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Effect of first and second German COVID-19 lockdown on physical activity in patients after pulmonary vein isolation



ARTICLE INFO

Keywords

Pulmonary vein isolation
Fitness tracker
Physical activity
COVID-19 lockdown

1. Introduction

Physical activity is an essential component in the prevention of almost all chronic diseases particularly in cardiovascular diseases [1]. A few studies recommend 150 min/week of moderate activity for having a positive benefit on human health status [1–3]. Fitness tracker in combination with smart phone and app-based data collection provide continuous, objective, remote monitoring of physical activity [4,5]. Recent data suggest a significant reduction in physical activity during the COVID-19 related in-home confinement in normal population and in patients with implantable cardioverter-defibrillators [6,7].

The aim of this study was to investigate the level and potential changes of physical activity before and during the first and second COVID-19 lockdown in Germany in patients after pulmonary vein isolation (PVI).

According to our hypothesis, despite the federal government's order that patients should not see others and preferred to stay home, they may develop consistent physical activity based on continuous wearing of a fitness tracker.

2. Methods

We analyzed data from 51 consecutive patients with paroxysmal or persistent atrial fibrillation (AF) after elective PVI and with available activity data during COVID-19 lockdown.

Patients were assessed for physical activity four weeks before (from 24th February 2020 to 22nd March) and four weeks after the official beginning of the first German COVID-19 lockdown (from 23rd March to 20th April 2020). In addition, physical activity of patients was assessed four weeks before the second (from 4th October to 1st November 2020) and four weeks after the beginning of the second COVID-19 lockdown (from 2nd to 29th November 2020). Patients included in this hypothesis-generating study were part of a prospective, multicenter study focusing on AF recurrence after PVI (DRKS00012914). Further inclusion criteria comprised age ≥ 50 to ≤ 77 years, BMI ≥ 23 to ≤ 35 kg/m² and the willingness to wear a Polar™ A370 fitness wristband all day allowing continuous measurement of physical activity (daily step counts, daily

calorie burn and weekly walking distance) and data collection via Polar smart app/homepage. Patients were informed during inclusion in the study that the fitness wristband must be worn every day for 365 days except at night. The Polar™ A370 fitness tracker measures a person's activity using a 3D accelerometer on the wrist of the non-dominant side [8]. The calculation of the distance is based on the step length done by means of a patented logarithm based on the body weight and the individual walking pace. Walking speed is recorded by the tracker through wrist movements. Stored activity data can be viewed both, on the Polar Flow app via smartphone and on the Polar Flow homepage. Patients were allowed to take off the wristband at night, so that the watches are charged during this period, if needed. Furthermore, the data transmissions via the Polar-flow App was regularly checked by study nurses and a physiotherapist, so that an immediate contact is made in case of missing data > 24 h.

This study was approved by the local ethics committee of the state of Brandenburg (S18(a)/2017).

The definition of the 1st lockdown in Germany, which officially went into effect on March 22nd, 2020, included that they should not meet other people and should preferably stay at home [9]. At the same time, they are allowed to leave the apartment, if they have to go to work, go to a doctor's appointment, go shopping or go for a walk always under the condition to keep 2 m distance from other people (to keep the risk of infection as low as possible). Furthermore, public places (theater, concert, museums, fitness center), churches as well as restaurants were completely closed [9]. Thereby the police was controlling for compliance with these rules. This version was valid until April 19, 2020 [9].

As data was not normally distributed, continuous variables are reported as medians with 25th to 75th interquartile ranges. Categorical variables are expressed as counts and percentages. Wilcoxon signed rank test and Friedman test were used for nonparametric comparison of two or more paired samples.

3. Results

The median ages of patients were 63.0 (25th – 75th percentile 58.0–69.0) years with 20 (39%) women. Median body mass index was

<https://doi.org/10.1016/j.ijcha.2021.100901>

Received 27 July 2021; Received in revised form 9 October 2021; Accepted 17 October 2021

Available online 21 October 2021

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Table 1
Baseline characteristics of the study cohort.

