

The Effect of Proprioceptive Neuromuscular Facilitation (PNF) on Activities of Daily Living of client with Cerebrovascular accident

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Abstract

Introduction: Stroke is a significant event in the life of a patient and the disruptions cause many problems for the person's performance and the changes in their lifestyle. Thus, considering the various aspects of stroke patients and its impact on the lives of these patients, this study was done to examine the effect of Proprioceptive Neuromuscular Facilitation (PNF) exercise on activities of daily living of stroke patients admitted to the martyr Beheshti hospital of Yasuj in 2016.

Methods: This study is an interventional clinical trial. The study population for this study included 60 patients with stroke referring to martyr Beheshti hospital of Yasuj which lasted 4 months to 2 years from their illness. These patients were selected by random sampling, then assigned to two groups of 30 as control and intervention. Initially, the activities of daily living were assessed using the elderly activities of daily living (ADL) questionnaire. Then, the intervention group received proprioceptive neuromuscular facilitation (PNF) exercise. Immediately and one month after the last training session patients were evaluated in activities of daily living. Then, the collected data were analyzed by SPSS statistical software with 95% confidence level and $P < 0.05$.

Results: In this study, 60 patients with stroke participated in two groups of control and intervention (30 each). Based on the findings of this study, 34 (56.7%) of the samples were male and the remaining were female. The mean age of the samples was 72.1 ± 10.7 years (range 90-60 years). No significant difference was observed between the two groups in terms of age, sex, marital status, education, occupation and other demographic variables ($P > 0/05$). The findings of the study showed that there was no significant difference between the two groups in the pre and post intervention (immediately after the intervention and one month after the intervention) between the two groups of intervention and control in terms of the average scores of activities of daily living ($P > 0/05$).

Conclusion: According to the findings of this study, proprioceptive neuromuscular facilitation exercise didn't effect on the activities of daily living patients with stroke.

Key words: Proprioceptive Neuromuscular Facilitation (PNF), Activities of Daily Living (ADL), Cerebrovascular Accident (CVA) or Stroke.

Introduction

Stroke is caused by disorders of the nervous system(1). The disease is acute nerve damage caused by impaired blood supply to part of the brain due to a blockage or rupture of an artery that feeds it(2). It is an important event in the life of the patient, while creating a functional disorder causing mental health problems, and social and economic difficulties(3). The World Health Organization defined stroke as follows: "The acute onset of neurological dysfunction due to disturbance in cerebral circulation that results in signs and symptoms which depend on the local area involved in the brain and its duration longer than 24 hours"(4). Stroke is the third cause of death(5) and the second leading cause of disability(6, 7).

In the United States almost 700 thousand people annually are affected to this disease(8). A World Health Organization study in partnership with 12 countries regarding the incidence of stroke in the study population showed that 1/2 up to 2/5 in a thousand is variable. The standard rate for men, have been 2 per thousand in Colombia, 4 to 8 thousand in most European countries and 15 per thousand in Japan. Risk for women is on average 30 percent lower than men(9). In Asia, the number of deaths from stroke and coronary heart disease mortality, are equal(10). According to the report of World Health Organization in 2011, the incidence of stroke in India, was 130 per hundred thousand inhabitants per year(11). Data in Iran in the field of epidemiology of stroke, is inconcise and scattered (12). In Iran, stroke is the fourth leading cause of death after heart disease, cancer and accidents (13). The disease, in addition to a high mortality rate causes substantial morbidity as well(14). Studies show that over time, the problems and the results are changed by approximately 30% improvement and 40% is associated with disabilities(15). The cost to the United States of America directly attributed to stroke, is estimated at \$ 30 billion(16). Depending on the severity and type of stroke, patients with varying degrees of impairment of physical, mental and social experience can have these changes affect their quality of life(17). Including cerebrovascular accidents effects, muscle weakness and stiffness affects limb function(18). Disability from stroke, is due to decreased quality of life after the onset of the disorder(19). Many patients suffering from stroke, needed care and rehabilitation measures after discharge from hospital. These patients will be unable to perform daily living tasks and need the help of others(20). The goal of treatment for these patients, is improving quality of life by reducing the effects of the disease(21). So, it seems that using an effective method to improve neuromuscular function can lead to improved quality of life and reduce medical and social costs and one such method is possibly PNF techniques.

In a study by Victoria et al(2013) as Proprioceptive Neuromuscular Facilitation stretching technique (PNF) was done, and it stated that PNF technique was a valuable part of any program of rehabilitation(22). According to the study on various aspects of stroke patients and its impact on life, and individual and social performance of these

patients, this study was conducted to examine the effect of proprioceptive neuromuscular facilitation exercise on activities of daily living in stroke patients admitted to the martyr Beheshti hospital Yasouj.

Materials and Methods

This study is a clinical trial. The sample study, was conducted on 60 patients with stroke admitted to the neurology ward of the martyr Beheshti Yasouj hospital with criteria such as: Personal and informed consent to participate in the study, over 4 months to 2 years after stroke Adults over 60, once having a stroke, non-active phase of the disease, lack of orthopedic and neurologic diseases and the ability to communicate. The sample size for each group of 30 people was considered.

