International Journal of Multidisciplinary Education and Research
ISSN: 2455-4588; Impact Factor: RJIF 5.12
Received: 20-04-2019; Accepted: 23-05-2019
www.educationjournal.in
Volume 4; Issue 4; July 2019; Page No. 82-88

Intervention range of motion (ROM) and foot massage towards motor function in non hemorrhagic patient

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Abstract
Background: Cardiovascular diseases such as heart disease and stroke rank first with an impact on impaired bodily functions. Strokes can cause death and considerable disability caused by a sudden decline in neurological function due to cerebrovasluker disease. Disruption of blood circulation causes oxygen to be carried by the blood decreases, causing nerve cell death. The actions taken to deal with stroke are comprehensive actions that include promotive, preventive, curative and rehabilitative. One comprehensive action to reduce the impact of stroke is worsened in patients with range of motion exercises range of motion and foot massage.
Method: The type of research used is True Experiment using a pre-test-post-test with control group design. This study arranged three groups: the first intervention group who were given treatment Range of Motion (ROM) with foot massage for 15 minutes, the second intervention group treated Range of Motion (ROM) with foot massage for 20 minutes and control group who were given Range of Motion treatment (ROM) without foot massage for 30 minutes. Technique probability sampling with method simple random sampling is used to get 57 respondents were divided into three groups with each group amounted to 19 respondents.
Results: The result statistical test One Way Anova showed a p value <0.05 so that it can be concluded that there is an effect intervention of Range of Motion (ROM) with foot massage to improve motor function in non-hemorrhagic stroke patients.
Conclusion: The results of the study after being given a nursing action improved motor function improved in patients who received intervention Range of Motion (ROM) with foot massage for 15 and 20 minutes, so that complementary therapy was effectively implemented to patients who experience motor function disorders especially in non-hemorrhagic stroke patients.

Keywords: range of motion (ROM), foot massage, motor function, non-hemorrhagic stroke

1. Introduction

The era of globalization, which is followed by developments in the progress of science and technology in the field of health underwent significant changes. The results of WHO research and Imperial College (2018) stated that 40.5 million of 56.9 million people in the world died from non-communicable diseases (PTM). Indonesia is currently experiencing an epidemiological transition and a double burden of disease, from the morbidity and mortality rates of infectious diseases have not been resolved to the maximum while non-communicable diseases are increasing. Cardiovascular diseases such as heart disease and stroke rank first with an impact on impaired bodily functions [1].

Stroke can cause considerable death and disability. According to the National Stroke Association (2016) that most people who have a stroke are over 65 years old, but this stroke does not look at age, the incidence of productive age also begins to increase even in infants and children. Stroke is a decrease in neurological function that occurs suddenly due to cerebrovasluker disease. Lack of public knowledge about stroke and the delay in coming to the hospital are also complex problems that need to be addressed [2].

Stroke has become the leading cause of death in almost all hospitals in Indonesia with a prevalence of 7% in 2013 and an increase of 10.9% in the year. This figure is almost comparable to the average number of stroke prevalence in all provinces in Indonesia [3]. Decreased neurological function due to stroke can lead to more severe conditions even to death. The likelihood of death reaches 30% -35% and the emergence of major disability in survivors reaches 35% -40% of the number of patients who have had a stroke.[4] Data in Central Java shows the number of stroke patients was ranked 13th in Indonesia in 2018 with the number of stroke cases as many as 40,972 consisting of hemorrhagic strokes as many as 12,542 and non-hemorrhagic strokes as many as 28,430 patients. Data in the city of Semarang obtained 801 cases of hemorrhagic stroke and 2,141 cases of non-hemorrhagic stroke [4].

The medical record data of Tidar City Magelang Hospital from 2016 to 2018, the average number of inpatients with stroke was 1,386. Hemorrhagic stroke as many as 428 patients per year and non-hemorrhagic stroke as many as 858 patients per year and unknown causes of stroke as many as 100 patients per year [5].

The main problem of stroke patients is the occurrence of paralysis or muscle weakness due to brain lesions of the pyramidal part together with adjacent extrapyramidal fibers. Long-term muscle weakness that often occurs due to stroke is hemiparesis. Weakness on one side of the body or hemiparesis and hemiplegia can occur on the face, arms, legs or the whole side of the body. This immobility condition will result in patients experiencing complications and decreased ability to perform daily activities [6].

