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TRUNK ROTATION TRAINING FOR IMPROVING WEIGHT TRANSMISSION THROUGH HEMIPLEGIC LOWER EXTREMITY.

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ABSTRACT

This study evaluated the effectiveness of trunk rotation training in improving weight transmission through hemiplegic lower limb. In this study 30 subjects were randomly assigned into two group namely conventional group and experimental group with six subjects in each group. Subjects in the conventional group received conventional set of exercises, experimental group received all the interventions that were used in conventional group but, Trunk rotation training was additionally given without increasing the treatment duration. All the subjects received 3 weeks of treatment with 5 days of treatment in every week, with one session that lasted 45 minutes per day. The ability of weight shift in standing, in both groups, was measured using a bathroom scale inserted in a wooden platform to standardise the inter limb distance and to prevent movement of the bathroom scales. The analysis of the pre and post intervention values showed that there was a significantly more improvement in the weight transmission in the experimental group. Thus, this study concludes that trunk rotation training is an effective tool in improving weight transmission through the paretic lower extremity in hemiplegic subjects.

KEY WORDS : **Trunk rotation training, trunk exercises, symmetrical weight transmission, hemiplegia**

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INTRODUCTION

According to WHO cerebro vascular accident is defined as 'A rapidly developed clinical signs of a focal disturbance of cerebral function of presumed vascular origin of more than 24 hours duration'[1]. Stroke is characterized by a wide clinical presentation that depends up on the location and extent of lesion, amount of collateral blood flow and early acute care etc. Movement deficits are most evident in the limb contralateral to the side of the stroke and are characterized by weakness of muscles of opposite side limbs, weakness of trunk and abdominal muscles[1,2]. Weight shift towards either leg is a pre requisite for independent walking. But the patients with stroke are unable to shift weight far enough over the hemiplegic leg. So learning to load and unload the affected limb while standing is an important step in balance and gait training of stroke patients [3]. There are many interventions to improve weight transmission in the affected limb like weight shifting exercises, task specific exercises of lower limb, use of auditory feedback, use of postural sway biofeedback, use of vertical ground reaction force feedback [4,5,6,7]. Only a few studies have been done on trunk muscle contribution on lower limb movements. Out of them one study states that Leg and trunk muscle demonstrate a specific pattern of compensatory movement for every movement in the upper extremity. It is shown that activities in these muscles began prior to the arm muscles [8]. Studies done reports reaching on the non paretic side by the affected upper extremity and unaffected upper extremity improves use of paretic lower extremity to control the trunk movement for stability. In spite of so many studies the efficacy of the trunk rotation over weight shifting in the coronal plane is not studied in detail. So this study is aimed to find out the efficacy of trunk rotation in sitting position in improving activity in the affected lower extremity in subjects with hemiplegia in standing position.

Inclusion Criteria

In this study, 30 patients with acute stroke, were included. These patients were randomly assigned into two groups namely group A (n = 15) and group B (n = 15) if they fulfill the following criteria. Subjects with first time cerebrovascular accidents resulting in hemiplegia, between 40 and 65 years of age, with weight bearing 30% of body weight or less through the paretic lower extremity during independent standing, with Motor assessment scale score of 2 for standing balance (Stand without support with foot apart for more than 30 seconds) were selected.

METHODOLOGY

All the patients signed a consent form before participation.*Control Group*: Subjects in this group received conventional set of exercises which included exercises to improve voluntary control with emphasize on improving muscles of lower extremity that helps in improving weight transmission in affected lower extremity, balance training in sitting, bed mobility and transfer and training in activities of daily life (ADL) and training trunk rotation was not a part of the training. *Experimental Group*: Subjects in this group received conventional set of exercises plus trunk rotation training. Trunk rotation training was done with the patients seated comfortably on a stool with their foot placed on ground with heals 30cms apart in a plantigrade position. The subjects were asked to reach for objects which were placed at an angle of 45 degrees (measured by drawing a straight line along the great toe on the side of the reaching upper limb and marking an angle of 45 degree from this line towards the reaching side.) contralateral to the reaching limb and at a distance of 20 percent more than the length of their upper limb. Patients reached with both hemiplegic and normal upper limb repeatedly for 30 times. Treatment was twice daily for 5 days. Training session consisted of three sets of ten repetitions with rest time of two minutes. Therapy is stopped if the patient doesn't concentrate or gets tired. Data's were collected before and after intervention in each session of therapy. The ability of weight shift in standing, in both groups, was measured using a bathroom scale inserted in a wooden platform for stability. Foot markings were made on the scale to standardize the foot placement. Between each reading the patient was made to sit and when they were made to stand they stood without assistance on the bathroom scale. Three readings of the measure of the ability of the patients were taken in both the experimental and control group and the average of the three was calculated.

