Performing Magnetic Resonance Imaging in Patients with Conditional Cardiac Devices: A Collaborative Protocol to Mitigate Risk

D. Campbell, RN BScN CCN(c); A.M. Johri, MD MSc FRCPC FASE; C.S. Simpson, MD FRCP FACC FHRS; R. Hart, BA RN; K. Hubbard, BSc MRT R; A. Baranchuk, MD FACC FRCPC; S. McKendry, MRT R; C. Myers, RN

Background

Magnetic resonance imaging (MRI) is becoming a gold standard for soft tissue evaluation. However, the performance of MRI is contraindicated in patients with conventional cardiac devices. It is expected that 50 -75% of patients with implantable cardiac devices will require an MRI over the lifetime of their device and that MRI indications will double after age 65[1,2]. Given the increase in MRI indications and the growing number of cardiac devices, MRI conditional cardiac devices have been developed. Safe performance of MRI in patients with these select devices requires careful verification of compatibility through screening protocols. The lack of standardized screening protocols and knowledge regarding the existence of these conditional cardiac devices has led to MRI refusal in this patient population.

Objective

To ensure patients are not denied access to MRI with conditional cardiac devices and to mitigate risk by developing a rigorous screening protocol to ensure the correct compatibility has been verified.

Safety Concerns

Hazards due to radiofrequency (RF), static and gradient magnetic fields can cause the following:

- Mechanical effects (device movement, dislodgement, or lead fracture)
- Lead tip heating
- Over and Under-sensing
- Current induction leading to rapid pacing
- Reed switch interference
- Electrical reset or permanent device damage
- Death

Methods

1. Established an Interprofessional working group from the Radiology and Arrhythmia Service.
2. Literature review.
3. Interprofessional working group education provided by device industry Clinical Specialist.
4. Teleconference with MRI clinical expert with experience performing MRI on conditional cardiac device patients.
5. Review of industry safety recommendations for Radiology and the Arrhythmia service.
6. Reviewed checklists, and workflow documents from hospitals performing MRI on conditional cardiac devices in Canada.
7. Received Health Canada approval documentation for MRI conditional status of device.
8. Reviewed our institutions collaborative consultation process and screening protocols for cardiac device patients undergoing surgery and/or radiation oncology.

Results

A comprehensive workflow document was developed outlining each department’s responsibilities:

Conclusions

- A Collaborative Screening Protocol was developed.
- Any patient with a cardiac device is screened and follows through these 3 forms if their device is found to be MRI conditional.
- To date 25 MRI scans have been completed for patients with conditional cardiac devices.
- 5 patients were excluded from MRI access as screening showed that their cardiac devices were not MRI conditional.

References: