CLINICAL MRI EXAMS FOR PATIENTS WITH IMPLANTED ELECTRONIC DEVICES

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HIGHLIGHTS

- The use of magnetic resonance imaging (MRI) as a diagnostic technique is rapidly expanding.[1]
- The number of patients who undergo implantation of cardiovascular devices is increasing. It is estimated that up to 75% of pacemaker and ICD recipients will develop an indication for MRI.[2,3]
- Implantable cardiac devices are subject to multiple effects from MRI, including force and torque, electrical current induction within the field resulting in myocardial capture, and heating and tissue damage.[4-8]
- This session will review a safety protocol for non-cardiac and cardiac MRI of patients with standard permanent pacemakers or ICDs.

MRI IN PATIENTS WITH DEVICES

- **TARGET AUDIENCE** – Cardiologists and radiologists interested in providing imaging services to cardiac device recipients.
- **OUTCOMES/OBJECTIVES** – To review the safety protocol, including the ability to a) identify cardiac device systems and configurations that are low risk for MRI, and b) appropriate device programming and monitoring steps during MRI.
- **PURPOSE** – To enable the diagnostic and therapeutic uses of MRI for cardiac device recipients.
- **RESULTS** - We have published our results including long-term follow up of 555 MRI studies in 438 patients with implantable devices. The median age of our patient population was 68 years, and of all patients, 54% had pacemakers and 46% had ICDs. Of all patients, 22% had complete heart block. The majority of MR examinations performed in our cohort imaged the brain and spine (40% and 22%, respectively). Fifteen percent of our patient population underwent repeat MR imaging for clinical follow-up of diagnostic findings and/or treatment effects. When comparing immediate post MR examination to pre-examination values, we observed statistically significant but clinically small changes in several device variables. These changes included minor decreases in right ventricular sensing and atrial and right and left ventricular lead impedances. Long-term changes were also observed, including decreased right ventricular sensing and impedance, increased right ventricular capture threshold, and decreased battery voltage. Neither immediate nor long-term changes in device parameters were large enough to require lead or system revision or device

reprogramming. In 3 of 438 patients in our recently reported cohort, the implantable cardiac device exhibited acute power-on-reset events. Of note, during long-term follow-up interrogations, there was no evidence for device malfunction in patients who experienced power-on-reset events.[9]

- **DISCUSSION** – MRI can be safely performed in patients with certain pacemaker and ICD systems using a protocol based on device selection, programming, and close patient monitoring.
- **CONCLUSION** – The ability to perform MRI in the millions of patients with implanted cardiac devices can have significant diagnostic and therapeutic benefits.

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