In connection with the sampling, after first obtaining approval from the Ethics Committee, first; the samples were chosen as convenient and accessible and then randomly allocated to two groups of 30, who were assigned as .intervention (14 women and 16 men) and controls groups (12 females and 18 males). Then, the activities of daily living in both intervention and control groups were assessed, before doing the exercises, using a questionnaire to assess activities of daily living elderly (ADL) containing 30 questions, with four option Likert scale, and with five subscales consisting of extensive (9 items), personal activities (7 items), social and religious activities (8 items), work fine (4 items) and the activities of the washing machine (2 items) were measured. Scores of 0 to 90 were allocated with the higher scores indicating high mobility activities, extensive and productive individual (23). A score of 0 to 30 indicates that it requires full or most of the time with the help of others. From 31 to 60, this indicates that it requires less time and somewhat other people's help and From 61 to 90, it represents complete independence that does not require anyone's help. Then a proprioceptive neuromuscular facilitation exercise program for 8 weeks, each session lasting 30 to 45 minutes (16 sessions during 2 months) in the intervention group was administered(24). The control group received no intervention.

In this study, we used the two following patterns:

1-Arm joint patterns (Upper limb):

Flexion-Abduction-External rotation (Elbow flexed and Elbow extended)

Extension- Adduction- Internal rotation (Elbow flexed and Elbow extended)

Flexion-Adduction- Internal rotation (Elbow flexed and Elbow extended)

Extension-Abduction- External rotation (Elbow flexed and Elbow extended)

2. Knee joint patterns (lower limb):

Flexion-Abduction-External rotation (Knee flexed and Knee extended)

Extension-Adduction-Internal rotation (Knee flexed and Knee extended)

Flexion-Adduction-Internal rotation (Knee flexed and Knee extended)

Extension-Abduction-External rotation (Knee flexed and Knee extended)

The therapist firstly placed the member in a balanced position with respect to the three axes of motion and in this case, the muscles were drawn as far as possible (not up to the end of the range of motion). The exercises two times a week for 30 to 45 minutes lasted for 8 weeks(24).

First stage: An active or inactive stretch was applied within 10 to 20 second, and the muscle or target muscle, slowly and gradually, was taken to the end of the range. This situation was kept for moments.

Second stage: Immediately or after a rest of about 2 to 3 second, the contraction was done unlike the resistance of the therapist. This contraction can be isometric or static, or less likely to be shortened and concentric. The duration of this contraction is usually 3 to 6 seconds. At this stage, the target muscle is calmed down by the “self-restraint” or “reciprocal tension reflection” mechanism and ready for further stretching.

The third stage: Immediately or after an interval of about 2 to 3 seconds, again, the muscle or target muscle stretched to reach a new point in the range of motion. (25).

Immediately and 4 weeks after the last exercise session, activities of daily living in both intervention and control groups using the questionnaire (ADL) was measured (23). The collected data were analyzed by SPSS software using descriptive statistics(Tables and charts, indicators centrist and dispersion indicators) as well as inferential statistical tests (Kolmogorov Smirnov, V-test Repeated measurements ANOVA and paired t-test) with 95% confidence level and $P < 0.05$.

Results

The results of this study showed that samples of study in both groups in terms of age, are in the range of 60 to 90 years. 56/7% of samples were male and 43/3% were female. In terms of job, most of the samples (35%) were unemployed. In terms of education, 40% primary education, 36/7% illiterate and 23/3% were middle and high school education. 20% of the samples in the intervention group, and 30% in the control group were rural, and 80% of the samples in the intervention group, and 70% in the control group were urban. 30% of the samples in the intervention group and 23.3% in the control group were single, and 70% of the intervention group and 67/6% of the control group were married, and divorced. In both groups, 55% have a positive family history of stroke. 61.7% of samples in the right hemisphere, and 38/3% in the left hemisphere, suffered from stroke.61.7% of the samples were paralyzed in the left half of the body and 38/3% in the right half. The mean scores and mean differences in the activities of daily living in both intervention and control groups are presented in the following tables (opposite page):

Discussion

Based on the results of this study, proprioceptive neuromuscular facilitation exercises on the parameters of activities of daily living (extensive, personal, belief-social, delicate and washing by car) of patients with stroke in the intervals before intervention, immediately after the intervention and one month after the end of the intervention, showed no significant statistical difference($P > 0/5$). Also, the findings of the study indicate that there is no significant difference between the mean and standard deviation of daily activities in the two groups before and immediately after the intervention, but one month after the end of the intervention, the extensive activities in the intervention group were more than control, but the difference was not significant. Also, belief-social activities and personal activities have shown a similar situation. In addition, delicate activities and washing by car did not show a significant change in the situation. In general, before intervention, immediately after the intervention and one month after the intervention, there was no significant difference in the mean of activities of daily living between the two intervention and control groups($P > 0/05$). By searching in databases and various sources, a study consistent with the current study that the effects proprioceptive neuromuscular facilitation exercises on the activities of daily living of patients with cerebrovascular accident have not been obtained. Most of the studies used in these exercises are for neuromuscular problems, rehabilitation, motor function, vascular function, quality of life and even pain.

