

The clinical impact of 1.5T MRI in patients with a permanently implanted pacemaker: A necessary procedure for indicated cases.

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Problem:

Over 3 million Americans have a permanently implanted pacemaker. Current ACR guidelines state that an implanted pacemaker is a relative contraindication and that MR imaging is not routine¹. Investigators have reported that MRI can be performed safely if certain criteria are met and precautions taken². The purpose of our study was to determine the clinical impact of 1.5T MRI in pacemaker patients at our institution.

Methods:

A recently developed pacemaker protocol was strictly followed to insure patient safety. The indication for the MRI was reviewed by neuroradiology on a case-by-case basis. Imaging alternatives were considered and discussed with ordering physicians. Patients were confirmed to be non-pacemaker dependent, and pacemaker parameters were interrogated prior to and after the MRI by cardiology. Neuroradiology, cardiology and medical physics staff were present during scanning to tailor the exam to the clinical question, monitor the effect of the magnetic field and gradients on the cardiac rhythm, and modify the imaging parameters to maintain SAR below 1.5 watts/kg. Patient histories, prior imaging examinations and MRI studies were reviewed to determine the effect the MRI study had on patient management and clinical outcome.

Results:

Nineteen 1.5 Tesla MRI examinations of the head and/or spine were performed on 15 patients for a variety of indications. Three patients had multiple MRI examinations. All exams were completed without incident. A variety of pathologic conditions were identified including a foramen magnum meningioma, intracanalicular acoustic neuroma, multifocal glioblastoma multiforme, and a spinal dural arteriovenous fistula. In 8 of the 15 patients, the diagnosis could only be obtained by MRI, with a diagnosis not made on alternative modalities. In 5 patients, the MRI added value to patient management. In one patient, the MRI was critical for treatment as the MRI was performed for intraoperative MRI guided surgical placement of bilateral deep brain stimulators.

Conclusions:

MRI examinations at 1.5 Tesla in pacemaker patients have the ability to significantly affect patient care and offers diagnostic information not available by other studies. This study illustrates the need for MR imaging in patients with implanted pacemakers. It is apparent that MRI is indicated when other imaging modalities fail to provide a diagnosis. Further work regarding the safety and efficacy of performing MRI in pacemaker implanted patients is warranted.

Images:

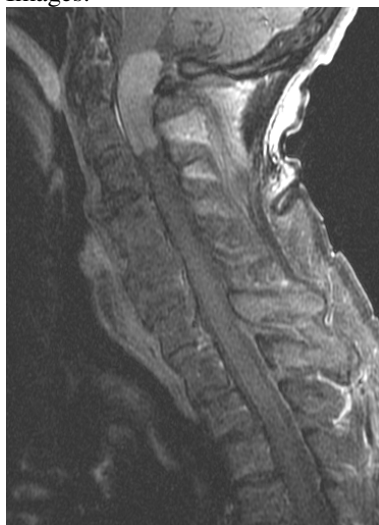


Figure 1. Contrast enhanced MRI of the cervical spine in a myelopathic patient with an implanted pacemaker. The enhancing intradural extramedullary mass at the craniocervical junction was shown to represent meningioma. This was not detected on an outside CT myelogram. However, the diagnosis is readily made with MRI.



Figure 2. Sagittal T2 weighted image of the lower thoracic spine showing T2 signal within the spinal cord and conus medullaris, and prominent vessels along the surface of the spinal cord. Subsequent bolus MRA of the spine and catheter arteriogram confirmed presence of spinal dural AVF. The dural AVF was successfully disconnected at surgery.

References:

¹Kanal E, Barkovich AJ, Bell C, et al. ACR Guidance Document for Safe MR Practices; 2007. *AJR Am J Roentgenol* 2007;188:1-27.

²Martin ET, Coman JA, Shellock FG, et al. Magnetic Resonance Imaging and Cardiac Pacemaker Safety at 1.5 Tesla. *J Am College Cardiology* 2004;43:1-11.