The impact of a stroke can result in motor disturbances due to disruption of nerves that function to contract muscles in the body when stimulated. motor function disorders that occur can result in muscle weakness that in a long time can occur paralysis of the upper and lower limbs [7]. In addition, there are also disturbances in communication, perception and bladder dysfunction. The initial stroke also affects concentration, memory problems, body control problems (apraxia), visual perception problems, even confusion and rejection [8]. The magnitude of the problems caused by a stroke, it is necessary to take action to prevent, treat and minimize complications that occur. In addition, nurses must also participate in reducing mortality and disability resulting from stroke.

Comprehensive stroke treatment and supported by advances in diagnostic technology and appropriate therapeutic measures are needed because of the continued consequence of a very fatal stroke. Stroke treatment can begin during the hyperacute phase until the rehabilitation phase or after a stroke. Treatment for stroke can be either collaborative or independent.

The actions taken to deal with stroke are comprehensive actions that include promotive, preventive, curative and rehabilitative. The action so far taken to deal with stroke for the first time or repeatedly is to use medical therapy with drugs. The use of anti-platelet as anti-thrombolytic is indicated for the prevention of secondary stroke [9]. Criteria for administration of anti-thrombolytics after the first 3-4.5 hours are the best time for functional improvement of the brain and reducing mortality [10].

Rehabilitation as early as possible is carried out so that it can go through a faster, optimal physical recovery process and avoid disruption of other organs and disabilities that may occur due to stroke. Disorders that occur in sensory and motor function of stroke patients cause bodily imbalances, the occurrence of tension in the soft tissue and even weakness in the muscles. Functions that are lost due to impaired motor control in stroke patients result in loss of coordination, imbalance of the stroke patient's body to maintain in a certain position. Therefore it is necessary to have an alternative that can be done to improve the motor function of stroke patients [11].

Many complementary therapies are developed in health services to improve the health status of patients, one of which can reduce the deteriorating impact on stroke patients is withexerciseRange of Motion [12]. This exercise is used to maintain a level of perfection in the ability to move joints normally and completely to increase muscle mass and muscle tone. It also can use the elbow at a certain point of the muscle. In patients with post-stroke, narrowing of blood flow and oxygen occurs which causes pain and muscle spasms, so ROM or range of motion exercises are useful for opening narrowing of blood vessels.

ROM is useful in improving limb function through its effect to expedite movement in the body. Extremity is one part of the body that is important to do ROM. Motion on the hand can be stimulated by grasping function exercises which are carried out through three stages namely opening the hand, closing the fingers to grasp the object and regulating the grip strength [13].

Giving ROM done 2 times a day with a duration of 45-60 minutes of exercise for 7 days showed that a significant increase in muscle strength was 1.70 934% [14]. Significant increase in muscle strength after doing passive exercises 5 times a day with a duration of 10 minutes for 8 days of training, showed that a significant increase in muscle strength was 3.87 (55%) [15].

Current nursing services show that the provision of nursing care to stroke patients is not in accordance with existing standards. Stroke can occur in someone who has an unhealthy lifestyle, such as eating foods high in fat and cholesterol and lack of exercise. Apart from the factor of being late for patients to come to the hospital to get help, handling treatment in the ward has not shown good results for patients who experience mobilization problems. In addition to providing ROM therapy, other therapies need to be done to improve the motor function of stroke patients, including massage [16].

Massage is a complementary therapy that can improve and maintain good health in promotive, preventive, curative and rehabilitative functions. It also can have a positive impact on the soul and body of stroke sufferers. One type of massage performed on stroke patients is foot massage [17].

therapy foot massage is a holistic therapy to provide relaxation that can affect a decrease in sympathetic nervous system activity is beneficial to improve blood circulation and lymph flow and reduces depression. Vasoconstriction in peripheral blood vessels can inhibit blood circulation and increase vascular resistance. Stimuli arising from foot massage or friction that is carried out can expedite blood flow that can affect health. One of thetechniques massage performed on the foot area is an effleurage that can dilates peripheral blood vessels and backflow from the lower extremities to the heart. Effleurage massage is a massage using the palm of the hand / thumb gently toward the circulation repeatedly [18].

