

A Comparative Study between Hold Relax Technique and Static Stretching to Improve Gait Parameter of Hemiplegic Stroke Patients

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Abstract

Aim: A hold relax technique of Proprioceptive Neuromuscular Facilitations and Static Stretching were used to improve gait parameter in hemiplegic patients.

Methodology: A total of 30 patients were selected. Interventions were given for three times per day for six days in a week for four weeks, which consisted of hold relax technique of Proprioceptive Neuromuscular Facilitation or Static Stretching of knee extensors and ankle plantar flexors muscle of hemiplegic stroke patients.

Results: T test was applied, mean \pm standard deviation of each group was compared and the P value was taken less than 0.05 for significant differences.

Conclusions: There was significant differences in the gait parameter (stride length, cadence and walking velocity) between two groups A & B treated with hold relax technique of Proprioceptive Neuromuscular Facilitation and Static Stretching.

Keywords: Hold relax technique; Static stretching; Hemiplegic stroke patients

Introduction

People who have experienced a cerebrovascular accident (stroke) may exhibit an increased resistance to passive joint movement, decreased joint range of motion, and some exaggerated stretch reflexes. Researchers and clinicians have frequently described some of these symptoms as components of spasticity, defined as "a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex [1].

In stroke, lesion to one side of the brain results in hemiplegia which is characterized by the uncoordinated movement and lack of control of the contralateral side of the body. The severity of the lesion will determine the degree of the motor and cognitive involvement which produces hypertonicity of the muscle of arm and leg which disrupt the balancing mechanism of proprioception feedback, voluntary motor control and ambulatory ability [2]. Patient with such cerebrovascular accident present lower extremity extensor synergy with equinovarus positioning of the foot and ankle complex, sustained plantar flexion of the ankle, sustained hip and knee extension and pelvis retraction on involved side [2].

The mechanical properties are typically expressed as stiffness, which is the relationship between passive resistive torque and joint displacement, and torque relaxation, which is the decrease in peak passive torque (passive resistance) exhibited at a joint held in a non-neutral position over time [3,4]. Studies have shown that, in patients with spasticity, passive mechanical properties of muscle are to some extent responsible for impaired gait patterns and enhanced passive joint resistance [5]. Investigators [4,6] have shown that stretching of the plantar-flexor muscles for periods ranging between 30 minutes and 6 weeks, imposed with a tilt table or cast, reduced passive ankle joint resistance, increased ankle joint range of motion, and improved gait characteristics (e. g. stride length, stride width, angular joint displacement). Some researchers [4,7] have argued that the effects of static stretching are proportional to the amount of time a stretch is held at its end-range. Accordingly, some authors [6,8] have suggested that prolonged static stretching rather than short-term stretching (e.

g. 2 minutes) can be a convenient and cost effective means of reducing symptoms of spasticity.

Reflex relaxation is the goal of hold-relax technique. Relaxation may allow an increase in the passive range of motion and may help in decreasing the pain related to excessive tension. Sherrington concept of Reciprocal Innervations and successive induction call for inhibition of antagonist during agonist contraction and inhibition of muscle group immediately after its contraction. In hold relax technique after reaching the range of agonist pattern a hold [static] contraction is performed against the gradually building resistance & goal is a pain free response. After the entire phase the new agonist range is achieved & process is repeated. This sort of stretching is thus helping the therapist to slowly overcome the pathological evolved tightness of the muscle due to excessive firing of the gamma motor neuron. Our aim of study was to compare the effect of the hold relax technique of PNF and static stretching to improve the gait parameter of hemiplegic stroke patients. Therefore, it is predicted that in the current study, Patients with hemiplegia shows greater improvement of gait parameter with applying of hold relax technique of PNF than static stretching.

Method and Materials

Subjects

A total of 30 patients of stroke with hemiplegic, age 40-50 years were randomly selected. All participants were on phase of medication, tested after an overnight abstinence of at least 12 hours from their usual medication regimen. All participants were naive with respect to the experimental design.

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Study design

The study was two groups (Group A and Group B). Each group was 15 patients of male with hemiplegia.

Group A patients received Hold Relax Technique of Proprioceptive Neuromuscular Facilitation and Group B patients received static stretching.

Measuring tools

Stride length: linear distance between two successive points of contact of opposite extremities. It is usually measured from the heel strike of one extremity to the heel strike of opposite extremity [9].

4.3.2 Cadence: It is the number of steps taken by a person per unit of time. Cadence can be calculated steps per second or steps per minutes (Cadence = number of steps/time) [10].

Walking velocity: It is the rate of linear forward motion of the body, which can be measured in ms or Cm9 (Walking velocity= distance walked/time).

Procedure

The patients were diagnosed to have stroke with hemiplegic and who fulfilled the above inclusive and exclusive criteria were selected. The attendant of entire subject signed an informed consent approved by ethical committee of Ayushman college, Barkatullah university, Bhopal, Madhya Pradesh, India. A closed environment with least possible distraction was selected as site for data collection. General demographic data was taken

Thirty male hemiplegic subjects were randomly selected on the basis of inclusion and exclusion criteria. And were divided into two group namely Group A & B randomly. All of these subject were assessed using a general neurological Performa and the pre-test value of gait parameter Such as stride length, cadence and walking velocity were recorded. Group A was treated by hold relax technique of PNF, and Group B was treated by static stretching.

