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[Intervention Review]

Neuromuscular electrical stimulation for muscle weakness in adults with advanced disease

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ABSTRACT

Background

Patients with progressive diseases often experience muscle weakness, which impacts adversely on levels of independence and quality of life. In those who are unable or unwilling to undertake traditional forms of exercise, neuromuscular electrical stimulation (NMES) may provide an alternative method of enhancing leg muscle strength. Programmes appear to be well tolerated and have led to improvements in muscle function, exercise capacity and quality of life. However, estimates regarding the effectiveness of NMES from individual studies lack power and precision.

Objectives

Primary objective: to evaluate the effectiveness of NMES for improving muscle strength in adults with advanced disease. Secondary objective: to examine the acceptability and safety of NMES, and changes in muscle function (strength or endurance), muscle mass, exercise capacity, breathlessness and health-related quality of life.

Search methods

Studies were identified from searches of *The Cochrane Library*, MEDLINE, EMBASE, CINAHL and PsycINFO databases to July 2012, citation searches, conference proceedings and previous systematic reviews.

Selection criteria

We included randomised controlled trials (RCTs) in adults with advanced chronic obstructive pulmonary disease (COPD), chronic heart failure, cancer or human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) comparing a programme of NMES as a sole or adjunct intervention to no treatment, placebo NMES or an active control. We imposed no language restriction.

Data collection and analysis

Two review authors independently extracted data on study design, participants, interventions and outcomes. We assessed risk of bias using the Cochrane Collaboration's tool. We calculated mean differences (MD) or standardised mean differences (SMD) between intervention and control groups for outcomes with sufficient data; for other outcomes we described findings from individual studies.

Main results

Eleven studies involving a total of 218 participants met the inclusion criteria across COPD, chronic heart failure and thoracic cancer. NMES significantly improved quadriceps strength by a SMD of 0.9 (95% confidence interval (CI) 0.33 to 1.46), equating to approximately 25 Newton metres (Nm) (95% CI 9 to 41). Mean differences across various walking tests, favouring NMES, were 40 m (95% CI -4 to 84) for the six-minute

walk test, 69 m (95% CI 19 to 119) for the incremental shuttle walk test and 160 m (95% CI 34 to 287) for the endurance shuttle walk test. Limited evidence was available for the assessment of other secondary outcomes.

Authors' conclusions

NMES appears an effective means of improving muscle weakness in adults with progressive diseases such as COPD, chronic heart failure and cancer. Further research is required to clarify its place in clinical practice, by determining the optimal parameters for a NMES programme, the patients most likely to benefit, and its impact on morbidity and service use.

PLAIN LANGUAGE SUMMARY

Muscle stimulation for weakness in adults with advanced disease

Individual studies suggest that the use of neuromuscular electrical stimulation, or NMES, may help improve muscle weakness which occurs as a consequence of a progressive disease. NMES uses a lightweight stimulator unit and skin electrodes to produce a muscle contraction. Being a passive form of exercise, it allows patients to exercise their leg muscles at home and unsupervised. This may be particularly helpful for patients who are unable to take part in existing forms of exercise, for example, because of breathlessness or fatigue.

This review considers 11 small clinical trials comparing NMES to no exercise or 'placebo NMES' in patients with advanced COPD, chronic heart failure or thoracic cancer. NMES appears to be effective, with programmes leading to improvements in leg muscle strength and ability to exercise. However, these benefits need to be confirmed in larger trials and further research is required to help determine effects on other outcomes such as quality of life and use of healthcare services.