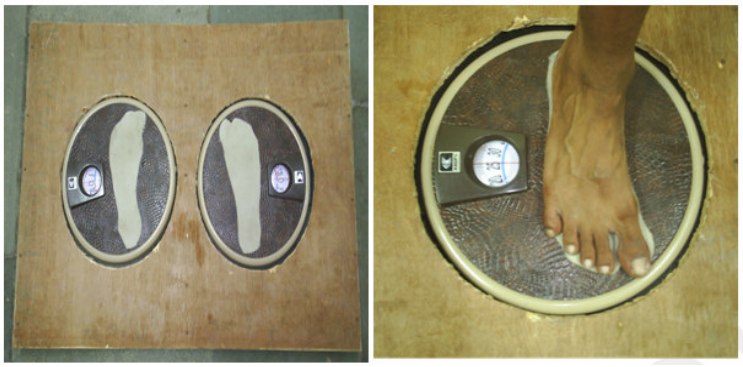

Figure 1
Bathroom scale fixed inside a wooden plank

Figure 2
Subject reaching to an object at 45^0 and 20% beyond arms length using trunk rotation.

RESULTS

In this study results were analyzed using independent t-test for between group analysis for pre test and post test values and paired t-test is used for within group analysis of both groups. The difference between the pre test values in experimental group and control group was found to be not statistically significant, which signifies that both groups were similar before intervention. It was found that within experimental group and control group there was a statistically significant increase in weight transmission in affected extremity, which signifies that both the intervention had impact on improving weight transmission in the affected extremity and thereby restoring symmetry. Between group analysis gave a statistically significant difference when post test value associated with experimental group which received conventional exercises and trunk rotation were given compared to control group that received conventional exercises alone. This signifying that adding trunk rotation training along with the conventional exercises has a superior effect on weight transmission in affected extremity compared to only conventional exercises.

Table 1
Between group analysis of the pre test variables.

	Experimental group	Control group	"p" Value (<0.005)
Pre Test	16.83 (3.78)	14.73(2.60)	Not Significant (0.745)

Table 2
Within group analysis of the pre and post test values.

	Pre test	Post test	P value
Experimental group	16.83(3.78)	30.27 (4.04)	Significant (0.01)
Control group	14.73 (2.60)	22.93 (5.19)	Significant (0.021)

Table 3
Comparison of improvement in weight transmission between groups

	Experimental group	Control group	"p" value (<0.005)
Post test	13.43 (3.91)	8.2 (3.89)	Significant

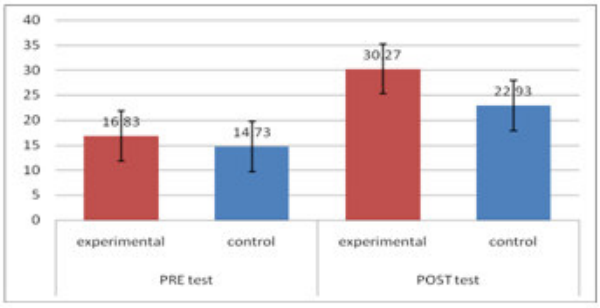

Figure 1
Comparison of weight transmission in experiment and control groups before and after intervention

DISCUSSION

Loss of symmetrical weight transmission in lower extremity is one of the major problems faced in the hemiplegic patient because it associated with poor gait and balance problems [9]. Most of these techniques train patients in standing. There are very few techniques for training patients in sitting to improve weight transmission in the paretic extremity. Training patients in sitting can

be of immense help in patients who cannot stand independently, and can prepare the patient for standing. Mudie in 2002, proved that improvement in weight transmission that is gained in sitting can be generalized to standing. In this study trunk rotation training in sitting position has been employed in an attempt to improve weight transmission in the affected extremity [10]. Subjects trained with trunk rotation might have improved in weight transmission in their affected extremity because it is possible that movement of the upper limb could have elicited contraction in the paretic lower limb. It might be due to the fact that the lower limb helps in increasing the base of support, breaking the momentum of the moving trunk. Lower limb muscles, being one of the postural muscles, might have got recruited well in advance before the upper limb moves in order to maintain posture. In this study subjects reached across the body in 45° angle because it was already proved to be effective compared to pure frontal or sagittal plane reach [11]. The subjects reached 20% beyond their arms length, as proved to be effective compared to reaching within arm's length [12,13]. So, when reaching far away from the body the center of gravity would have been displaced out of the base of support. In order to maintain the balance muscles of lower limb might have been recruited along with the opposite trunk muscles. In this study thigh support was standardized by supported it fully, because literature states that the thigh support plays an important role in the demand imposed to an individual on reaching, there by recruitment of muscles also varies with extent of thigh support. Limitations in this study are small size population, both the groups were not equally treated with experiment group receiving an additional intervention which might have influenced the results, force plates could have been a better choice than bathroom scale. Future studies can focus on comparing trunk rotation training with some of the already proven techniques like trunk dissociation training [14,15,16].

CONCLUSION

This study concludes that trunk rotation training results in greater improvement of weight transmission in the paretic extremity.

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