MRI in patients with cardiac implantable electronic devices, our institutional experience

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Target audience: Clinicians, Translational Researchers

Purpose: To evaluate the clinical outcomes of patients with cardiac implantable electronic devices (CIEDs) that underwent magnetic resonance imaging (MRI) over a variety of anatomic regions, after pre-procedure cardiology assessment.

Methods: This is an IRB-approved and HIPPA-compliant retrospective study of 141 cases. A cross-departmental protocol, coordinated between Cardiology and Radiology, was instituted to evaluate patients with ICDs that were in clinical need of an MRI. From 7-2012 and 9-2014, a total of 141 cases with CIEDs were referred for MRI that received cardiology evaluation prior to imaging. Criteria for clearance to perform the MRI included: 1) active pacing leads placed > 6 months, 2) pacing lead and device battery parameters stable and within normal range and 3) stale unpaced heart rhythm with a HR > 50 bpm . Patients cleared for MRI were subject to device interrogation/programming before and after the imaging. All studies were performed on a 1.5T system (Magnetom Aera). CIEDs were turned off prior to imaging and the patient was monitored with EKG, blood pressure and pulse oximetry during the course of the exam. Clinical parameters related to patient monitoring during MRI were recorded, as were device parameters pre and post MRI. All patients had subsequent follow-up with cardiology with 6 weeks of the MRI.

Results: A total of 141 cases were referred for cardiology consult, and 127/141 (90%) were cleared for MRI based on clinical parameters. No adverse clinical events or significant alterations in recorded clinical parameters (defined as requiring medical staff intervention) were observed. Scan time ranged from 9 to 190 minutes (average 48 minutes). The number of exam are presented in Table 1 by anatomic region, with 27/127 studies (21%) involving directed cardiothoracic imaging. Postprocedure interrogation of CIEDs found no significant change in pacing lead or device parameters.

Discussion: Our data suggest a clinically indicated MRI may be safely performed with a dedicated institutional protocol including pre-procedure cardiology assessment, pre and post imaging device interrogation, and clinical monitoring during the exam. Studies with the CIEDs in the magnet isocenter were included in this study and showed no increased adverse effects.

Conclusion: MRI in patients with cardiac implantable electronic devices could be performed safely on a case-by-case basis and only if the site is staffed with individuals with the appropriate radiology and cardiology knowledge and expertise, including cases involving directed cardiothoracic imaging.

References: (1) Eur J Radiol. 2014 Aug; 83(8):1387-95. (2) PACE 2005; 28:326–8. (3) Med Devices (Auckl) 2014; 7:115-24.

Table 1	
Imaged body region	**Number of cases**
Head	37
Head and spine	2
Cardiothoracic	27
Abdomen	30
Pelvis	3
Brachial plexus	1
Upper extremity	1
Lower extremity	8
Spine	18

Table 1. Number of cases with different body regions imaged.