Case Study

Impact of Cawthorne Cooksey Exercise and Strength Training on Gait and Balance Related Impairments in Multiple Sclerosis Patient: A Case Study

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Abstract

Background: Multiple sclerosis commonly develops between 20 to 40 years of age, however also seen in older populations. It is more common in females than in males. Fatigue, impaired coordination, pain, blurred vision, weakness in limbs are often the complaints.

Objective: A case study is to provide evidence of the feasibility, acceptance and benefits of Cawthorne Cooksey exercise and strength training in gait and balance related impairments of a multiple sclerosis patient.

Method: 58 years old multiple sclerosis patient was provided an individualised therapy for 3 weeks. Outcome measures included Tinetti Performance Oriented Mobility Assessment (Tinetti POMA) and Timed Up and Go (TUG).

Result: Findings demonstrated the effectiveness of the cawthorne cooksey exercise and strength training for use by multiple sclerosis patient with gait and balance impairments.

Conclusion: The Tinetti POMA Scale and TUG test scores suggested improved gait and balance. However the results were not clinically significant.

Keywords: Cawthorne cooksey exercise, strength training, multiple sclerosis

Introduction

Multiple sclerosis is a chronic neurodegenerative disease whose symptoms are only partially relieved by medication. Multiple sclerosis affects a wide range of neurological functions, including cognition, vision, muscle strength and tone, coordination and sensation. The many symptoms associated with multiple sclerosis cause mobility limitations, gait and balance disorders in later stages of the disease, and sometimes even in early stages of the disease in recently diagnosed people with multiple sclerosis who present with no clinical disability[1]. Multiple sclerosis have balance related impairments characterised by marked sway while walking and delayed responses

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to perturbations. Many people with multiple sclerosis fall frequently, fear falling, and risk of fall-related injuries is increased. Muscle weakness and fatigue are the main causes of reduced daily activity in such persons. Inactivity further compromises normal functioning of muscle, mobility, and thereby overall physical fitness. The cycle of reduced activity further contributes to increased disability, and reduced quality of life of multiple sclerosis patients. Disability due to this disease can impede activities of daily living and decrease quality of life, both for multiple sclerosis patients and for their care partners and families[2].

Balance is an integrated component of physical function, and a product of the task being done and the circumstances in which it is performed. The maintenance of upright posture or balance requires the involvement and joint functioning of multiple sensorimotor processes (visual, vestibular, proprioception) to generate well coordinated movements that maintain the centre of mass within the limits of stability[3].

Cawthorne Cooksey exercise is an exercise based program designed to reduce dizziness, gaze instability, imbalance and fall risk[4]. Such vestibular exercises help in new arrangements of peripheral sensorial information, allowing new vestibular stimulation patterns necessary for new experiences to become automatic. This practice of balance can help in improving reactions of balance and thereby reducing falls. They involve head, neck and eye movements, posture control exercises in different positions (seated, in two-leg and one-leg positions, walking), use of soft surface to reduce proprioceptive input, and exercises with closed eyes keeping out visual cues.

Strength training is known to promote neural adaptations such as increased motor unit activation and synchronisation of firing rates, which may decline with periods of inactivity. Neural adaptations gained through physical activity may have favourable functional outcomes in multiple sclerosis subjects, depending on multiple sclerosis lesion load and location. Moreover, improving strength in muscle capable of adaptation to overload stimuli may also help maintain or improve overall fitness and functional ability including ambulatory status[5].

Therefore, the purpose of this study is to assess the effectiveness of balance and gait training in multiple sclerosis patients. Increased knowledge about these training interventions will allow a better understanding and will help in providing better assistance.

Case Description

The patient was a 58 year old female, known case of multiple sclerosis since 4 years, not under medications for the same for almost 2 years. Patient complained difficulty maintaining balance while walking, leading to fear of falls. On the Tinetti POMA scale, the patient scored 24, indicating moderate fall risk and on the TUG scale, she took 10.1 seconds to finish the 3 metres walk. A comprehensive approach focusing on balance and gait was devised to address her condition. Cawthorne Cooksey exercises are special exercises that are known to treat the difficulties experienced with the balance impairment. The purpose of these exercises was to build up a tolerance mechanism and slowly the symptoms will disappear. Strengthening exercises was given in order to address the weakness in lower limbs. Regular adherence to the prescribed exercises, coupled with proper technique and posture awareness, were instrumental in achieving optimal outcomes for the patient.

Intervention

The patient attended the session for a total of 3 weeks, 5 days per week. Each session lasted about 45-60 minutes. The Cawthorne Cooksey exercise is an organised program designed specifically to improve balance and coordination gradually. At first, the patient is made to lie on the couch, asked to perform slow and then quick eye movements in various directions (up to down, side-to-side) followed by head movements in the same directions. As the exercise progresses, the patient is asked to go for sitting position and made to do activities like shrugging and circling their shoulders, reaching down to pick up objects from the floor, and even transitioning from sitting to standing, first with their eyes open, then closed.