Treatment intervention

Group A patients were received hold relax technique of PNF: Patient was placed in the supine position with knee flexion, and examiner ask the patient for extension of the knee, and examiner applied hold for 6 seconds for knee extensors, followed by 10 second relaxation using hold relax technique of proprioceptive neuromuscular technique [11]. Similarly applied hold relax technique for planter flexors. i.e, placed the patient foot in dorsiflexion and was asked the patient for planter flexion and examiner was holded for 6 seconds and followed by 10 seconds relaxation. The hold relax technique was repeated for three times per day for six days in a week for four weeks [12].

Group B patients received static stretching

Patient was placed in prone in comfortable position by applying pillow. And examiner was applied stretching of knee extensor for 10 seconds followed by 5 seconds rest period. And was asked the patient to turn supine position and examiner was applied stretching of the plantar flexors for 10 seconds followed by 5 second rest [13]. Stretching was repeated for three times per day for six days in a week for four weeks.11 Materials used: Materials were used in these study are treatment couch, pillow, chalk powder, stop watch, marker and inch tape.

Neither the subjects of both the groups received any other form of treatment for hemiplegic stroke. At the end of 4 weeks outcome measures are collected immediately after the last intervention by examiner.

Statistical analysis

A pretest-posttest experimental group design was used for the study. The pretest measurement of gait parameter values on day 1 and post treatment values of gait parameter on last day treatment was taken. The data was analyzed using the SPSS 18 Software. Paired T- test applied for comparison of pre-test treatment values and post-test treatment values within and each groups respectively. The results were taken to be significant if $p < 0.05$.

Results

Table 1 and Table 2 details the results of present study. Between group analysis revealed significant improvement of pre-treatment values of gait parameter of first days and post treatment values of gait parameter of last days of treatment sessions.

When mean value 35.53 and standard deviation 7.8 of pre-test of stride length of group A was compared with mean value 37.53 and standard deviation 9.05 of pre-test of stride length of group B, then P value was found to be 0.648, which was greater than 0.05. It shown the result was not significant difference. Similarly when mean value 48.67 and standard deviation 11.74 of pre-test of cadence of group A was compared with mean value 49 with standard deviation 12.3 of pre-test of cadence of group B, then P value was found to be 0.94, which was greater than 0.05. It shown result was no significant difference. When mean value 9.19 and standard deviation 4.306 of pre-test of walking velocity of group A was compared with mean value 42.3 and standard deviation 7.47 of pre-test of walking velocity of group B, then P value was found to be 0.104, which was greater than 0.05. It shown result was not significant difference.

When Mean value 46.8 of and standard deviation 7.35 of post-test of stride length of group A was compared with mean value 42.3

Group	Stride length			cadence			Walking velocity		
	Men +SD	T	p	Mean +SD	t	p	Mean +SD	T	P
A	35.53 ± 7.8	.648	.522	48.67 ± 11.74	.075	0.9403	9.19 ± 4.306	.042	.966
B	37.53 ± 9.05	.648	.522	49 ± 12.39	.075	0.9403	9.133 ± 3.918	.042	.966

Group A: Hold relax technique of PNF, Group B: Static stretching, SD: Standard deviation

Table 1: Comparative analysis between pretest values of group A & B.

Group	Stride length			Cadence			Walking velocity		
	Mean ± SD	T	P	Mean ± SD	t	p	Mean ± SD	T	P
Pre	46.87 ± .35	1.67	.104	59.67 ± 12.7	1.11	0.27	14.48 ± 4.8	2.15	.03
Post	42.37 ± .47	1.67	.104	54.73 ± 11.62	1.11	0.27	10.79 ± 4.4	2.15	.03

Group A: Hold relax technique of PNF, Group B: Static stretching, SD: Standard deviation

Table 2: Comparative analysis between post test values of group A & B

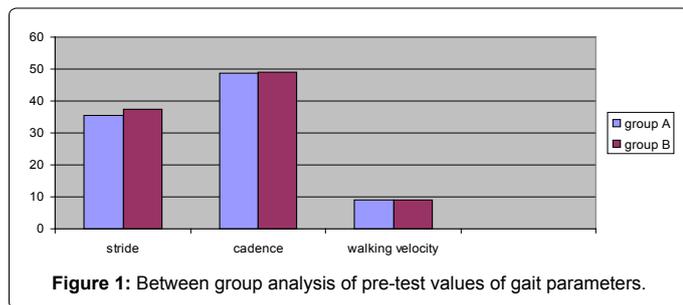


Figure 1: Between group analysis of pre-test values of gait parameters.

