

SUMMARY

MRI systems utilize powerful static and pulsed magnetic fields combined with pulsed radio wave energy to visualize detailed internal structures.

This article discusses potential interactions between MRI and implantable devices

Products Referenced

All ICDs, CRT-Ds, CRT-Ps, Pacing Systems and Leads.

Products referenced herein may not be approved in all geographies. For comprehensive information on device operation and indications for use, reference the appropriate product labeling.

CRT-D: Cardiac Resynchronization Therapy Defibrillator
 CRT-P: Cardiac Resynchronization Therapy Pacemaker
 ICD: Implantable Cardioverter Defibrillator

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Magnetic Resonance Imaging (MRI) and Implanted Medical Devices

MRI for patients with implantable pulse generators has been contraindicated by MRI manufacturers and warned against by medical device manufacturers.

Patients with implanted devices that are not defined as MR Conditional should not be exposed to MRI scanning without a careful and complete risk-benefit analysis because strong fields associated with MRI scanning may interfere with normal device function, damage implanted pacemaker or defibrillator systems, or cause patient injury or death. If MRI cannot be avoided, patients must be closely monitored and appropriate device function should be verified upon cessation of MRI.

Potential MRI interactions with the device system include the following:

Potential interaction(s)	ICDs and CRT-Ds	Pacemakers and CRT-Ps	Lead systems (including abandoned leads)
Inhibition of tachyarrhythmia therapy (ATP/shock therapy not provided when needed)	■		
Inappropriate tachyarrhythmia therapy (ATP/shock therapy provided when not needed)	■		
Deactivation of tachyarrhythmia therapy*	■		
Asynchronous pacing (pacing therapy provided independent of intrinsic cardiac activity)	■	■	
Inhibition of pacing (pacing therapy not provided when needed)	■	■	
Triggered ventricular pacing up to the Maximum Tracking Rate (MTR)	■	■	
Erroneous episodes stored in pulse generator EGM and counter memory	■	■	
Apparent drop in battery voltage or appearance of replacement indicator [†]	■	■	
Pulse generator pulling or twisting at implant site	■	■	
Pulse generator vibration	■	■	
Irreversible damage to the pulse generator	■	■	
Induced arrhythmias	■	■	■
Lead heating, which may lead to tissue damage and pacing threshold changes			■
Pulse generator heating and damage	■	■	
Unintended stimulation (gradient-field induced current incident on lead causing a short pulse)	■	■	■

*Requires reprogramming to restore.
[†]In most instances, the indicator can be reset/cleared in defibrillators with a manual capacitor reformation.

For additional information and considerations for the performance of MRI examinations in patients with implanted medical devices, please refer to the American Heart Association's Scientific Statement on the safety of MRI in patients with cardiovascular devices.¹

¹ Levine, G. N., A. S. Gomes, A. E. Arai, D. A. Bluemke, S. D. Flamm, E. Kanal, W. J. Manning, E. T. Martin, J. M. Smith, N. Wilke, and F. S. Shellock. "Safety of Magnetic Resonance Imaging in Patients With Cardiovascular Devices: An American Heart Association Scientific Statement From the Committee on Diagnostic and Interventional Cardiac Catheterization, Council on Clinical Cardiology, and the Council on Cardiovascular Radiology and Intervention: Endorsed by the American College of Cardiology Foundation, the North American Society for Cardiac Imaging, and the Society for Cardiovascular Magnetic Resonance." *Circulation* 116.24 (2007): 2878-891. Print.