Effect oftherapy massagereduces the potential for stress when used clinically, massage is done once a week for at least 15 minutes to significantly reduce the psychological symptoms of anxiety. Theeffect massage beneficialcan reduce blood pressure, mood is not calm and affect the heart rate.[19] Massage techniques also affect the smooth circulation of blood flow so that it can balance the flow of energy in the body and relax muscle tension. Thetechnique effleurage used in foot massage with emphasis on the same point as the acupressure technique, K1, can help restore the motor function of stroke patients.

Research and data have been presented, where range of motion exercises (ROM) and foot massage are carried out to restore the motor function of patients after stroke after 5 hours of attack. Basically as a result of a stroke can have an impact on sensory, motor and cognitive functions, so in this study to find out how effective the actions of ROM and foot massage to improve motor function in stroke patients.

Therapy of giving ROM and foot massage to be done with two different durations in each intervention group with a duration of 30 minutes (ROM 15 minutes and foot massage 15 minutes) and 40 minutes (ROM 20 minutes and 20 minutes foot massage). Researchers considerations in determining the duration of time given because in previous studies ROM has been done in stroke patients for 30-40 minutes by giving 2 times a day for 7 days to 3 weeks. The duration given by researchers is shorter with combined foot massage. Considerations are taken to determine the effectiveness of the therapy provided, physiotherapy is limited and the conditions of each respondent are different.

2. Methods

This type of research uses a research True Experiment by using a pre test - post test with control group design. This study arranged three groups: the first intervention group who were given treatment Range of Motion (ROM) with foot massage for 15 minutes, the second intervention group treated Range of Motion (ROM) with foot massage for 20 minutes and the control group who were given Range of Motion (ROM) treatment without foot massage for 30 minutes. Provision of Range of Motion (ROM) with foot massage is given for 7 days with a duration of 15 minutes, 20 minutes and 30 minutes. Motor function assessment is to determine muscle strength using the Medical Scale Research Council instrument, while assessment of susceptibility to motion uses goniometry instruments. The motor function assessment that was given therapy Range of Motion (ROM) and foot massage with non-hemorrhagic stroke patients was performed posttest 4 times namely day 2th, day 3th, day 5th and day 7th.

The population in this study were patients with non-hemorrhagic stroke who were treated at Tidar General Hospital, Magelang City. Determination of the minimum sample size using techniques probability sampling with method simple random sampling and based on inclusion and exclusion criteria as many as 57 respondents divided into three groups with 19 respondents each in the first intervention group (ROM and foot massage for 15 minutes), 19 respondents in the second intervention group (ROM and foot massage for 20 minutes) and 19 respondents in the control group (ROM without foot massage for 30 minutes).

In this study, researchers conducted data collection by observation, identification, interviews and filling out questionnaire sheets. The data collected was analyzed through the IBM SPSS program version 24.0, and continued with a different test, namely the parametric test (One Way Anova). The processed data is used as a basis for discussing statement matters, which are then presented in tabular form so that conclusions can be drawn.

3. Result

Based on the table above shows that the characteristics of respondents by sex and frequency of stroke there is no significant difference between the intervention groups and a control group with a p value > 0.05 which means that the proportion of sex and frequency of stroke by respondents is equal or homogeneous. On the other hand, the age characteristics in this study showed a p value <0.05, so it can be concluded that the age of respondents between the intervention and control groups was not homogeneous.

Table 1: Distribution frequencies respondent based on age, sex and frequency of stroke based on demographic data

Variable	Respondent Group						P Value
	Intervention 15 minute		Intervention 20 minute		Control 30 minute		
	N	%	N	%	N	%	
Age							
45-55	11	57.9	7	63.2	4	21.1	0.011
56-66	8	42.1	12	36.8	15	78.9	
Total	19	100.00	19	100.00	19	100.00	
Gender							
Male	13	68.4	12	63.2	9	47.4	0.283
Female	6	31.6	7	36.8	10	52.6	
Total	19	100.00	19	100.0	19	100.00	
Attack Frequency							
First strike	9	47.4	11	57.9	10	52.6	0.745
Second attack	10	52.6	8	42.1	9	47.4	
Total	19	100.00	19	100.00	19	100.00	

