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Physics SABI Case

Kalpana Kanal, PhD, DABR
Mussie Tesfaldet R.T. (R)(MR)MRSO(MRSC™)
Christina Brunnquell, PhD, DABR

University of Washington, Seattle, WA

Question 1

An MRI order is received, and the patient has an implanted pacemaker. What would be the next step?

A. Go ahead with the MR exam

B. Tech will research CIED components for MR safety.

C. Send the patient to x-ray to identify the pacemaker

D. Seek approval from an attending Radiologist

Question 2

What pre-MRI check is essential to clear the pacemaker for MRI?

A. Confirm generator and lead(s) make and model
B. Cardiology CIED programming orders
C. Consult with patient's primary care physician
D. A and B
E. All of the above

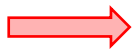
Question 3

What are MR non-conditional devices?

A. Devices and leads that have been studied and established as MR safe

B. Implanted devices and leads from separate manufacturers

C. Older devices and leads that were not specifically studied or include abandoned, fractured, or epicardial leads.



D. B and C

E. All of the above.

Teaching points

When entering an MRI environment, it is important to consider safety hazards for patients with implants, external devices etc.

- Implants, medical devices and other equipment used around an MR scanner are labeled as follows:
  - MR safe
    - no safety hazards
  - MR unsafe
    - these devices and patients with these devices should not be allowed in the MR scanner room

Teaching points

- MR conditional
  - these devices and patients with these devices can enter the MR scanner room under specific conditions provided in the labeling.

- MR Non-Conditional
  - A non–MRI-conditional device may include older devices and leads that were not specifically studied or include abandoned, fractured, or epicardial leads. (Gupta et al)
  - Radiology: Cardiothoracic Imaging 2020; 2(5):e200086 https://doi.org/10.1148/ryct.2020200086

Pacemaker/ICD workflow

- **This is site specific and varies by practice across the country**.
- At our hospital,
  - ✓When an MRI order is received and the patient has an implanted pacemaker or defibrillator, scheduler will obtain make, model, physician managing their device, and the date it was implanted for both generator and leads. Exam will not be scheduled until implant is cleared.
  - ✓According to the information received, the MRI Supervisor or Lead (MRSO) will determine if the pacemaker is MRI conditional, Non-conditional, or contraindicated (typically 2 days turnaround time).
    - This includes confirming implant history with two sources (we often encounter discrepancies between hospitals, manufacturers, and OP reports), obtaining scanning conditions from the manufacturer and entering them into EMR.

Pacemaker/ICD workflow

- If device is determined to be MRI conditional,
  - MRI exam scheduled
  - Schedule with pacemaker representative
  - Obtain cardiology orders from the patient's Cardiologist or EP physician. This is needed prior to MRI to determine MRI mode settings.
  - The cardiology orders provided to pacemaker representative prior to exam.
  - Device is interrogated and programmed once RN is monitoring patient's vitals (O2 and ECG)
  - Patient is scanned while RN monitoring vitals (O2 and ECG)
  - Once scan completed, the manufacturer representative will return CIED to pre-MRI settings.

Pacemaker/ICD workflow

- If device is determined to be MRI non-conditional,
  - Radiologist section head approval is needed for exam risk vs benefit/necessity/alternative imaging options
  - MR exam scheduled with radiologist approval
  - EP nurse reviews pacemaker/ICD implant history to re-check if patient has abandoned or capped leads rendering device contraindicated for MR
  - Patient arrives, written informed consent is obtained by Radiologist
  - EP nurse to interrogate and program the CIED
  - Monitor vitals (O2 and ECG)
  - Following MRI, EP RN will return CIED to pre-MRI settings.

Resources

- https://www.fda.gov/radiation-emitting-products/mri-magnetic-resonance-imaging/mri-safety-posters
- Indik et al - 2017 HRS expert consensus statement on magnetic resonance imaging and radiation exposure in patients with cardiovascular implantable electronic devices, http://dx.doi.org/10.1016/j.hrthm.2017.04.025
- Maralani et al - MRI Safety and Devices: An Update and Expert Consensus, View this article online at wileyonlinelibrary.com. https://onlinelibrary.wiley.com/doi/10.1002/jmri.26909