communications & Office Equipment
- Medical & Dental Procedures

Household & hobby items

Most household and hobby items are unlikely to affect your Micra when the items are in good working condition, used as intended, and the recommended distances are maintained. For items that transmit power through an antenna, it is recommended that you follow the noted distances between the antenna and your Micra.

Special considerations

Maintain at least the recommended distance between the item and your Micra :

12-inch/30 centimeters distance

- Car/Motorcycle – from components of ignition system
- Electric Fence
- Transformer Box (green box in yard)

2-foot/60 centimeters distance

- Beach Comber Metal Detector—from search head
- Induction Cooktop Stove

Not Recommended

- Ab Stimulator
- Electronic Body Fat Scale
- Magnetic Mattress Pad/Pillow

Minimal risk

Maintain at least a 6-inch/15 centimeters distance between the item and your Micra:

- Electric Grocery Cart/Golf Cart—from motor
- Electric Kitchen Appliances—hand-held (electric mixer or knife)
- Electronic Pet Containment Fence—from collar, remote and base antenna
- Electric Shaver—corded
- Electric Toothbrush Charging Base
- Exercise Bike—from magnet in wheel
- Hair Dryer—hand-held
- Hand-Held Back Massager
- Magnetic Therapy Products
- Radio-Controlled Items—from antenna
- Sewing Machine/Serger—from motor
- Small Magnet (household magnet)
- Speakers
- Tattoo Machine
- Treadmill—from motor
- Ultrasonic Pest Control Device
- Vacuum Cleaner—from motor

No known risk

If the item is used as intended and in good working condition, there is no known risk:

- Battery Charger—for household batteries
- Casino Slot Machine
- CD/DVD or Recorder
- Curling Iron
- Dishwasher
- Electric Blanket
- Electric Guitar
- Electric Toothbrush
- Electronic Weight Scale
- Garage Door Opener
- Hair Straightener
- Heating Pad
- Hot Tub
- Ionized Air Filter
- Iron
- Kitchen Appliances –small and large (blender, can opener, refrigerator, stove, toaster)
- Low Voltage Residential Power Lines
- Massage Chair/Pad
- Medical Alert Necklace
- Microwave Oven
- Remote Control (CD, DVD Player, TV)
- Salon Hair Dryer
- Sauna
- Shaver/Trimmer– battery powered
- Tanning Bed
- Television

Tools & industrial equipment

It is important that your power tools and/or equipment be in good working order and properly wired (three-prong plug, if applicable) and used as intended by the manufacturer of the product. It is recommended that corded electrical items be plugged into a safety outlet device called a ground fault circuit interrupter (GFCI or GFI).

Special considerations

Maintain at least the recommended distance between the item and your Micra :

12-inch/30 centimeters distance

- Boat Motor
- Car Battery Charger
- Gasoline Ignition Systems—from components of ignition system
- Gasoline Powered Tools—from components of ignition system (lawn mower, snowblower, weed whacker, chainsaw)

2-foot/60 centimeters distance

- Bench Mounted/Free Standing Tools—for motors 400 horsepower or less (air compressor, drill presses, grinder, pressure washer, table saw)
- Jumper Cables
- Welding Equipment (with currents under 160 amps)

Not Recommended

- Welding Equipment (with currents over 160 amps)

Minimal risk

Maintain at least a 6-inch/15 centimeters distance between the item and your Micra:

- Circular Saw—skill saw
- Drills—battery and electric powered
- Electric Chainsaw
- Grinder (hand-held)
- Hedge Trimmer—electric powered
- Lawn Mower— electric powered
- Leaf Blower—electric powered
- Router
- Sander
- Screwdriver— battery powered
- Soldering Gun
- Weed Whacker—electric powered

No known risk

If the item is used as intended and in good working condition, there is no known risk:

- Calipers—battery powered
- Flashlight—battery powered
- Laser Level
- Soldering Iron
- Stud Finder

Communications & office equipment

Guidelines for safe operation of communications and office equipment include such factors as transmitting power, frequency and antenna type. For items that transmit wireless signals through an antenna, it is recommended that you follow the noted distances between the antenna and your Micra.

Special considerations

Maintain at least the recommended distance between the item and your Micra :

12-inch/30 centimeters distance

- Amateur Radio, Ham Radio, Marine Radio, Walkie Talkie –between 3-15 watts –from antenna
- Citizens Band (CB) Radio–5 watts or less–from antenna
- Uninterrupted Power Source (UPS)

2-foot/60 centimeters distance

- Amateur Radio, Ham Radio, Marine Radio, Walkie Talkie –between 15-30 watts–from antenna

Minimal risk

Maintain at least a 6-inch/15 centimeters distance between the item and your Micra:

- Amateur Radio, Ham Radio, Marine Radio,
- Walkie Talkie –3 watts or less–from antenna
- Cellular Phone–3 watts or less–from antenna
- Disney Magic Bands (6" from band reader, band itself has no known risk)
- Electronic Reader/Reading Devices
- Home Wireless Electronics–from antenna
- Remote Keyless Entry–key fob (such as Smart Key)
- Remote Car Starter
- Smart Meter (utility companies)
- Security Badge Wall Scanner

No known risk

If the item is used as intended and in good working condition, there is no known risk:

- Activity bands (FitBit™, Body Bug™, Nike+™, Jawbone™)
- Calculator
- Copy Machine
- Desktop/Laptop Computer
- Digital Music player (iPod™)—non-transmitting
- Fax Machine
- Global Positioning System (GPS)
- Barcode Scanner
- Medical Alert Pendant
- Printer
- Radio AM/FM
- Scanner

Medical & dental procedures

Many medical procedures will not affect your Micra; however, certain medical procedures can result in serious injury, damage to your heart device, or device malfunction. Before undergoing any medical procedure, it is recommended that you advise your treating doctor or dentist that you have a Micra and consult with your heart doctor to evaluate any possible associated risk.

