

Whole-Body Electrical Muscle Stimulation As a Way To Increasing a Comfort of Life for Patient with Frozen Shoulder History

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Purpose: This research aims to present the effects of a whole-body electrical muscle stimulation (WB-EMS) physical training program on body composition and subjective pain experience for the 50 years old man A 71-day program was designed for the patient who completed 6 months of physiotherapy and rehabilitation phase after arthroscopy of a frozen shoulder, as an alternative way to complete recovery and increase comfort of life.

Methods: A WB-EMS trainer supervised a subject as he worked out, following a detailed physical training program displayed on a projector screen. The subject exercised by imitating the movements shown in a previously recorded video, while the trainer carefully observed the subject. All data was collected (body composition and circumference, quality of life, subjective shoulder pain and perceived exertion questionnaire) and exercises performed based on programmed training were made in the laboratory with access to appropriate equipment.

Results: Comparing day 0 (before training) and day 71, an upward trend was observed for muscle mass +5.82 kg (+19%) and segmental body composition data for lean mass +6.38 kg (+13%) in total. A downward trend was observed for segmental body composition data for fat mass -5.60 kg (-24%) in total. Body circumference data decreased for the hip, waist, and thigh -4.4cm (-2%) in total. Body circumference data increased for the arm, calf, and chest +8.7cm (+4%) in total. Our results indicated that WB-EMS physical training program can reduce fat (especially hip and waist area) and obtain gain mass, especially muscle mass for older subjects without pain. Quality of life index increase from 115 points (67%) to 152 points 89%.

Conclusions: The WB-EMS physical training program was a joint shoulder-friendly form of physical exercise during which the patient reported no pain. Subject achieved the training goal: reducing fat mass and gaining muscle mass which will increase his comfort of life and perhaps prevents other age-related diseases 50+. Because of the study's-controlled environment, this training could likely be adapted for successful home use with careful attention to detail, especially having the trainer's guidance readily accessible.

Keywords: electrical muscle stimulation, WB-EMS, fat mass reduction, body composition, frozen shoulder

Introduction

Frequency distribution of ages adhesive capsulitis has a higher average incidence rate over age 50.^{1,2} Adhesive capsulitis, also known as a frozen shoulder³ can lead to severe shoulder pain, significant difficulties at work, and a diminished quality of life⁴ and limits a range of motion.^{5,6} Follow-up investigations after arthroscopy have shown that for 50 years of patients, a convalescence period is limited to a maximum of 6 months in almost half the cases and to a maximum of 12 months in 86% of cases.⁷ Physiotherapy is preferred within 6 to 12 months of arthroscopy, and after this period patients can physically exercise without pain.⁷ Various methods of physiotherapy are used,⁸ but combining shoulder exercises with either electroacupuncture or interferential electrotherapy can effectively treat frozen shoulder.⁹ Interferential electrotherapy is a popular physiotherapy treatment in Asia, that utilizes a high carrier frequency (around 4000 Hz), to accelerate frozen shoulder treatment.⁹ The impact of electrical muscle stimulation is very promising on muscle stiffness problems and musculoskeletal pain.¹⁰

For more than 50 years an electrical muscle stimulation (EMS) was used during training of human muscles.¹¹ EMS was used on individual muscle groups, but rarely on more than three at the same time.^{12,13} Only in the last decade has EMS technology made it possible to use the system for full body training and also guidelines regarding the safety of EMS training have begun to appear.^{14,15} A training method that is gaining popularity is whole-body EMS (WB-EMS), which can stimulate several muscle groups at once with intensity that is targeted to specific regional areas. Although many different protocols could be used, WB-EMS typically uses brief impulse phases (4-6 s) interspersed with short rest phases (4 s), with moderate to high impulse intensity, lasting roughly 20 minutes. Although the majority of procedures employ comparable impulse settings (such as bipolar, 80-85 Hz, 300-400 s, intermitted), two fundamentally distinct WB-EMS concepts have emerged and should be taken into account when categorizing WB-EMS. One technique prescribes high voluntary loads superimposed by WB-EMS with an impulse intensity that only permits the proper application of the target exercise (e.g., weighted squats, jumps), and combines