The exercise done while standing challenged balance further; the exercise started with eye and head movements once again, then throwing a small

ball between hands at different heights, first at eye level and then under the knee. Next the program progressed to walking across the room with open and closed eyes, finally to walking up and down on inclines and stairs with eyes open.

Strength training included specific exercises to strengthen target muscle groups crucial for functional strength and stability. These exercises focused on large muscle groups like quadriceps (straight leg raises, squats), hamstrings (leg curls, marching, single leg bridging), calves (raises), gluteus maximus (leg raises, glute bridging, fire hydrants), and tibialis anterior (dorsiflexion against resistance).

These comprehensive approaches were used to address both balance and functional strength, which was essential for preventing falls and improving overall ambulation.

Outcome Measures

1. Tinetti Performance Oriented Mobility Assessment is a task oriented test that measures gait and balance abilities in older adults. Scoring: It is a three point ordinal scale. It ranges from 0 to 2 points, where 0 shows the highest level of impairment and 2 shows the individual's independence. Total test score is 28 points, out of which 16 is the total balance score and 12 is the total gait score[19].
2. Timed Up and Go test is a goal based test used to assess the mobility of an individual. It measures how quickly an individual can stand up, walk 10 feet, turn around, walk back, and sit down. The variable measured was the total time taken by the test, and then the score assigned in seconds was observed, which was correlated with the risk of falls. It is often done to evaluate mobility in older adults and predict their risk of falls in the neurological population[20].

Results

Table 1 Outcome Measures. Based on the scores, substantial improvements in Tinetti POMA Scale and TUG test scores following the 3 weeks intervention were observed. There was a 10.7% improvement in Tinetti POMA scale and a 18.8% improvement in TUG test.

Table 1. Change in the scores of condition specific outcome measure

Outcome Measures	Baseline	After 3 weeks
Tinetti POMA	24/28	27/28
TUG	10.1 seconds	8.2 seconds

In the Tinetti POMA scale, patient scored 24 in the first week, which progressed to 27 in the third week; ie, patient progressed from moderate fall risk to low fall risk.

In the TUG test, patient finished the test in 10.1 seconds in the first week, which she finished in 8.2 seconds in the third week. Patient has progressed from independent for main transfers to completely independent.

Discussion

The current study was performed with a goal of achieving improved balance and a more stable gait. The aim of the study was to find out the effectiveness of Cathrone Cooksey exercise and strength training on balance and gait impairment of multiple sclerosis patients. The pre and post assessments with different outcome measures showed improvement. Cawthorne Cooksey exercise and strength training were given for 1 session, 5 days a week for 3 weeks. The results have shown that Cawthorne Cooksey exercise and strength training were effective in treating multiple sclerosis patient with moderate impairment. The patient showed progress in three weeks outpatient rehabilitation. There was improvement in the patient's gait pattern and lower limb strength. More importantly, the patient was more confident to walk.

Post intervention Tinetti POMA score increased by 3 points which was clinically not significant (MCID for Tinetti POMA is 7 points)[19]. Similarly, the difference of 1.9seconds seen in TUG scores were not clinically significant (MCID for TUG is 2.1seconds)[20].

In this study, Cawthorne Cooksey exercise showed improved balance in multiple sclerosis patient. Similar study was done by Hosam Magdy Metwally Abd Alhamid et al (2019) about the effectiveness of Cawthorne Cooksey exercises on trunk kinetics and velocity of gait in patients with multiple sclerosis. They concluded that the vestibular

system contributes considerably to the stabilisation of body posture throughout locomotion, hence Cawthorne Cooksey exercises were considered a valuable method for treatment because these exercises reduce vertigo and restore balance[4]. Similarly, Fatemeh Feshki et al (2020) conducted a study on female patients with multiple sclerosis. She tested the effects of balance training and Cawthorne Cooksey exercises on static balance and mobility on 48 individuals. The research results concluded that performing Cawthorne Cooksey exercises improved static balance and mobility in patients with multiple sclerosis[6].

A study conducted by Gregory M Gutierrez et al on effectiveness of resistance training on gait kinematics in persons with multiple sclerosis. It was reported that resistance training in multiple sclerosis patients changed gait characteristics, which after the intervention closely resembled the patterns of normal healthy individuals. They found significant increase of stride time in the swing phase, step length, stride length, and foot angle, and significant reduction of stride time in the stance, duration of the double-support phase, and toe clearance from floor. These changes were more identical to normal gait patterns of subjects without known impairments. Finally, they concluded that resistance training is an effective intervention strategy for improving walking and functional ability in moderately disabled persons with multiple sclerosis[5].

But one main limitation of this approach is that, since the experiment was conducted on one subject with moderate disability, it is not known how it may affect individuals with severe functional limitations. Also, the duration of the study was limited to 3 weeks, long term effects are unknown.

Conclusion

Cawthorne Cooksey exercises and strength training were effective in improving gait and balance. However, the improvements were not clinically significant.

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Consent: Informed consent was taken from the participant in the study for the publication work. Participant was fully aware of the procedure that was carried out. The consent was read and signed by the participant.

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