Underdetection of Ventricular Fibrillation by Wearable Cardioverter-Defibrillator Leading to Sudden Death

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A 51-year-old man with end-stage renal failure collapsed at a hemodialysis facility and was transferred after ventricular fibrillation (VF) was successfully terminated by an automated external defibrillator. Coronary angiography revealed 90% stenosis in the proximal portion of the circumflex artery, where a drug-eluting stent had been deployed. Transthoracic echocardiography revealed severe stenosis of the aortic valve. Insertion of an implantable cardioverter-defibrillator and aortic valve replacement were scheduled for 1 month later, and he was discharged on the 10th hospital day with a wearable cardioverter-defibrillator (WCD) (Life Vest®, Zoll Medical Corp., Chelmsford, MA, USA). However, 13 days later, he was found dead.

The WCD recordings were reviewed. At 1 h before he was found dead, VF started (**Figure B**) and was accordingly detected 20 s later (**Figure C**). However, as the voltage of VF decreased, the algorithm determined 67 s later that VF had stopped (**Figure D**), despite continuation of VF. **Figure E** shows the same recording as in **Figure D**, with detectors. The upper gray line demonstrates the lack of

morphology match with the baseline recording, which is determined by vectorcardiography, showing that VF detection was stopped because the morphology matched the sinus rhythm over several seconds (**Figure E**, arrow). Vectorcardiography demonstrated a similarity between baseline sinus rhythm (**Figure A**) and VF (**Figure D**). Without any shocks delivered, the rhythm changed to an agonal rhythm 10 min later (**Figure F**), and eventually he died.

This case demonstrates that a WCD may miss VF, causing sudden death. Incidental vectorcardiographic similarity between sinus rhythm and VF may cause underdetection of VF.

Disclosure

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Figure. Side-side (SS) and front-back (FB) electrograms and corresponding vectorcardiography (VCG) during baseline (**A**), initiation (**B**), detection (**C**), and underdetection (**D**) of ventricular fibrillation (VF). (**E**) Same recordings as in (**D**), with detectors. (**F**) Electrograms during agonal rhythm.