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Title: Effects of exercise training and neuromuscular electrical stimulation on symptoms, muscle strength, exercise capacity, activities of daily living, and quality of life in COPD

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Body: Purpose: Chronic obstructive pulmonary disease (COPD) have systemic consequences affecting exercise capacity and quality of life. The purpose of this randomized controlled study was to evaluate effects of neuromuscular electrical stimulation (NMES) on symptoms and function in COPD patients undergoing exercise training. Materials and methods: Twenty-seven clinically stable COPD patients (62.8±7.5 years, FEV₁: 40.0±16.4%) were included. The NMES group (n=13) underwent endurance and quadriceps resistance training plus NMES, 2 days/week for 10 weeks. Control group (n=14) was applied the same exercise regimen plus placebo NMES. Incremental (ISWT), and endurance (ESWT) shuttle walk tests, quadriceps strength (1 repetition maximum), Medical Research Council (MRC) dyspnea scale, Fatigue Severity Scale, London Chest Activities of Daily Living Scale (LCADL), and St George Respiratory Questionnaire (SGRQ) were evaluated before and after the treatment. Results: In both groups, quadriceps strength, ISWT and ESWT distance increased, and MRC, LCADL and SGRQ scores decreased significantly after the treatment (p<0.05). Increase in ISWT distance in the control group was significantly more than that of NMES group (69.28±33.61 m vs 38.46±41.80 m, p<0.05). There were no significant differences in any of the other parameters (p>0.05). Conclusion: Increase in exercise capacity was more evident when endurance and quadriceps resistance training was applied without NMES. Inclusion of NMES have no additional effects beyond exercise training on muscle strength, symptoms, activities daily living, and quality of life in stable COPD.