



MRI Scan and Implanted Cardiac Devices

Patient Information Sheet

You are receiving this information sheet because you have an Implanted Cardiac Device and your Doctor has requested for you to have an MRI.

What is an MRI?

Magnetic Resonance Imaging (MRI) is a non-invasive medical imaging test that uses a strong magnetic field, radio waves and a specialized computer to produce detailed images of internal soft tissue structures of the human body. The procedure does not use ionizing radiation and is considered to be safe; however, **metallic implanted devices within the patient's body may be affected by the magnetic field**. When having an MRI, the patient is required to lie on an examination table which then moves him or her into the MRI machine. The machine is open at both ends, and some exams may be performed either head first or feet first. Holding still is important for obtaining the best images since the machine is sensitive to motion. Also, some exams may require an intravenous injection.

What does this mean for you and your device?

There are two main classifications for implanted cardiac devices with regards to MRI scanning; Non-MRI-conditional and MRI-conditional.

- Non-MRI-conditional devices are not specifically designed to be scanned. With the use of special programming, close monitoring, and specific MRI settings, these scans can be safe for you and your device.
- MRI-conditional devices have been designed and tested to reduce the potential risks associated with MRI with specific MRI settings.

Potential complications may include

- Pacemaker /ICD movement (displacement)
- Loss of normal Pacemaker or ICD function
 - Changes to the programmed settings
 - Reed switch closure (the feature which normally causes pacing that ignores a natural available heart rate) resulting in a fast paced rate in Pacemakers
 - “noise” signals on leads causing too much pacing or no pacing when required
- Rarely, in an ICD, can an MRI cause the temporarily programmed “OFF” ICD Therapies to turn “ON”, which may lead to an inappropriate (not necessary) shock
- Changes in heart rhythm recordings (electrocardiograms/ ECGs)
- Rarely cause serious abnormal heart rhythms (arrhythmias)
- Vibration sensations in the chest caused by mechanical forces
- Heating up of heart muscle tissue near the lead electrodes (tips of the implanted wires)
- Permanent damage to the Pacemaker or ICD generator or the implanted leads (wires)

The incidence of life-threatening or serious adverse events from MRI scanning of Non-MRI-Conditional systems is extremely low, at **less than 1%**.

No long-term clinically significant adverse events were reported in a study funded by Johns Hopkins University and the National Institutes of Health, the safety of MRI, performed with the use of a prespecified safety protocol in 1509 patients who had Non-MRI-Conditional systems. Only one patient required their generator to be changed. (NEJM 2017; 377:2555-2564)

Before your exam

- **Review this handout with your ordering physician**
- **If you feel comfortable with this information, you will be asked to sign a consent form**
- **Once the consent is signed and your scan is booked, please arrive as scheduled for your pre-MRI scan appointment at the Pacemaker Clinic**

What to expect on the day of the scan?

- Arrive at the Pacemaker Clinic at your booked pre-MRI scan appointment time
- The Pacemaker Nurse/Tech will test (interrogate) your device and program it to the required settings for the MRI, based on the manufacturer settings and your specific pacing needs
- If you have an ICD, the therapies (shock and anti tachycardia pacing) will be deactivated for the scan
- Depending on the required parameters for your device, a Pacemaker Nurse/Tech may accompany you over to the MRI unit
- You will have a chance to speak with an MRI Tech prior to your scan
- You will have your scan under supervision of the MRI Tech. A Pacemaker Nurse/Tech will be present only if required. The Radiologist will be present in the MRI department during your scan.
- After your scan the Pacemaker Nurse/Tech will again test your device and reprogram it to the original settings. Once the scan is confirmed satisfactory, you will be free to go home.
- You will have a follow up Pacemaker Clinic appointment at your regular interval.

References

Verma et al. Canadian Heart Rhythm Society and Canadian Association of Radiologists Consensus Statement on Magnetic Resonance Imaging with Cardiac Implantable Electronic Devices, Canadian Journal of Cardiology 30 (2014) 1131-1141

Nazarian et al. Safety of Magnetic Resonance Imaging in Patients with cardiac Devices, The New England Journal of Medicine, (2017) 377:2555-2564

Medtronic, SureScan Pacing Systems Guidelines for MRI procedures

Boston Scientific, ImageReady MR-Conditional Systems, Programming Manual for MRI Protection Mode
Boston Scientific, ImageReady Programming Manual for MRI Protection Mode

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