IPhone12 will stop your implantable defibrillator

8 January 2021, by John Hewitt

In a recent paper in the journal *Heart Rhythm*, doctors describe how they turned off the potentially life-saving cardiac defibrillator function of an implanted Medtronic device simply by holding an iPhone 12 near it. The authors had nothing personal against Medtronic, or for that matter, against the new iPhone. The main reason they singled the phone out here was because it is compatible with some of the most advanced new technologies available for various magnetic-based communications and charging.

This technology, known as MagSafe, is basically harmless. It typically integrates charger, magnetometer and NFC reader into a compact package that depends on fairly decent alignment for efficient operation. The problem, at least for Medtronic, is the magnets that facilitate the positioning and docking. The iPhone 12, for example, has a ring of them around its central charging coil. In a nutshell, permanent magnets are never going away, they are simply a perfect solution to many gadget problems. Applications including securing cochlear implant links, joining cables and fastening wristbands now make extensive of use of strong, miniature magnets.

Unless companies like Medtronic get on board and move to smarter device configuration options, they will continue to butt heads with consumer devices—and they will continue to lose. Smarter options don't have to be expensive; just look at your cheap IR TV remote or ultrasonic receiver-emitter pair. These devices simply work. They use an uncomplicated code to make sure there is no interference from all the other ambient sources that are invariably present. A couple of secure ultrasonic bits superimposed on your basic 40 khz carrier waves is all that is really needed. It is likely that companies like Medtronic are working on solutions like this; for example, a Medtronic programming head of some sort can be had on Ebay at the moment for a mere $34.99.

In the larger scheme of things, having a handy iPhone, iWatch, fitbit, or even JUUL vape pen in your pocket to turn off inappropriate pulses or change stimulation modes is not such a bad thing, considering the alternative. Note that all these devices have accidentally toggled pacemakers. For example, if you have say, a standard issue Medtronic c Implantable Cardioverter Pacemaker or Resynchronization Defibrillator, they don't give you a tiny pen. Instead, you lug around their giant 3" diameter,5/8" thick donut magnet that gives a field of 90 Gauss at 1.5."

Perhaps now is a good time to look a little closer into what different implantable pacemaker/defibrillators actually do, and why inappropriately triggering them—or not triggering them, as the case may be—is undesirable. Inappropriate triggering is nothing unusual; it is, in fact, the central preoccupation for these devices. In other words, choosing when to force a contraction, or rhythm, and when to let the heart try to take some responsibility. There are different ways to implant, record from, and stimulate an ailing heart. You can do it externally to the heart chambers, inside the atrium, the ventricle, or both depending on the condition or pathology.

For example, with permanent chronic atrial fibrillation you might get by with a single atrial lead, while with intermittent or paroxysmal fibrillation, you likely want dual atrial and ventricular leads. In pacemaker vernacular, common control modes have names like AOO (asynchronous atrial pacing), VOO (asynchronous ventricular pacing), or DOO (asynchronous A+V pacing). More advanced modes, like DDD mode, have additional logical if-then control, something like the following: "dual-chamber anti bradycardia pacing; if atria fails to fire, it is paced. If the ventricle fails to fire after an atrial event (sensed or paced) the ventricle will be paced."

For the case of the accidental activation by a smartwatch, researchers replicated the misbehavior using a Medtronic Visia AF MRI S DF-1 single chamber ICD defibrillator. In the case of the accidental activation by a JUUL case, a man with a prolonged H-V interval had a dual-chamber Medtronic Evera MRI XT DR DDMB1D1. The reporting authors noted that although in this case, he was fine after reverting to magnet mode and halting emergency stimulation, there is clear potential for unintentional temporary programming and arrhythmic complications with these devices as they stand now.

More information: Joshua C. Greenberg, et al. Life Saving Therapy Inhibition by Phones Containing Magnets, *Heart Rhythm*. DOI: doi.org/10.1016/j.hrthm.2020.12.032

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