Sports Injuries & Medicine
Dahm JB. Sports Injr Med: 6: 176.
www.doi.org/10.29011/2576-9596.100076
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Case-Report

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Myocardial Complications and Decline in Leftventricular Function after Whole BodyElectro-Myo-Stimulation (WB-EMS)

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Citation: Dahm JB (2022) Myocardial Complications and Decline in Leftventricular Function after Whole-Body Electro-Myo-Stimulation (WB-EMS). Sports Injr Med 6: 178. DOI: 10.29011/2576-9596.100178

Received Date: 13 May, 2022; **Accepted Date:** 24 May, 2022; **Published Date:** 31 May, 2022

Introduction

Whole-body electro-myo-stimulation (WB-EMS) has been introduced as an alternative to physical training and gained huge popularity. Although evidence that WB-EMS is more effective than conventional training for increasing muscle force or mass is lacking, it is used as a complement to voluntary exercise in athletes, for improving fitness and health in healthy subjects and in patients who cannot perform conventional voluntary exercise because of illness [1-4]. Manufacturers claim WB-EMS as useful for increasing strength, losing fat or improving general health and WB-EMS is offered by fitness centers and WB-EMS-devices are available for purchase in shops and the internet. However, it has been shown, that EMS can induce muscular damage and muscle force reduction up to −20% 4 respectively 7 days application [3-5]. Additionally, findings from MRI suggest that tissues other than muscles, such as connective tissues and/or intracellular structures could be altered during single-muscle EMS-induced contractions [6].

Keywords: ECG**;** electro-myo-stimulation; EMS.

EMS: Good for Muscles, Bad to Your Heart?

In healthy subjects, WB-EMS does not seem to affect blood pressure, heart rate and oxygen uptake. It remains open whether WB-EMS was the only risk factor in published cases of rhabdomyelosis after WBS-EMS, because in randomized trials investigating WB-EMS, CK activity was not measured and risk factors for rhabdomyolysis are not mentioned as contraindications for WB-EMS. From healthy subjects, only elevation of creatine-kinase (CK) activity with inter-individual variability was reported after WB-EMS so far. In the following we report a case of transient ECG-changes mimicking myocardial ischemia <2h after performing WBS-EMS-training in a 54year old female.

Case Report

Because of declining fitness and increasing dyspnea during her regular fitness and running, the 54year old female (173 cm/75 kg) and her personal trainer asked for a sportscardiology-check in order to evaluate- or rule out cardio-pulmonary disease. Since a first episode of self-limiting paroxysmal atrial flutter (instantaneously after WB-EMS), she was on low-dose nebivolol (1,25mg/die) and flecainid (150mg/die). No arterial hypertension or left-ventricular hypertrophy have been documented, neither a family history for cardiovascular or atherosclerotic diseases. All routinely obtained laboratory values including cholesterol, HDL, LDL, triglycerides, ASAT/ALAT, CK and previous ECG's were in the normal range (figure 1).

The sportscardiological check (e.g. echocardiogram, ECG at rest) was carried out with sportphysiological stress-test in-field while running in the stadium field-track. The ECG at rest 50 min after WB-EMS (figure 1) showed preterminal-negative T-waves V4-6 mimicking moycardial ischemia. The continuously obtained ECG while running (Amedtech, Aue, Germany) showed pseudo-normalization of the T-inversions V4-6 (figure 2) with no additional changes or rhythm disorders after reaching the anaerobic threshold already with a maximum oxygenuptake <3.900ml/min, Hr 165/min., MET 8.5. Despite the absence of angina pectoris, the heart team took the decision to rule out a coronary-ischemic reason for the ischemia-typical ECG-changes by ambulatory coronary angiogram, which showed no significant coronary lesions or coronary artery disease. 4 days after the index ECG, the ECG was normal again (figure 3). 3 weeks after complete cessation of WBS-EMS, patient's fitness normalized, and during sportphysiological stress-test oxygen uptake increased to 4.400ml/min, Hr 163/min.,

MET 11.7, no ECG changes during stress.

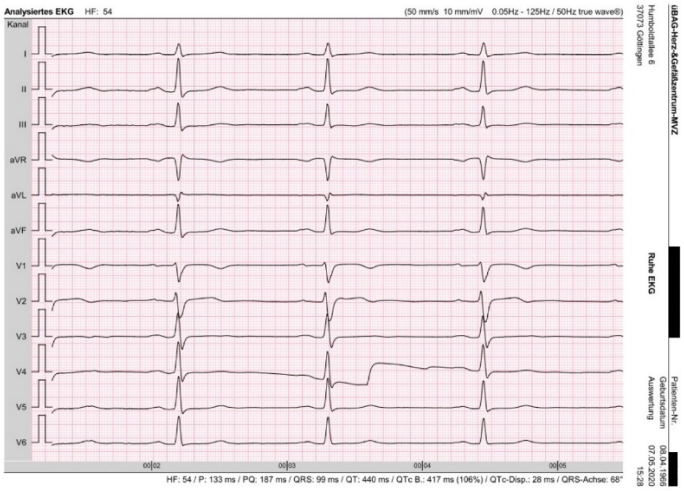

Figure 1: ECG before WB-EMS.

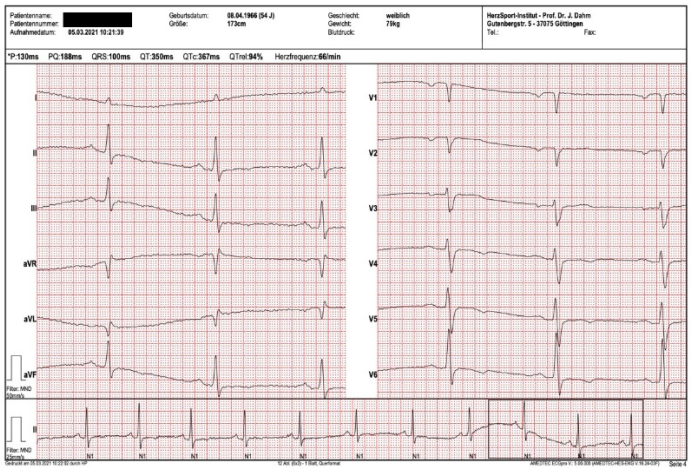

Figure 2: ECG 1h after WB-EMS.

Figure 3: ECG 4d after WB-EMS.

Discussion

Our case of a 54year old female with significant ECG-changes (T-inversions V4-6) is the first documented case report of transient ECG-changes directly after WBS-EMS mimicking myocardial ischemia, which made invasive coronary angiogram necessary in order to rule out coronary artery disease.

Because WBS-EMS is electromechanically working on muscle inducing active muscle-activity passively, it possibly affects heart-muscle too, which may be an additional reason of the already reported muscle force reduction of -20% [4,5], the declining fitness, dyspnea and episode of paroxysmal atrial flutter.

Due to the extensive growth of WB-EMS used in fitness centers and at home as an easy option for increasing strength, loosing fat or improving general health, more scientific research

should be done not only concentrating on muscle damage but also on heart-muscle as a side effect of WB-EMS considering current types applied, stimulation frequency and individual risk factors for rhabdomyolysis. Regulatory authorities should become aware of the problem and operators should routinely be educated in using WB-EMS in order to increase the safety of WB-EMS.

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