Special considerations

- Diathermy (high frequency, short wave and microwave)

Acceptable with precautions

Inform your treating physician that you have a Micra and/or consult with your heart doctor/clinic. Medical procedures that require some precautions:

- Ablation (specifically, microwave ablation and radiofrequency ablation)
- Acupuncture with AC-Alternate Current Stimulus
- Argon Plasma Cautery
- Blood Bag Dielectric Sealing Equipment
- Bone Growth Stimulator Alternating Magnetic Field
- Bone Growth Stimulator Introducing AC Current
- Colonoscopy–polyp removal
- Computerized Axial Tomography (CT or CAT) Scan
- ECT (Electroconvulsive Shock Therapy)
- Electrolysis
- Electrosurgery and Other Procedures That Use an Electric Probe to Control Bleeding, Cut Tissue or Remove Tissue
- EMG Electromyography–automated sequence
- EMG Electromyography–single stimulus
- External Defibrillation, AED and Elective Cardioversion
- Hyfreicator

- Hyperbaric Oxygen Therapy (HBOT)
- Interferential Electrical Current Therapy
- Lithotripsy
- Magnetic Therapy
- Mechanical Ventilation with a Respiration Rate Monitor
- Muscle Stimulators and Other Devices Sending Current into Your Body
- Neutron Radiation
- Radiation Therapy (external x-ray, Gamma Knife™ or radiosurgery)
- Radiotherapy (Including high-energy radiation therapy)
- Stereotaxis
- Therapeutic Ultrasound
- TMS (Transcranial Magnetic Stimulation)
- Transcutaneous Electrical Nerve Stimulation (TENS) (including Neuro Muscular Electrical Stimulation (NMES))
- Transmitting Loop for Digital Hearing Aid
- Transurethral Needle Ablation (TUNA™ Therapy)
- TUMT (Transurethral Microwave Thermotherapeutic Device)
- TURP Prostate Test (Transurethral Resection of the Prostate)
- Virtual Colonoscopy Performed with CAT Scan (CT Scan)

Acceptable

If the item is used as intended and in good working condition, there is no known risk:

- Acupuncture—no electrical stimulus
- Acupuncture DC— direct current
- Bone Density Test (x-ray)
- Bone Density Ultrasound—on heel or hand
- Bone Growth Stimulator Direct Current
- Capsule Endoscopy

- Colonoscopy–diagnostic only
- Dental Apex Locator (root locator)
- Dental Drills
- Dental Pulp Tester
- Dental Ultrasonic Scalers/Cleaners
- Dental X-Ray
- Diagnostic Ultrasound (Sonogram)
- Diagnostic X-Rays (fluoroscopy)
- Digital Infrared Thermal Imaging (DITI)
- Echocardiogram
- EECP–Enhanced External Counter Pulsation Therapy
- Electrocardiogram (ECG/EKG)
- Electroencephalography– EEG
- Electronystagmography (Audiology–ENG)
- Hearing Aid (in or behind ear)
- Heart Rate Monitor
- Iontophoresis (drug patch)
- Laser Surgery
- Lasik Eye Surgery
- Lie Detector Test
- Mammography
- Medical Helicopter
- Nuclear Stress Test
- PH Capsules
- Positron Emission Tomography (PET Scan)
- Relief Band™
- Sleep Apnea Machine

Shaping a positive attitude towards living with your micra

Remind yourself of the benefits - Remind yourself that your Micra protects you from the serious consequences of irregular heartbeats

Block negative thinking - Catch yourself if you are imagining the worst case scenarios. Remind yourself that most people feel positive about having their pacemaker

Discuss concerns - Make a list and discuss any worries you might have about your condition or heart device with your doctor and with your loved ones. Develop a plan about how to cope with your concerns

Plan your quality of life - The goal of your ongoing care is to achieve the best quality of life possible. Take an inventory of the activities that are most important to you and discuss plans to return to those activities with your doctor

Explore the unknown - Learn about your medical condition and your Micra from your doctor, nurse, device manufacturer, and other websites. Often learning about your condition and Micra helps reduce anxiety



Educational resources & support

You can rely on Medtronic as your experienced partner when you have a question around your Micra or patient monitoring solution†.

00800-266-632-82*

Official country language(s)
Monday-Friday 8am-4pm**

[medtronic.eu](https://www.medtronic.eu)

[bhf.org.uk](https://www.bhf.org.uk)



Be Connected

† Subject to local availability

* Free-of-charge number

** Ability to leave voicemail outside of office hours

References

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Life with a
Micra™ leadless
pacemaker

Information contained herein is not medical advice and should not be used as an alternative to speaking with your doctor.

Discuss indications, contraindications, warnings, precautions, adverse events and any further information with your health care professional.

Please note that the intended use of a product may vary depending on geographical approvals.

Medtronic products placed on European markets comply with EU and UK legislation (if applicable) on medical devices.

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