

Impact of COVID-19 Pandemic on Physical Activity in Patients With Implantable Cardioverter-Defibrillators

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Purpose: The coronavirus disease-2019 (COVID-19) pandemic has been spreading rapidly worldwide since late January 2020. The strict lockdown strategy prompted by the Italian government, to hamper severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) spreading, has reduced the possibility of performing either outdoor or gym physical activity (PA). This study investigated and quantified the reduction of PA in patients with automatic implantable cardioverter-defibrillators (ICDs) for primary prevention of sudden death.

Methods: Daily PA of 24 patients was estimated by processing recorded data from ICD-embedded accelerometric sensors used by the rate-responsive pacing systems.

Results: During the forced 40-d in-home confinement, a mean 25% reduction of PA was observed as compared with the 40-d confinement-free period (1.2 ± 0.3 vs 1.6 ± 0.5 hr/d, respectively, $P = .0001$).

Conclusions: This objective quantification of the impact of the COVID-19 pandemic on PA determined by an ICD device showed an abrupt and statistically significant reduction of PA in primary prevention ICD patients, during the in-home confinement quarantine. To counteract the deleterious effects of physical inactivity during the COVID-19 outbreak, patients should be encouraged to perform indoor exercise-based personalized rehabilitative programs.

Key Words: cardioverter-defibrillators • COVID-19 • physical activity

The coronavirus disease-2019 (COVID-19) pandemic has prompted many governments to promote strict indoor isolation strategies to hamper the virus spreading by limiting human-to-human transmission. Respect for such necessary, but draconian, recommendations has unavoidably reduced the possibility of performing either outdoor or gym physical activity (PA). Physical inactivity is a major risk factor for cardiovascular disease.¹ A large study on 185 000 US subjects reported a steep fall in PA (by 48%) measured by Fitbit trackers since a Federal emergency was declared through April 6.² However, so far, the literature is sparse regarding precise quantification of a PA decline in cardiac patients during the COVID-19 pandemic. The expected

growing prevalence of physical inactivity raises concerns about the maintenance of well-established favorable effects of PA on physical and mental health in such patients.³ The dose-response interaction between the immune system and PA has been described by a J-shaped curve, demonstrating the importance of regular and moderate-intensity exercise to improve the immune system.^{4,5} Accordingly, there is general agreement in support of keeping physically active during the quarantine, especially for older patients.⁶

An implantable cardioverter-defibrillator (ICD) is the recommended treatment for either primary or secondary prevention of sudden cardiac death in selected high-risk patients. Light-to-moderate exercise training programs in ICD recipients have resulted in similar benefits as in other cardiac patients.⁷⁻¹⁰ They also provide potential protective effects against arrhythmic risk through autonomic nervous system balance, metabolic changes, and increasing coronary vascular density and flow. In such patients, an ICD represents a unique tool for continuous monitoring of PA via embedded accelerometric sensors used by the rate-responsive pacing systems.¹¹

The aim of this study was to investigate and quantify changes in PA during the in-home confinement in patients implanted with ICDs.

METHODS

We analyzed data of 24 patients (72 ± 10 yr, 17 males) implanted with ICDs (Boston Scientific) for primary prevention of sudden death and with home-monitoring follow-up. Such ICDs enable a continuous monitoring and recording of PA via embedded accelerometric sensors used by the rate-responsive pacing systems. Recorded data were then processed by a specific algorithm and translated into estimates of time spent in movement, that has been used as surrogate of PA.¹¹ Device-based recordings of patient PA levels were quantified as hr/d and assessed across two timespans: 40 d before and 40 d after the national lockdown began, respectively (Figure).

RESULTS

During the forced 40-d in-home confinement, a 25% mean reduction of PA was observed as compared to the 40-d confinement-free period (mean 1.6 ± 0.5 vs 1.2 ± 0.3 hr/d, respectively, $P = .0001$). Since left ventricular systolic dysfunction is not uncommon in primary prevention ICD patients, baseline exercise performance is expected to be low¹² and this may account for the relatively shallow decline in PA of our patients. Thus, data were reanalyzed after excluding very inactive patients (ie, PA <1 hr/d), but results did not change showing a significant decrease in PA after lockdown began (2.0 ± 0.6 vs 1.5 ± 0.4 hr/d, respectively, $P = .0001$).

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The authors declare no conflicts of interest.

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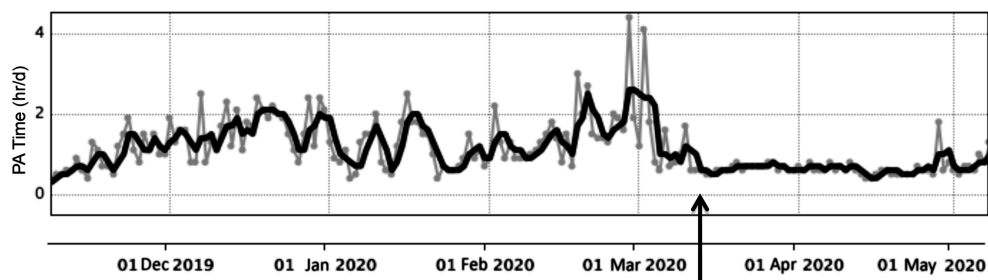


Figure. A patient's daily physical activity over time. The fragmented gray curve indicates daily activity in hours, whereas the smooth curve represents mean values by 3-d groups. The arrow indicates the beginning of the in-home confinement quarantine over the whole national Italian territory (March 12, 2020); from this date onward, the curve falls abruptly down and appears flat with little daily variation of physical activity.

DISCUSSION

This may be the first objective quantification of the impact of the COVID-19 pandemic on PA determined by an ICD device. An abrupt cessation of physical exercise has been associated with rapid loss of PA-related benefits. A mild reduction by even 25% of daily PA in poorly trained ICD patients may underlie a clinically significant worsening of frailty (eg, increasing fall risk) and loss of metabolic, cardiovascular, and musculoskeletal conditioning within just two weeks. To counteract the deleterious effects of physical inactivity during the COVID-19 outbreak, patients should be encouraged to perform indoor exercise-based personalized rehabilitative programs.¹³⁻¹⁵

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