The risk of electromagnetic interference from a hearing aid device tested on a cardiac resynchronization therapy device

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Abstract
A 65 year old lady underwent implantation of a SORIN Paradym 8750 cardiac resynchronization therapy-implantable cardioverter defibrillator (CRT-ICD) (ELA Medical—SORIN Group, Milan, Italy) for non-ischemic dilated cardiomyopathy (ejection fraction of 27 %, left bundle branch block with QRS duration of 178 ms and NYHA class II symptoms).

The patient was profoundly hard of hearing and relied heavily upon her hearing aid device (Personal PA Wideband Receiver, Model PPA R7-4NA, Eden Prairie, Minnesota, USA), particularly when attending church. The device is a four-channel wideband receiver pre-tuned to frequencies 72.1, 72.5, 72.9, and 75.7 MHz (Figure 1). When in use the personal PA receiver was worn around the neck, hanging over the anterior chest wall (similar to a necklace) and used in conjunction with head-phones and neck loop telecoil couplers (1). Given the proximity of the personal PA device to the left sided CRT-ICD pocket, concern about possible electromagnetic interference (EMI) was raised (2).

Although details of the personal PA system were available, there was no clear guidance from either the manufacturers of the Personal PA system or from the manufacturers of the CRT-ICD as to the likelihood of any potential interference. We therefore conducted a systematic evaluation to assess for possible interference between the two devices using a previously reported protocol. (2,3). Briefly, the personal PA system was switched on and was progressively brought closer to the patient’s CRT-ICD at distances of 1.0, 0.5, 0.25 and 0 meters.

Resumen
Se presenta un caso de una paciente portadora de un cardiodesfibrilador-resincronizador que necesita de un dispositivo auditivo para poder oír. No hay literatura disponible entre las potenciales interacciones entre estos dos dispositivos. Se relata las pruebas realizadas y sus resultados para determinar el potencial riesgo de interferencia electromagnetica.

To the editor
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Interference with RV pacing was initially assessed with VVI pacing (10 beats per minute above the intrinsic heart rate) (Figure 2A), followed by assessment of ventricular sensing (in a bipolar configuration at maximum sensitivity (0.4 mV)) at an intrinsic rate of 80 beats per minute. The test was then repeated programming the CRT-ICD device to AAI using the same protocol, followed by assessment of atrial sensing (in a bipolar configuration at maximum sensitivity (0.2 mV)). The process was then repeated with biventricular pacing in a LV tip to RV coil configuration (Figure 2B). The pacing system was interrogated through a programmer with information from surface electrodes, intracardiac electrograms, and channel markers. Normal pacing function was observed throughout without any significant EMI and no disturbances to sensing or capture detected (Figure 2A and 2B).

**Figure 1:** The Personal PA PPA R7-4NA Hearing Aid Device.

**Figure 2A:** CRT-ICD recordings. RV lead recording: RV pacing assessed in VVI pacing mode (10 beats per minute above the intrinsic heart rate). No significant EMI was produced by the hearing aid device.
Defibrillator function was subsequently tested at maximum sensitivity (0.4 mV) (with sensing on and therapy off) bringing the personal PA device progressively closer until it was overlying the CRT-ICD pocket. Normal functioning of the defibrillation system was noted without any EMI.

The Personal PA Wideband Receiver, Model PPA R7-4NA was therefore considered safe to be used in this specific situation with no interference with the SORIN Paradym 8750 CRT-ICD noted.

BIBLIOGRAFIA

