Spatiotemporal Analysis of Planned Gait Termination in Ambulatory People with Multiple Sclerosis and Healthy Subjects

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Summary

Gait termination (GT) is both a challenging task in postural control and a functional phase of gait. However, GT has not been studied frequently in people with multiple sclerosis (pwMS). This study aims to compare pwMS and healthy subjects (HS) in the GT. Twenty-five pwMS and 15 HS were included in this cross-sectional study. The spatio-temporal parameters (STPs) of the GT completed with three right and three left feet were evaluated with the gait analysis system (GAITRite®). Maximum accelerations were higher in HS ($p=0.02$). However, there was no difference in all other STPs ($p>0.05$). When GT were examined, accelerations of pwMS were lower ($p=0.001$), the duration of the double support period ($p<0.001$) and the last two step width ($p<0.001$) were greater. Therefore, pwMS, who are similar to HS in walking as a whole, have difficulty in GT, which shows that it is a better gait evaluation method for ambulatory pwMS.

Introduction

In multiple sclerosis (MS), sclerotic involvement is seen in various regions of central nervous system (CNS) related to postural control and gait. For this reason, balance and gait impairment are frequently observed in pwMS and analysis is sometimes difficult [2]. Gait termination is a period that involves the transition from steady-state gait to a quiet standing posture and is a very challenging activity for the CNS [3]. Therefore, it can be used as a better method to evaluate gait and balance in CNS diseases.

Methods

Twenty-five pwMS, aged between 18 and 65 years, with an Expanded Disability Status Scale (EDSS) score between 0 and 4.5, and 15 HS participated in this cross-sectional study. Demographic information and EDSS score were recorded. An electronic walkway system (GAITRite®) was used to evaluate the STPs of gait termination. The last two steps were evaluated as GT. The data of each participant's walks, which ended with 3 right feet and 3 left feet, were analyzed. Data from a total of 6 walks of each participant were collected. Data from 6 walks were averaged and included in the analysis. In addition to the termination of the walk, the STPs data of each participant's walk were also collected and analyzed. Spatio-temporal parameters were the following: max velocity, cadence, step time, step length, stride length, step width single support time, dual support time, step-extremity ratio, GT velocity.

Results and Discussion

There was no difference between pwMS and HS in terms of age ($p=0.25$), body mass index ($p=0.39$) and gender ($p=0.80$). Maximum walking accelerations were higher in HS than pwMS ($p=0.02$). There was no significant difference in all other spatio-temporal parameters of whole gait trail between pwMS and HS. When the last 2 step data of the GT phase were examined; pwMS had lower GT accelerations ($p=0.001$), double support period duration ($p<0.001$) and last two step widths ($p<0.001$) were greater.

Conclusions

When the gait was examined as a whole, although there was no significant difference between ambulatory pwMS and HC, except for acceleration; the increase in the width of the last two steps and the duration of the last double support period showed that individuals with MS had difficulty in GT. According to our findings, we emphasize that GT is an assessment method that provides better results in ambulatory MS patients with standard STPs of whole gait. Evaluation of GT in terms of rehabilitation practices and gait analysis may be a suitable method to provide better results for clinicians and researchers.

References

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