Variables	n = 51
Age (years)	63.0 (58.0–69.0)
Women, n (%)	20 (39.2%)
Body mass index (kg / m ²)	27.8 (25.9–31.1)
Antiarrhythmic drugs* after PVI, n (%)	9 (18%)
Paroxysmal AF, n (%) / persistent AF, n (%)	23 (45%) / 28 (55%)
Baseline LVEF (%)	57 (25–79)
Baseline Left atrial diameter (mm)	40 (13–62)
Coronary artery disease, n (%)	13 (25%)
Previous myocardial infarction, n (%)	3 (6%)
Peripheral artery disease, n (%)	3 (6%)
Diabetes, n (%)	10 (20%)
Arterial Hypertension, n (%)	34 (67%)
Stroke, n (%)	2 (4%)
Chronic kidney disease, n (%)	5 (10%)
Type of pulmonary vein isolation	
Cryoballoon ablation, n (%)	34 (67%)
Radiofrequency ablation, n (%)	17 (33%)
Time between PVI and first lockdown (days)	201 (104–238)
AFEQT Score*, points	62.0 (49.0–83.0)

Antiarrhythmic drugs: flecainide or amiodarone, PVI, pulmonary vein isolation. Atrial fibrillation (AF); LVEF, left ventricular ejection fraction. Atrial Fibrillation Effect on Quality-of-Life (AFEQT) questionnaire. Continuous Variables are reported as median and 25 to 75th interquartile range, Categorical variables are expressed as counts and percentages.

27.8 (25th – 75th percentile 25.9–31.1) kg/m². Two-thirds of patients were ablated using the cryoballoon and one-third with radiofrequency ablation. Patient characteristics are shown in Table 1. The timing of patients last ablation varied widely, between 3 and 12 months follow-up.

The data transfer to the Polar-flow-web page showed that the patients wore the watches for an average of 15 h per day. Physical activity over time from before first lockdown to within second lockdown is shown in Figs. 1a and 1b.

Four weeks before first German COVID-19 lockdown, median level of physical activity in patients after PVI was 8,588 (25th – 75th percentile 6,540–12,782) steps per day with a numerical increase to 9,659 (25th – 75th percentile 6,643–12,747) steps per day during the first lockdown, P = .131. After end of first lockdown, the level of physical activity remained essentially unchanged with 9,740 (25th – 75th percentile 8,712–15,347) steps per day one month before beginning of the second lockdown. During the second lockdown, physical activity (9,237 [25th

– 75th percentile 8,114–13,381 steps per day]) did not differ compared to physical activity during the first lockdown, P = .586 (Fig. 1a).

A similar pattern was found for walking distance with 34.3 (25th – 76 percentile 23.0–49.3) km per week one months before the first lockdown and 37.5 (30.5–55.2) km per week during the second lockdown, P = .795 (Fig. 1b).

4. Discussion

In patients after PVI, we observed no relevant change in step count and walking distance when comparing the period before with that of during the first and second COVID-19 lockdown in Germany. The level of observed physical activity was similar to that of other cardiac populations or normal population [10].

Benefits of physical activity on cardiovascular health are well known. In March and November 2020, Germany went into lockdown due to COVID-19 pandemic and population had to change their lifestyles with unknown effects on their mobility and possible negative effects on health status. In Italian cohort, Sassone et al. recently reported deleterious effects of physical inactivity during the COVID-19 outbreak in elderly patients with implantable cardioverter defibrillators [6]. In patients after PVI and without strict in-home confinement as practiced in Italy, we did not observe such negative lockdown-related effects on physical activity, at least in part indicating a higher resilience of this younger and “healthier” patient cohort with a high motivation to be physically active. Also, heart failure patients might have been more scared to COVID-19 infection contributing to interruption of their physical activity.

As far as we know, this is the first study investigating daily physical activity measured by activity wrist band in post PVI patients. Regarding the observed lack of difference in physical activity between first and second lockdown, we speculate that patient motivation may outweigh potential lockdown-related restrictions.

Study results may not be generalizable, as the German confinement was not that restrictive as seen in other countries, such as Spain or Italy. The results are limited by statistical analysis not accounting for correlation or heterogeneous variance over time. Given that patients were aware that they were being monitored, in this present study lacking a control group we cannot rule out selection bias.