In a study by McMillan et al, stated that, the quality of life of patients with stroke is significantly lower than the quality of life of the control group (26). In a study by Ruth Dickstein and colleagues in 1986, entitled “Rehabilitation of a stroke with three methods of training”, covering 131 patients, stated that these patients underwent three treatment methods, finally, they concluded that there was no significant difference in the improvement of daily life activities in all three groups(27). Attar Sayyah et al (2016), in a clinical Trial study, examined the effect of proprioceptive neuromuscular facilitation exercises on fatigue and quality of life in patients with multiple sclerosis. Their results showed that these exercises significantly reduced fatigue and increased the quality of life in patients with MS(28). Also, a study by Sadeghi D. Cheshmeh et al. To compare the effects of closed and PNF chain motion on the static and dynamic balance of the elderly between 60 and 80 years of age, the findings suggest that these two methods of training can improve balance Static and dynamic elderly people to be used(29). PNF technique is commonly used in athletes and clinical settings to increase the active and passive motor range and to optimize motor function and rehabilitation (30). Evidence suggests that active exercises after cerebral stroke lead to neural plasticity in the cerebral cortex, resulting in improved motor function after the stroke of the brain (31). However, this study was designed with the idea that proprioceptive neuromuscular facilitation exercises with muscular rehabilitation can provide more flexibility in the muscular congestion of stroke patients, the physical fitness of the patient increases and this event

Table 1: Compare the activities of daily living score before and after intervention in both experimental and control group

Activities of daily living(ADL)	Parameter	time	Intervention group	Control group	Statistical test	
			M±SD	M±SD	Statistics(k ²)	P-value
			Course activities	Before intervention	10/7±2/7	11/9±4/4
Immediately after the intervention	11/6±4/4	11/5±4/7	0/9			
A month after the intervention	12/5±4/4	11/1±5/1	0/3			
Personal activities	Before intervention	11/1±3/5	11/9±4/5	0/3	0/8	
	Immediately after the intervention	12±5/2	12/1±5/3	0/9		
	A month after the intervention	12/7±4/6	12/4±4/6	0/8		
Religious and social activities	Before intervention	12/4±3/7	12/8±4/1	0/6	0/8	
	Immediately after the intervention	13/8±3/9	13/4±4/9	0/6		
	A month after the intervention	14/2±2/9	13/7±4/3	0/6		
Delicate activities	Before intervention	3/1±2/2	3/5±2/3	0/5	0/8	
	Immediately after the intervention	3/6±1/7	3/8±2/4	0/7		
	A month after the intervention	3/8±1/6	3/6±2/4	0/6		
Activities washing machine	Before intervention	1/4±0/8	1/5±0/8	0/2	0/8	
	Immediately after the intervention	2/1±1	1/7±1/1	0/4		
	A month after the intervention	2/1±0/5	1/9±0/6	0/1		

Table 2: Compare the mean difference in activities of daily living before and after the intervention in experimental group

Activities of daily living(ADL)	Parameter	Mean difference					
		T2 - T1		T3 - T1		T3 - T2	
		Mean difference	P-value	Mean difference	P-value	Mean difference	P-value
Course activities		0/9	0/01	1/8	0/001	0/9	0/5
Personal activities		0/9	0/03	1/6	0/001	0/7	0/3
Religious and social activities		1/4	0/001	1/8	0/001	0/4	1
Delicate activities		0/5	0/04	0/7	0/06	0/2	0/2
Activities washing machine		0/7	0/001	0/7	0/001	0	0/2

Table 3 : Compare the mean difference in activities of daily living before and after the intervention in control group

Activities of daily living(ADL)	Parameter	Mean difference					
		T2 - T1		T3 - T1		T3 - T2	
		Mean difference	P-value	Mean difference	P-value	Mean difference	P-value
Course activities		-0/4	0/05	-0/08	0/005	-0/04	0/07
Personal activities		0/2	0/5	0/5	0/2	0/3	0/3
Religious and social activities		0/6	0/1	0/9	0/09	0/3	0/3
Delicate activities		0/3	0/2	0/1	0/7	0/2	0/05
Activities washing machine		0/2	0/4	0/4	0/06	0/2	0/3

will improve the activities of daily living the patients and their final result is to improve their quality of life. Possible reasons for not having an effect on this intervention include the lack of adequate time for muscle recovery in patients Also, muscle weakness and fatigue resulting from the severity and intensity of continuous exercises may be another reason for this. In addition, since everyday activities of daily living are measured by a questionnaire and the questionnaire is a subjective tool, there may be some problems in responding. Differences in the type of CVA, high age, physical and psychological dependence on others for activities of daily living and impaired central and peripheral nervous system of the patients can be affected by other causes. Therefore, it is suggested that these exercises be

taught as a general method of rehabilitation and in the following studies, the above considerations should be considered.

Conclusion

So, according to the results, among the mean muscle strength scores of these patients before and after PNF, Significant differences indicating the progression activities of daily living after proprioceptive neuromuscular facilitation exercise compared to before intervention, does not exist, which indicates a lack of improvement in the activities of daily living, people with stroke.

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