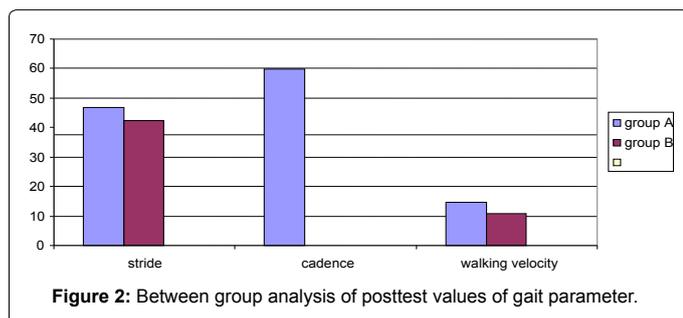


Figure 2: Between group analysis of posttest values of gait parameter.

and standard deviation 7.47 of post-test of stride length of group B, then P value was found to be 0.104, which was greater than 0.05, this shown result was not significant difference. Similarly when mean value 59.67 and standard deviation 12.7 of post-test of cadence group A was compared with mean value 54.73 and standard deviation 11.62 of posttest of cadence of group B, then P value was found to be 0.27, which was greater than 0.05, this shown result was not significant difference. When mean value 14.48 and standard deviation 4.8 of post value of walking velocity of group A was compared with mean value 10.19 and standard deviation 4.4 of posttest of walking velocity of group B, then P value was found to be 0.03, which was less than 0.05. It shown that result was statistically significant difference.

Above result showed that on last day of treatment regimen improvement of gait parameter (pre-treatment values and post treatment values) was better in group A as compared to group B.

Discussion

Our study supported the experimental hypothesis i.e., Hold relax technique of Proprioceptive Neuromuscular Facilitation was more effective to improve walking abilities of stroke patients than static stretching.

We assessed 30 patients, which were divided into two groups each containing 15 subjects. Group A was treated with the hold relax technique of Proprioceptive Neuromuscular Facilitation, whereas the group B was treated with the static stretching. Both the groups were assessed for the gait parameter such as stride length, cadence and the walking velocity. The mean of pre and the post values were compared in between the group. The independent t test was applied to analyze the data. Mainly the muscle group imploded for the study was knee extensor and plantar flexor.

Funk et.al [10] supports our study, they were worked on cerebral palsy children, and compared holds relax technique of PNF and static stretching to improve walking abilities in cerebral child patients. But we were studied on hemiplegic stroke patients and concluded that hold relax technique of PNF was better than static stretching to improve walking abilities of hemiplegic stroke patients.

When mean value 14.48 and standard deviation 4.8 of post value of walking velocity of group A was compared with mean value 10.19 and standard deviation 4.4 of post-test of walking velocity of group B, then P value was found to be 0.03, which was less than 0.05. This shown result was significant difference.

In group A Percentage changes of mean value of pre-test to post test of stride length was 13.76%, cadence was 10.15% and walking velocity was 22.34%. Similarly in group B percentage changes of mean value of group B pre-test to post test of stride length was 6.01%, cadence was 5.52% and walking velocity was 8.33%. Hence It shown that greater improvement of gait parameter occurred in group A than group B. Thus our study proved experimental hypothesis, which was Hold relax technique of PNF is more effective to improvement of walking abilities of stroke patient than static stretching.

Future Research

Science is dynamic and there is always a scope of improvement and change in time to come ahead. With progressive aim to move ahead we aspire to achieve highly accurate and reliable results. Thus every study leave back a scopes for other researcher to do something more advanced and varied in order to touch the height of perfection. This study examined only 30 subjects in total and data collection was confined to closed setup with minimum distractible conditions. Thus future researchers can expand the study by including more number of subjects so as to make generalization of the results and practice such experiments in variable environmental setups such as open environment. Thus it could be applied to real life situation.

In this study the protocol used included Hold relax technique of Proprioceptive Neuromuscular Facilitation and static stretching. But future researchers can progress the study by modifying the protocol like incorporating gait training exercises and strengthening exercises in the protocol given, protocol related to the real life situations could be used, such as using advanced different types of neuromuscular electrical stimulation. The scope of study can be expanded to different grade of spasticity and other neurological conditions.

Relevance to Clinical Practice

The result obtained in this study suggest that Hold relax technique of Proprioceptive Neuromuscular Facilitations to improve walking abilities of stroke patients is more beneficial than using static stretching. So these results show that Hold relax technique of Proprioceptive Neuromuscular Facilitation should be used for training tasks to improve walking abilities of stroke patients.

Limitation:

1. This study was done in hemiplegic subjects especially for lower limb muscle spasticity and so the study does not validate its role in upper limb muscle spasticity
2. As the study was done only in male subjects further studies should be done on the female also, so as to justify to both the sexes.
3. This study was done only with the age group ranging from 40-60, other age group were not considered
4. Only three parameters (stride length, cadence and walking velocity) of the gait were included in the study, to assess the improvement in the gait of the hemiplegic subjects, other parameter such as step length, base of support were not included.

Conclusion

The study concluded that there was significant difference in the gait parameter (stride length, cadence and walking velocity) between two groups A & B treated with hold relax technique of proprioceptive neuromuscular facilitation and static stretching respectively. Our study implies that hold relax technique, group A shown greater increment in the gait parameters such as stride length, cadence and walking velocity as compared to the static stretching, group B.

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