*Homogeneous Test

Table 2: Analysis differences in muscle strength and range of motion in the upper limb before and after treatment in the intervention group and control group

Time	Variable	Group	Mean±SD	F	*p*
Pre	Muscle strength	Intervention 15 minute	1.58±0.507	0.844	0.436
		Intervention 20 minute	1.47±0.513		
		Control	1.68±0.478		
	Range of motion	Intervention 15 minute	29.56±1.898	0.643	0.534
		Intervention 20 minute	30.11±3.072		
		Control	29.41±2.033		
Post 3	Muscle strength	Intervention 15 minute	1.79±0.419	0.468	0.629
		Intervention 20 minute	1.79±0.419		
		Control	1.89±0.315		
	Range of motion	Intervention 15 minute	30.11±1.824	0.468	0.629
		Intervention 20 minute	30.58±1.813		
		Control	29.60±1.897		
Post 5	Muscle strength	Intervention 15 minute	2.37±0.496	0.628	0.538
		Intervention 20 minute	2.53±0.513		
		Control	2.37±0.496		
	Range of motion	Intervention 15 minute	39.44±3.191	3.502	0.037
		Intervention 20 minute	42.22±4.088		

		Control	40.29±2.488		
Post 7	Muscle strength	Intervention 15 minute	3.32±0.487	0.929	0.401
		Intervention 20 minute	3.53±0.513		
		Control	3.37±0.496		
	Range of motion	Intervention 15 minute	49.95±3.958	15.421	0.000
		Intervention 20 minute	56.60±4.362		
		Control	54.87±3.044		

*One Way Anova Test

Based on the table above, it shows that the mean muscle strength and range of motion of the upper limb before being given treatment experienced an increase in the intervention and control groups. The control group had a greater average than the intervention group of 1.68.

The results of statistical tests of mean muscle strength and range of motion of the upper limb after being treated at the 3rd post and 5th post in the intervention and control groups were not significant differences with p values > 0.05. However, at post 7 the mean muscle strength showed a significant difference with p value < 0.05, on the contrary the mean range of post 7 motion was still no difference with the value of p value> 0.05. So that it can be concluded Range of Motion (ROM) and foot massage have an effect on increasing muscle strength. When viewed from the mean muscle strength and range of motion of the upper limb from the 3rd post, 5th post and 7th post in the intervention group for 20 minutes higher than the intervention group for 15 minutes and the control group 30 minutes.

Table 3: Analysis differences in muscle strength and range of motion in the lower limb before and after treatment in the intervention group and control group

Time	Variable	Group	Mean±SD	F	*p*
Pre	Muscle strength	Intervention 15 minute	1.37±0.496	0.628	0.538
		Intervention 20 minute	1.37±0.496		
		Control	1.53±0.513		
	Range of motion	Intervention 15 minute	29.52±1.899	1.049	0.357
		Intervention 20 minute	30.18±1.968		
		Control	29.34±1.775		
Post 3	Muscle strength	Intervention 15 minute	1.58±0.507	3.282	0.045
		Intervention 20 minute	1.84±0.374		
		Control	1.89±0.315		
	Range of motion	Intervention 15 minute	30.25±2.966	1.072	0.349
		Intervention 20 minute	31.39±2.499		
		Control	30.73±1.836		
Post 5	Muscle strength	Intervention 15 minute	2.37±0.496	0.929	0.401
		Intervention 20 minute	2.53±0.513		
		Control	2.32±0.487		
	Range of motion	Intervention 15 minute	41.99±3.302	3.429	0.040
		Intervention 20 minute	44.44±2.873		
		Control	42.94±2.486		
Post 7	Muscle strength	Intervention 15 minute	3.11±0.737	1.925	0.156
		Intervention 20 minute	3.47±0.513		
		Control	3.26±0.452		
	Range of motion	Intervention 15 minute	49.55±3.541	11.734	0.000
		Intervention 20 minute	54.34±3.417		
		Control	53.83±3.058		

*One Way Anova Test

Based on the above table, it shows that the mean muscle strength and range of motion of the lower extremities before treatment experiences experiencing improvement in the intervention and control groups. The intervention group of 15 minutes and 20 minutes had the same mean value of 1.37.

