

A pilot randomised trial to investigate the effect of functional electrical stimulation and exercise on the quality of gait of people with secondary progressive MS

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Introduction

A randomised controlled trial by Barrett et al. compared physiotherapy to improve core stability with FES for correcting dropped foot during gait. It was demonstrated that FES provided an effective orthosis, increasing walking speed, distance walked in 3 minutes and activities of daily living while reducing the incidence of falls but, no training effect was seen. However, a training effect was seen in the physiotherapy group, which showed increased walking speed over the 18 weeks of the trial [1, 2]. The authors suggested that a protocol combining correction of dropped foot and improved core stability might produce greater overall benefit. A significant consequence of reduced core stability is often hip retraction due to weakness in the gluteal muscles. In a study by Wilkinson et al. it was shown that it was feasible to increase hip extension and abduction by stimulating the gluteus maximus and medius muscles through the stance phase of gait [3].

Aims

The purpose of this study was to examine the effect of FES for the correction of dropped foot and hip instability in combination with physiotherapy core stability exercises on the gait of people who have MS.

Method

A randomised cross-over trial with baseline design was used. Group 1 received FES for correction of dropped foot for the first six weeks followed by six weeks use of the FES for correction of dropped foot and hip retraction. This was followed by 12 weeks continued use of FES with the addition of 8 sessions of core stability physiotherapy with home based exercise. Group 2 received the same physiotherapy intervention over the first 12 weeks followed by the addition of the FES intervention in the second 12 week period. Assessments were walking speed over 10m, physiological cost index (PCI), Rivermead Observational Gait Analysis (ROGA), functional reach, Psychosocial Impact of Assistive Devices Scale (PIADS), Multiple Sclerosis Impact Scale (MSIS-29), Fatigue Severity Scale (FSS) and a falls diary. Outcomes were taken at each end of the 4 week baseline, and at 6, 12, 18 and 24 weeks after the interventions began.

Results

Twenty-seven people with secondary progressive MS and a unilateral dropped foot were recruited, of which 20 completed the protocol. No changes were recorded in the base line period. In contrast to the previous study [1] use of FES resulted in an increase in walking speed (week 24 0.24ms^{-1} $p=0.44$) whereas physiotherapy did not. FES improves gait quality as indicated by reduction in ROGA score more than physiotherapy (-6 points at week 24 $p=0.044$). Adding gluteal stimulation further improved ROGA score (-5 to -7 $p<0.05$). Both interventions reduced falls but, adding FES to Physiotherapy increased the reduction in falls from 61% to 95% of base line ($p=0.028$) whereas, adding physiotherapy to FES did not have this effect. FES had greater impact on quality of life than physiotherapy, indicated by PIADS and statistically significant changes in MSIS29 scores that were only seen when FES was being used. Physiotherapy improved functional reach (7cm at week 6 $p<0.05$) while FES had no effect. No effect was seen on the effort of gait or on fatigue as indicated by PCI and FSS by either intervention.

Discussion

This study indicates that FES for dropped foot stimulation is a practical intervention that leads to measurable improvements in mobility, improvements in quality of life and reduction of falls. The addition of gluteal stimulation further improves the quality of gait but is of secondary importance compared to common peroneal stimulation alone. The addition of physiotherapy enhances the effect of FES but FES had the dominant effect.

Acknowledgements

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References

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