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To study the effects of trunk balancing and strength training program in paraplegics

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Abstract

The ability of paraplegic patients to maintain sitting balance affects activities of daily living such as mobility, using the bathroom and getting dressed. Acquisition of sitting balance is thus the most basic concern in rehabilitation of spinal cord injuries. The sitting balance of patients with paraplegia is based on not only the stability of the spinal column and pelvis but also on various complex mechanisms including muscle strength, the senses, the position of the head and upper extremities and reflexes such as righting reflexes and equilibrium reactions. Objective: This study was done to find out the effects of balance training on an on patients with spinal cord injury (SCI). [Methods] Twelve patients, 6 in the experimental group and 6 in the control, at a AVBRH rehabilitation hospital, Wardha were enrolled as subjects. The experimental group was treated with conventional therapy, and allowed to exercise on physioball for 3 weeks (30 minutes a day, 5 times a week. reaching forward, to the right and left, and over the head holding a ball with both hands. The following variables were measured before and after training; Modified Functional Reach Test. [Results] There was a significant increase in the Functional Reach Test in the experimental group. The experimental group also showed a significant decrease in perturbations with both opened and closed eyes after training. The experimental group showed a significant difference before and after training compared to the control, as shown by MFRT distance [Conclusion] Exercise on Physioball improves the sitting balance of patients with a spinal cord injury. This treatment can be recommended as an effective treatment program for patients with spinal cord injury.

Keywords: Trunk balancing, strength training program, paraplegics

Introduction

As per report of the International Conference [Spinal Injuries Management, New Delhi, (1995)], the incidence of spinal injury was estimated at 15 new cases per million per year in India. This translates into 15,000 new cases per year and with a backlog of ten years, the prevalence exceeds 0.15 million. There are various methods for improving the balance ability of SCI patients. Recent rehabilitation programs include balance training for brain damaged or SCI patients using video games or goal-oriented training programs. Goal-oriented and task-specific training have been reported to be effective methods in that they both increase the training amount and functions. Also, goal- oriented training increases the extent of completion of the program, and arouses the patients' interest and attention by repeating the task. Balance training on Physio Ball is more effective for patients with functional disabilities due to spinal cord injury than training on a stable surface. There is a close relationship between physical exercise of the trunk on Physio Ball and the proprioceptive sensory and balance ability. Previous studies of improvement of balance ability on Swiss Ball were mostly conducted with athletes, stroke patients, or patients with unstable ankles. These studies focused mainly on balance with visual and sensory Inputs.

Material and Methodology

Study Design: Interventional Study

Sample Size: 12

Study Setup: Ravi Nair Physiotherapy College, Sawangi Meghe, Wardha

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Inclusion Criteria

1. Both Male and Female
2. At Least Post 3 months since diagnosis of SCI on thoracic level
3. No Musculoskeletal Deformity

Exclusion Criteria

1. Any fracture in upper or lower limb
2. Psychiatric patients
3. Cerebrovascular Accident
4. Psychological unstable Subjects

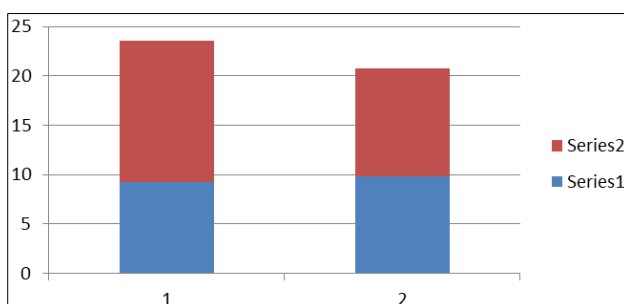
Procedure

Goal oriented training on a Swiss Ball and balance board was the main training program. First the patients sat a stable floor with their legs straight on the floor. The distance after reaching forward, to the left and to the right was separately measured. An device was placed at 2 cm beyond the subjects initial maximum reach point in each test and the distance was measured. The Balance board was placed on the stable Floor. The patients was instructed to sit on the middle of the board so equal balance is maintained on both sides. The patients were instructed to reach to the device from right and to from left side while maintaining there balance the distance was measured. The patients measurement were taken separately from left and right side. The test was considered to be complete if the patients is able to touch the device, Same procedure was done on swiss ball sitting with 90 degree of knee flexion with feet resting on the ground, tactile and verbal cues were given to the patients during the treatment procedure.

Each task was performed in sets of 5, consisting of 10 repetitions, each with a one minute break between each set. Training was performed 5 times a week, for 4 weeks. During the training session, training and control groups were performed conventional therapy for SCI patents. The conventional therapy included muscular strengthening for the upper and lower extremities, rolling over, sitting up, improving on-mat activities. The patients were also treated with kneel standing for 30 minutes, automated lower extremity cycling for 20 minutes, for the upper and lower extremities for 20 minutes, and electrical stimulation for 20 minutes.

Results

The Study Group showed a significant increase in functional reach test from 9.21 cm to 14.36 cm whereas there was no significant increase in control group after training 9.87 to 10.92 cm.



Discussion

The patients with SCI need to re-learn to move or to balance in the sitting position by developing selective posture-

controlling strategies, including the use of non-postural muscles. Dean *et al* (1999) reported that the trunk plays an important role in reaching for an object when the object is placed beyond an arm's length. Seelen *et al* reported a gradually shortened postural perturbation movement response time during rehabilitation for postural motor programming in lower extremity paralysis, particularly in patients with an upper and lower thoracic cord injury. This was caused by a shortened central processing time because the peripheral motor system eventually becomes accustomed to the new. Despite this, the sensory and motor functions have been reported to recover over several weeks of therapy in SCI patients and animal models, depending on the severity of injury. This type of recovery mechanism is often mentioned as neural plasticity, which includes axonal sprouting, synaptic rearrangement, and cellular properties caused by the remaining neurons or neuronal circuits in the damaged caudal and capital segments. Girgis *et al* examined the adaptability and plasticity of the descending pathway and motor ability in cervical SCI animals with a 6-week intervention of reaching. By reading the cortical map, they found that the growth-associated protein is cortically controlled by the reaching performance, and that sprouting of the nerve fiber in the damaged descending pathway is promoted. stated that an increase in motor unit recruitment in the distal muscles of the damaged segments became functional with appropriate training and the passage of time. Training on an Swiss Ball and balance board improved the balance ability of SCI patients. This is believed to occur due to the development of a nonpostural muscular use pattern, compensatory posture strategy and neural plasticity.

Conclusion

Exercise on an Swiss Ball and balance board surface improves the sitting balance of patients with a spinal cord injury. This treatment can be recommended as an effective treatment program for patients with spinal cord injury.

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