Radiofrequency Neurotomy for Facet Joint Pain in Patients with Permanent Pacemakers and Defibrillators

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Myth: Radiofrequency neurotomy (RFN) is an absolute contraindication in patients with a prior permanent pacemaker (PPM) or implantable cardioverter defibrillator (ICD).

Fact: Radiofrequency neurotomy (RFN) can be safely performed in these patients; however, close collaboration with a cardiologist or electrophysiologist is recommended prior to initiating the RFN procedure.

Radiofrequency neurotomy (RFN) is used in pain medicine for the treatment of painful conditions including facet joint pain [1]. Patients with facet (z-joint) pain may have unrelated comorbidities that require implanted permanent pacemaker (PPM) or implantable cardiac defibrillator (ICD). Both of these devices rely on the detection of electrical cardiac activity, rhythm, and rate to function properly. There are reports of RFN for various uses causing PPM/ICD dysfunction. There are no known reports of RFN procedures for spine pain causing ICD or PPM dysfunction that lead to serious injury or death.

For reports of PPM device malfunction, some data can be extrapolated from data on RFN for cardiac arrhythmias. Most of the available data focused on PPM rather than ICD dysfunction. RFN can theoretically disrupt the function of either device. A 1995 study looked at PPM activity in 25 patients with 13 different devices, most with unipolar electrodes, undergoing RFN for tachyarrhythmia. Sensing failures were observed in eight (32.0%) and pacing failures in four (16.0%) patients [2]. No pacemaker damage was seen. An animal study looked at the effects of RFN on pacemaker function [3]. The authors found that there are several parameters that reduce the interference with PPM function by monopolar instruments. These parameters included lowering the generator power setting and locating the dispersive electrode so the current vector does not traverse the pacemaker generator or leads [3]. The theoretical risks of RFN for lumbar and cervical spine are less than for cardiac and intra-thoracic procedures where the RFN probes are in much closer proximity to device leads [4]. There is some evidence that bipolar RFN may be safer than monopolar RFN [5]. There are no data available on whether other RFN technologies such as pulsed and cooled RF have a comparable risk profile. Theoretically the fact that these procedures are performed far away from PPM/ICD leads again suggests that they, like conventional RFN, likely carry far less risk than cardiac and intra-thoracic RFN.

Professional organizations, device manufacturers, and other experts have recommended precautions to minimize any possible risk of RFN interfering with PPM/ICD function. The American Society of Anesthesiology has advised that for both ICD/PPM the grounding electrode be placed >15cm away from pacing leads, and consideration of including a device representative or electrophysiologist for consideration of placing a magnet over the device or altering the mode. Post-procedure monitoring of the pacemaker is also advised [6]. Device manufacturers have also weighed in on the topic. For PPM, device manufacturers recommend either placing a magnet over the device or programming the PPM to asynchronous mode. For ICD, device manufacturers recommend deactivating tachy therapy prior to the RFN procedure [7]. This can be accomplished by re-programming or putting a magnet over the device [7].
Conclusion

There are no known reports of RFN procedures for spine or other joint pain causing ICD/PPM dysfunction that led to serious injury or death. However, caution is advised in patients who have cardiac pacemakers and defibrillators. If a decision is made to proceed with RFN in these patients, physicians should consider the following recommendations to maximize safety and minimize complications:

1. Educate the patient on the potential hazards and risks of RFN in the setting of a pre-existing PPM or ICD.
2. Ensure the patient is followed by a cardiologist/electrophysiologist and obtain prior approval from the provider, which should be documented in the patient's medical record.
3. If recommended by the cardiologist or electrophysiologist:
   a. Consider coordination of RFN procedure with the cardiac device manufacturer to have on-site support for interrogation of the cardiac device during the procedure in the event reprogramming of the device is required.
   b. Place a magnet over the device to inhibit triggering the device by RFN.
   c. Remove the magnet or use external defibrillator/pacing electrodes if cardiac arrhythmias occur during the RFN procedure.

References

6. ASA practice advisory: Keep grounding electrode 15cm away from pacing leads. Anesthesiology 2011;114:247-261.