The statistical test results of mean lower limb muscle strength after treatment at the 3rd post there was a significant difference with the p value <0.05, but at the 5th post and the 7th post showed a p value> 0.05. While the mean lower extremity range in post-3 there was no significant difference with p value> 0.05, after treatment at post-5 and post-7 showed a value of p value <0.05 so it can be concluded that the Range of Motion (ROM) and foot massage have an effect on improving range of motion. When viewed from the mean muscle strength and range of motion of the lower extremities from the 3rd post, the 5th post and the 7th post in the intervention group for 20 minutes higher than the intervention group for 15 minutes and the control group 30 minutes.

Table 4: Analysis post hoc test muscle strength and range of motion upper limb between in the intervention group and control group

Variable	Respondent group	(I) Day	(J) Day	Mean Difference	Std. Error	P value
Muscle strength	Intervention 1	1	7	-1.737	0.104	0.000
		1	3	-0.211	0.096	0.251
		3	5	-0.579	0.116	0.001
		5	7	-0.947	0.053	0.000
	Intervention 2	1	7	-2.053	0.093	0.000
		1	3	-0.316	0.110	0.060
		3	5	-0.737	0.129	0.000
		5	7	-1.000	0.000	-
	Control	1	7	-1.684	0.154	0.000
		1	3	-0.211	0.096	0.251
		3	5	-0.474	0.140	0.020
		5	7	-1.000	0.000	-
Range of motion	Intervention 1	1	7	-20.396	0.644	0.000
		1	3	-0.548	0.279	0.390
		3	5	-9.331	0.851	0.000
		5	7	-10.517	1.241	0.000
	Intervention 2	1	7	-26.497	1.077	0.000
		1	3	-0.475	0.199	0.169
		3	5	-11.639	0.984	0.000
		5	7	-14.383	0.764	0.000
	Control	1	7	-25.455	0.966	0.000
		1	3	-0.183	0.090	0.336
		3	5	-10.698	0.712	0.000
		5	7	-14.574	0.916	0.000

*Post hoc test Pairwise Comparisons

Based on the table above, shows the difference in time of increasing upper limb muscle strength before and after treatment in the 15 minute intervention group and 20 minute intervention on the 3rd day post there was no significant change in the value of p = 0.251 but after the 5th day te There was a significant change with p = 0.001, then the control group increased on the 7th day after treatment was given. Meanwhile, the difference in time of increased upper limb range before and after treatment in the 15 minute intervention group, 20 minute intervention and the control group did not change but after day 5 there was a significant change with p = 0.000.

Table 3.5: Analysis post hoc test muscle strength and range of motion lower limb between in the intervention group and control group

Variabel	Responden group	(I)Day	(J)Day	Mean Difference	Std. Error	Pvalue
Muscle strength	Intervention 1	1	7	-1.737	0.150	0.000
		1	3	-0.211	0.096	0.251
		3	5	-0.789	0.096	0.000
		5	7	-0.737	0.104	0.000
	Intervention 2	1	7	-2.105	0.105	0.000
		1	3	-0.474	0.118	0.005
		3	5	-0.684	0.110	0.000
		5	7	-0.947	0.053	0.000
	Control	1	7	-1.737	0.104	0.000
		1	3	-0.368	0.114	0.027
		3	5	-0.421	0.116	0.012
		5	7	-0.947	0.053	0.000
Range of Motion	Intervention 1	1	7	-20.029	0.518	0.000
		1	3	-0.731	0.392	0.470
		3	5	-11.733	0.777	0.000
		5	7	-7.565	0.569	0.000
	Intervention 2	1	7	-24.159	0.771	0.000
		1	3	-1.206	0.564	0.279
		3	5	-13.049	0.658	0.000
		5	7	-9.904	0.757	0.000
	Control	1	7	-24.488	0.874	0.000
		1	3	-1.206	0.407	0.050
		3	5	-12.393	0.672	0.000
		5	7	-10.889	0.839	0.000

*Test post hoc Pairwise Comparisons

Based on the table above, shows the difference between the increase in lower extremity muscle strength before and after treatment in the intervention group was given 15 minutes and 20 minutes of increased intervention on day 3 to the 5th day, the control group changes after the day i 5th to 7th day there was a significant change with a value of p = 0,000.