5. Conclusion

During the first and second COVID-19 lockdown in Germany no

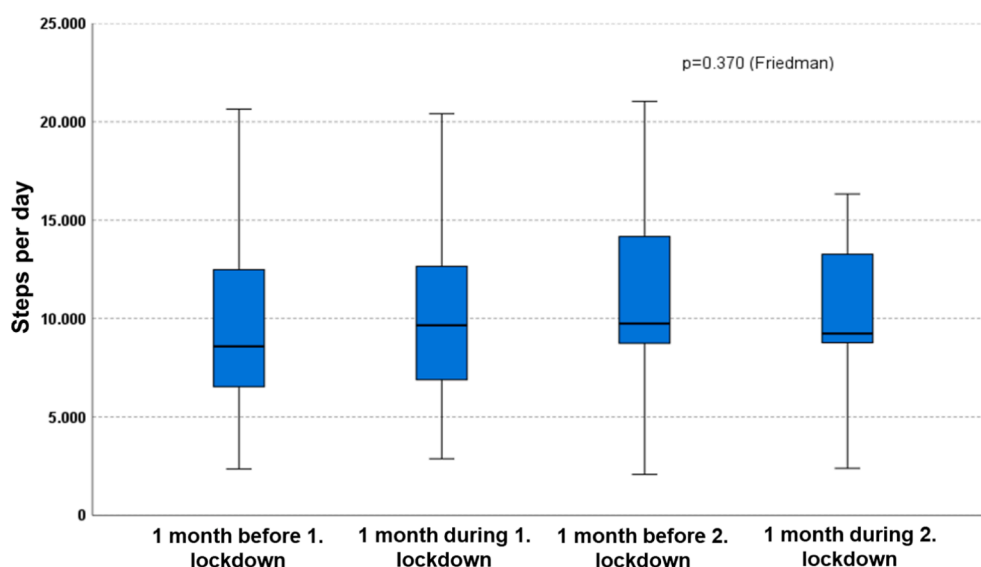


Fig. 1a. Steps per day before and during first and second COVID-19 lockdown (boxplots).

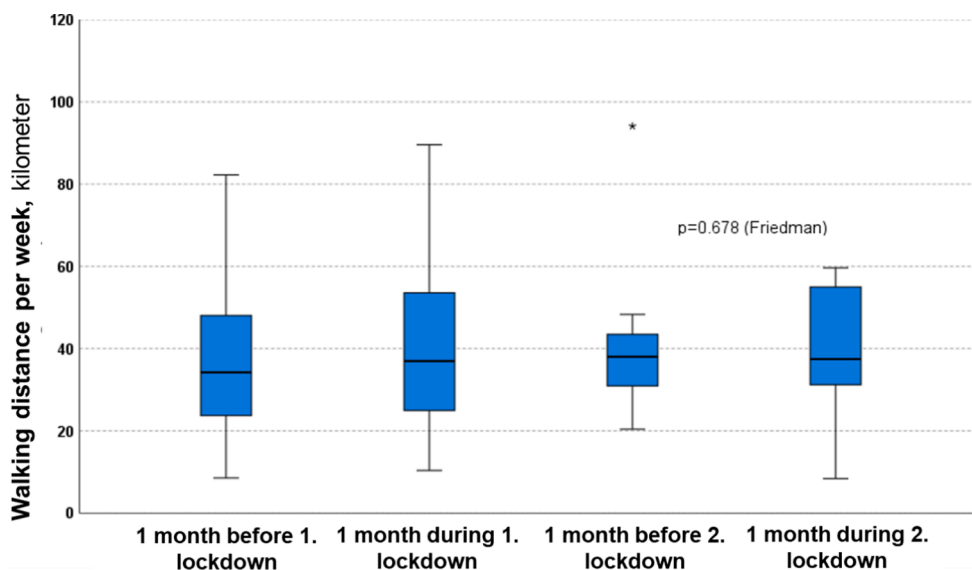


Fig. 1b. Walking distance per week in kilometre before and during first and second COVID-19 lockdown (boxplots).

changes in daily physical activity were found in a cohort of patients after PVI.

6. Financial support

The study was co-funded by the Ministry of Science research and culture State of Brandenburg.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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