Do induction cooktops pose a health risk for customers with defibrillators or pacemakers?

An Ask E Source answer

By Essie Snell

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Q: Do you have any information on how induction cooktops affect implantable cardioverter defibrillators (ICDs) and pacemakers?

A: As with almost any device that creates a strong magnetic or electromagnetic field—induction cooktops do theoretically have some potential to interfere with ICDs and pacemakers and that users may want to keep their device one to two feet away from an induction heating element. Additionally, the available scientific medical papers we identified seem to suggest that the risk to these kinds of devices from induction cooktops is fairly low, with some studies finding no evidence of adverse effects and others finding potential for interference under worst-case scenarios.

We offer a list of scientific papers published in medical journals and guidance provided by prominent medical device manufacturers and induction cooktop manufacturers. Additionally, if you're curious about the range of devices that have potential to interfere in some way with ICDs and pacemakers (from hair dryers and power tools to jumper cables and electronic body fat scales), Kaiser Permanente has a useful summary on its ICD:

Living Well with It web page.

Scientific medical papers

According to the 2006 Europace article Do Induction Cooktops Interfere with Cardiac Pacemakers?:

> A worst-case pacemaker-patient (PP) model representing left-sided implantation of a unipolar pacemaker was used for measurement of induced voltages, to judge whether induction cooktops could interfere with pacemaker sensing … [In conclusion] Patients are at risk if the implant is unipolar and left-sided, if they stand as close as possible to the induction cooktop, and if the pot is not concentric with the induction coil.

The 2005 Journal of Cardiovascular Electrophysiology article Induction ovens and electromagnetic interference: what is the risk for patients with implantable cardioverter defibrillators? explains:

> Interrogation of the devices after exposure did not show any inappropriate tachycardia detection, oversensing, or reprogramming. In conclusion, ICD patients can be reassured that [electromagnetic interference] is unlikely to affect their devices if induction ovens are used in their kitchens.

A 2005 paper from researchers in the Department of Clinical Engineering at Kitasato University in Japan, Electromagnetic interference of implantable unipolar cardiac pacemakers by an induction oven, says:

> The maximal interference distance from the oven was 34 cm [centimeters] for one of the pacemakers. Thus, the safe distance from an induction oven of a patient with an implanted cardiac pacemaker is considered to be 50 cm or more. In conclusion, in the pan-detection mode of the oven in the absence of a pan, the distribution profile of the magnetic field intensity peaked at the center of the cooking plate, and during the induction heating of a pan placed on the oven, it peaked at the circular edge of the pan. The induction oven asynchronized or generated pulses in implantable unipolar cardiac pacemakers up to a maximal distance of 34 cm from the induction oven.

According to a 2003 paper published in the French journal Archives of Heart and Vessel Diseases, Effects of 50

to 60 Hz and of 20 to 50 kHz magnetic fields on the operation of implanted cardiac pacemakers:

> Actual pacemakers do not present any electromagnetic interference with 50 Hz [hertz] and 60 Hz or induction cooktop frequency working. They are insensitive with medically correct settings. Unusual high sensitivity leads only to noise reversion mode, or transient ventricular tracking.

And the 2003 article in Pacing and Clinical Electrophysiology Induction Ovens and Electromagnetic Interference: What Is the Risk for Patients with Implanted Pacemakers? explains:

> The study showed no incidence of pacemaker malfunction during the entire test while the patients with intrinsic cardiac rhythms were exposed to the induction oven at varying energy strengths. Likewise, there was no external interference when the patients were paced at heart rates of 10–15 beats/min above their heart rates. The programmed parameters remained unchanged after the study. In conclusion, this study shows no EMI risk of an induction oven in patients with bipolar or right-sided unipolar pacemakers.

Manufacturer guidance

Medical device manufacturers:

- *Medtronic.* On its web page Household and Hobby Items Electromagnetic Compatibility Guide for Implantable Cardiac Devices, Medtronic recommends maintaining at least two feet between the heart device and an induction cooktop stove.
- *St. Jude Medical.* In its paper Effects of Induction Ovens on St. Jude Medical Implantable Cardiac Rhythm Devices (PDF), the authors state that "St. Jude Medical does not anticipate any interference between induction ovens and St. Jude Medical cardiac implants under normal operating conditions. Additionally, patients have used induction ovens with no reported adverse effects."
- *Boston Scientific.* The Boston Scientific Electromagnetic (EMI) Compatibility Table for Pacemakers, Transvenous ICDs, S-ICDs and Heart Failure Devices (PDF) suggests that users "maintain at least a 12-inch (30 cm) separation between stove top and device."
- *Biotronik.* The paper Electromagnetic Compatibility of BIOTRONIK Cardiac Pacemakers, ICDs and CRT devices (PDF) recommends a distance of at least 30 cm between the pacemaker and an induction cooktop.

Induction cooktop manufacturers:

- *Bosch.* In its induction equipment user manuals, Bosch advises users to "exercise caution using or

standing near an induction hob while it is in operation, if you wear a pacemaker or a similar medical device. Consult your doctor or the device manufacturer concerning its conformity or any possible incompatibilities."

- *Electrolux, Frigidaire, and LG.* In their user manuals, Electrolux, Frigidaire, and LG all state that "persons with a pacemaker or similar medical device should exercise caution using or standing near an induction unit while it is in operation, as the electromagnetic field may affect the working of the pacemaker or similar medical device. It would be advisable to consult your doctor or the pacemaker or similar medical device manufacturer about your particular situation."
- *GE.* On its Pacemakers and Induction Cooktops EMF (Electromagnetic Field) Questions web page, GE explains, "Based on recommendations by the FDA"s CDRH, a division of the Federal, Food and Drug Administration, exposure standards were defined for the product that are consistent with the most strict existing public standards governing any equipment operating at or near the frequency of induction cooktops. Our research and the pacemaker experiments showed these specifications to be conservative. We are confident that there is no risk to humans from magnetic fields produced by the product… [Nonetheless] We recommend that induction cooktop users with pacemakers should consult their doctors or pacemaker manufacturer regarding EMF levels and use of EMF producing equipment."
- *Fisher Paykel.* On its Safety and Warnings web page, Fisher Paykel says, "This appliance complies with electromagnetic safety standards. However, persons with cardiac pacemakers or other electrical implants (such as insulin pumps) must consult with their doctor or implant manufacturer before using this appliance to make sure that their implants will not be affected by the electromagnetic field. Failure to follow this advice may result in death."
- *KitchenAid.* On its Induction web page, KitchenAid states, "People with a pacemaker or similar medical device should use care when standing near this induction cooktop while it is on. The electromagnetic field may affect the pacemaker or similar device. Consult your doctor, or the manufacturer of the pacemaker or similar medical device for additional information about its effects with electromagnetic fields of the induction cooktop."