Meanwhile, the difference in time of increased lower extremity range before and after treatment in the 15 minute intervention group, 20 minute intervention and the control group increased on day 3 to day 5 there was a significant change with p = 0,000.

4. Discussion

Based on the results of the difference test (deviation) and the recovery time between the intervention and control groups before and after treatment, the results obtained an increase in muscle strength and range of motion after being given ROM and Foot Massage for 7 days. The increase occurred on the 7th day significantly with a value of p= 0,000. In the assessment carried out after being treated in the intervention group for 20 minutes, the results obtained mean muscle deficiency and range of motion higher than the intervention group for 15 minutes and control 30 minutes. This value shows that ROM and Foot Massage significantly affect the recovery of muscle strength and range of motion in non-hemorrhagic stroke patients.

Patients who experience motor function recovery can return to motion perfectly. The improvement in initial function recovery within 2 weeks is marked by recovery from the shoulders, elbows and palms the same week. Recovery will usually be complete in 4 weeks to 7 months. Some patients show relative relative recovery with increased fatigue tendency and mild weakness. This shows that the recovery process can be predicted.

Restoration of motor function in stroke patients is related to the severity of motor deficits during an acute stroke. Patients with mild motor deficits during an attack will be more likely to experience motor repair faster than stroke patients who have heavier motor deficits.

Providing nursing care to patients in the stroke unit room, the nurse's role is large enough to manage quality patients. Nurse independent intervention that can be given by patients is still rarely done. Self-care in the stroke unit room has a variety of ways to improve the patient's health recovery without providing a chemical effect on the body.

ROM administration therapy in this study was carried out because by moving the joints regularly in accordance with predetermined SOPs that can improve and maintain heart, respiratory function, prevent contractures and joint problems, improve muscle tone, prevent joint collapse and improve blood circulation.[20] Effects arising from ROM exercise can increase the chemical activity of neuromuscular and muscular which will increase stimulation of the nerve muscles of the extremities especially the parasympathetic nerves which stimulate the production of acetylcholine thus causing contractions. The mechanism through muscle especially the limb smooth muscle will increase metabolism in the mitochondria to produce ATP which is utilized by the limb muscles and increase the limb smooth muscle.[21]

Complementary therapy plays an important role in increasing the degree of health both promotive, preventive, curative and rehabilitative. The importance of alternative therapy as a treatment for maintaining health, reducing the effect of medical therapy for stroke patients in addition to ROM is Foot Massage. Foot massage therapy has various benefits to reduce anxiety, improve immune function and improve circulation. Foot massage that is done regularly can cause stimulation of nerve receptors and dilate blood vessels so that blood flow is smooth. Besides foot massage can also balance the flow of energy in the body and can overcome muscle tension. One of the movements in this foot massage is thetechnique effleurage causes vasodilation of peripheral blood vessels and facilitates the return of blood flow from the lower extremities to the heart.

5. Conclusion

Based on data processing and analysis of ROM and Foot Massage with a duration of 15 minutes and 20 minutes respectively of motor function (muscle strength and range of motion) upper and lower extremities as well as time to increase motor function, it can be concluded that:

5.1 There is no difference in strength muscle and upper limb range of motion before ROM and foot massage in the 15 minute intervention group, 20 minute intervention and control.

5.2 There was no difference in muscle strength and lower extremity range before ROM and foot massage in the 15-minute, 20-minute and control intervention groups.

5.3 There was a difference in muscle strength and range of motion of the upper limb before and after ROM and foot massage in the 15-minute intervention group, 20-minute intervention and control.

5.4 There was a difference in muscle strength and range of motion of the upper limb before and after ROM and foot massage in the 15-minute intervention group, 20-minute intervention and control.

5.5 There was an increase in muscle strength and range of motion of the upper limb before and after the 3rd, 5th and 7th day in the 15-minute intervention group, 20-minute intervention and control.

5.6 There was an increase in muscle strength and range of motion of the lower extremities before and after days 3, 5 and 7 in the 15 minute intervention group, 20 minute intervention and control.

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