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ORIGINAL ARTICLE

Randomized comparison of functional electric stimulation in posturally corrected position and motor program activating therapy: treating foot drop in people with multiple sclerosis

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ABSTRACT

BACKGROUND: Functional electric stimulation (FES) is recommended for foot drop in multiple sclerosis, although little is known about its therapeutic effect.

AIM: The aim of this study is to evaluate a therapeutic effect immediately and two months after program termination (persistent and delayed effect) of a new approach using FES in combination with correcting the patients' postural system. More specifically, we evaluate the effects of this approach on the patients' clinical functions and compared it with individual physiotherapy.

DESIGN: Parallel randomized blind trial.

SETTING: Two-month-long treatments, functional electric stimulation in posturally corrected position (group 1) and neuroproprioceptive facilitation and inhibition physiotherapy called motor program activating therapy (group 2).

POPULATION: Forty-four subjects with multiple sclerosis.

METHODS: Primary outcomes: gait (the 2-Minute Walk Test; Timed 25-Foot Walk test; Multiple Sclerosis Walking Scale-12) and balance (by e.g. Berg Balance Scale [BBS], the Activities-Specific Balance Confidence Scale [ABC], Timed Up-and-Go Test [TUG]). Secondary outcomes: mobility, cognition, fatigue and subjects' perceptions (e.g. Multiple Sclerosis Impact Scale [MSIS], Euroqol-5 dimensions-5 levels [EQ-5D-5L]).

RESULTS: Group 1 showed immediate therapeutic effect in BBS ($P=0.008$), ABC ($P=0.04$) and EQ-5D-5L (self-care, $P=0.019$, mobility $P=0.005$). The improvement in EQ-5D-5L persisted and in TUG-cognitive we documented a delayed effect ($P=0.005$). Group 2 showed an immediate improvement in BBS ($P=0.025$), MSIS ($P=0.043$) and several aspects of daily life (the effect on health today was significantly higher than in group 1, significant difference between groups $P=0.038$).

CONCLUSIONS: FES in the posturally corrected position has an immediate therapeutic effect on balance and patients' perceptions comparable to motor program activating therapy, and higher persistent and even delayed therapeutic effect.

CLINICAL REHABILITATION IMPACT: The study results point to the importance of correcting the patients' posture when applying FES, the possibility to treat foot drop by individual physiotherapy and the activation of the patients' auto reparative processes.

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Key words: Multiple sclerosis; Electrical stimulation; Posture; Rehabilitation.

Multiple sclerosis (MS) is a chronic, progressive disease of the central nervous system, believed to be caused by an autoimmune process and affecting approximately 2.3 million people worldwide. The most visible disability is impaired mobility, which also profoundly impacts the daily life of people with MS (pwMS).¹

Impaired mobility is often manifested as foot drop, which causes stumbles, falls, gait instability and decreased gait efficiency. This problem has been commonly solved with the use of an ankle-foot orthosis (AFO) — a passive fixation in dorsiflexion with no movement in the ankle. A recently developed alternative to the AFO



Functional electrical stimulation for foot drop in people with multiple sclerosis: The relevance and importance of addressing quality of movement

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Abstract: Impaired mobility is common in people with multiple sclerosis (MS). Changes in gait have different causes and require individualised gait rehabilitation. A common and often early cause of mobility impairment is footdrop, inability to lift the foot during the swing phase of gait, with increased risk of falls, effortful walking and fatigue. Using literature review, we have characterised published data on footdrop treatment in MS, specifically functional electrical stimulation (FES) to better understand the reported outcomes relevant to the user. We discuss the strengths and weaknesses of FES and how far it meets the needs of people with footdrop. Physiotherapy combined with FES may further enhance the benefits of FES. MS studies emphasise the value of maintaining activity levels in early MS but discussion on how to achieve this is lacking. We emphasise the value of qualitative measures to broaden our understanding and improve treatment and adherence and identify areas for further research. Supplementary video material illustrates key features of MS gait and its correction using FES and physiotherapy.

Keywords: Multiple sclerosis, gait, foot drop, functional electrical stimulation

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Practitioner summary

A survey of literature from 1990 to 2020 shows substantial evidence for the positive value of functional electrical stimulation (FES) for treatment of footdrop in multiple sclerosis (MS) using quantitative measures but few that reported qualitative outcomes. User and observer reported improvements in quality and safety of walking, user satisfaction and reduced effort and fatigue indicate wider benefits of the management of footdrop using FES than walking speed or endurance alone. Using short video clips, we illustrate, footdrop, FES at different stages of impaired mobility and postural correction by physiotherapy, all important to optimise FES use in MS.

Introduction

MS is a progressive condition most frequently resulting in impaired mobility. Many studies describe the impact of footdrop on gait efficiency and walking

safety.¹ Falls have been documented in 50% and repeat falls in 28% of single aid users.¹ Decreased walking ability is related to decreased levels of activity,^{2,3} which affects activities of daily living (ADL) and employment.^{4,5}

Footdrop, due to weakness of the anterior calf muscles or increased tone in the posterior calf muscles, is routinely treated with provision of orthotics such as an ankle foot orthosis (AFO). The orthotic effect of such devices is well documented, but many patients discard them due to discomfort, footwear limitations and cosmesis.^{6,7}

FES is a technological approach providing functional correction of footdrop by delivering electrical impulses to the common peroneal nerve and anterior calf muscles. Stimulation mimics normal voluntary gait movement (lifting the foot during the swing phase of gait and achieving correct placement on the ground).³ FES use in MS is usually delivered through surface adherent

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