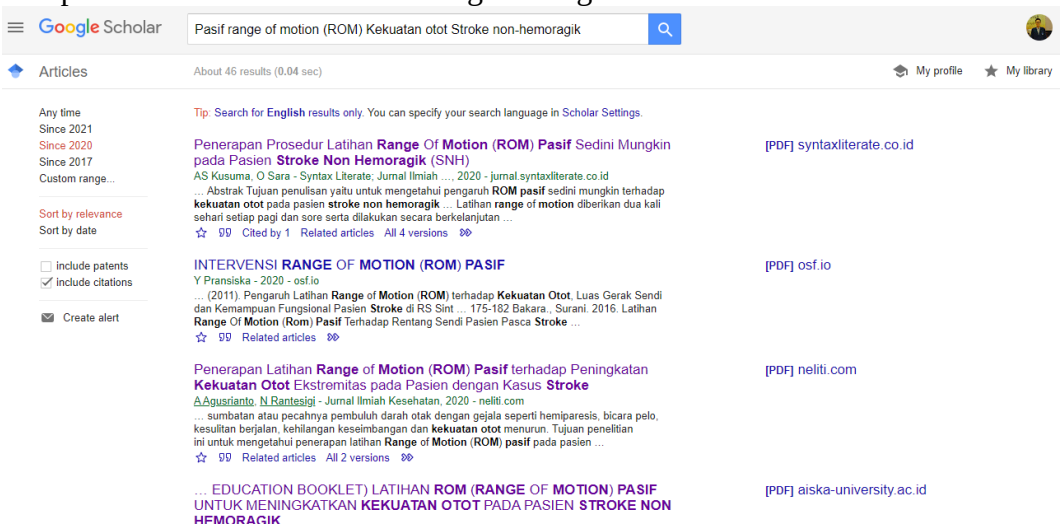
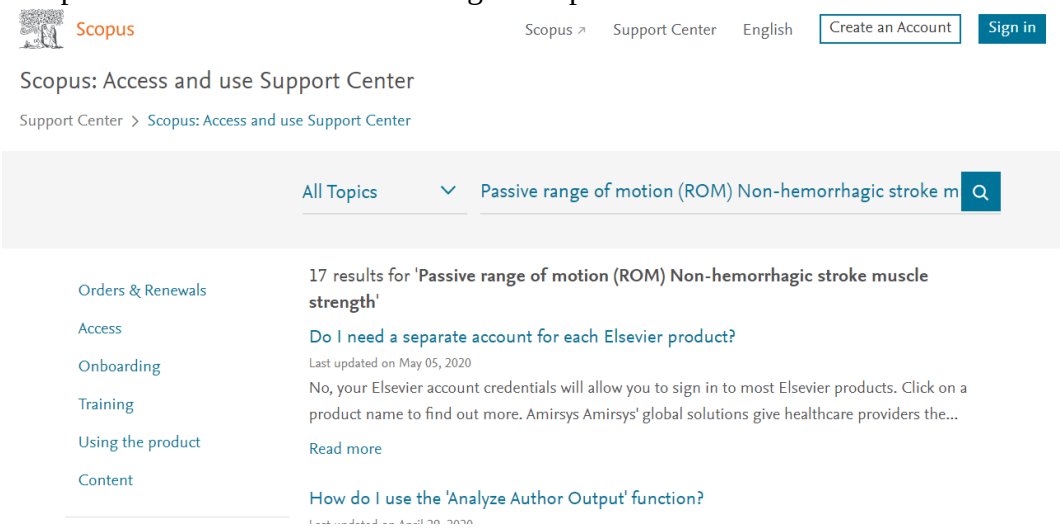
LAMPIRAN

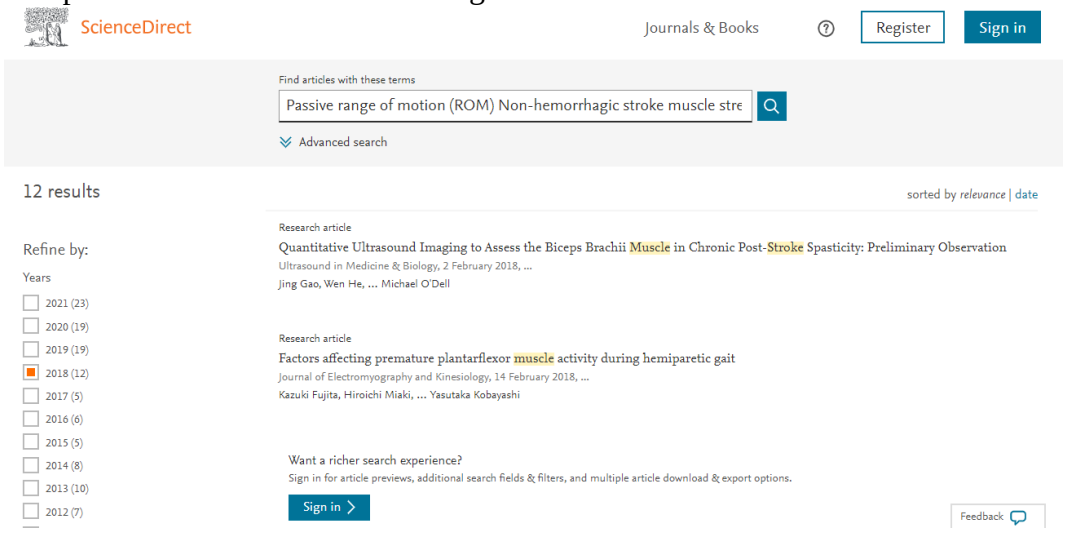
Lampiran 1. Pencarian Literatur dengan Google Scholar



Lampiran 2. Pencarian Literatur dengan Scopus



Lampiran 3. Pencarian Literatur dengan Science Direct



Lampiran 4. Lembar Konsultasi Online

NAMA MAHASISWA : Feby Jatu Puty Nur Wahyudien

NIM : P27820418041

JUDUL :

NO	HARI TANGGAL	MATERI BIMBINGAN	REVISI	TTD MAHASISWA	TTD DOSEN
1	Sabtu, 06 Februari 2021	1. Arahan penyusunan proposal KTI 2. Kontrak prosedur bimbingan	-		
2	Sabtu, 13 Februari 2021	BAB 1 Pendahuluan	1. Judul pakai studi literatur / literatur review 2. Menganti tujuan umum dan khusus		
3	Jumat, 26 Februari 2021	BAB 2 Tinjauan Teori	Ditambahi SOP pasif range of motion		
4	Kamis, 11 Maret 2021	BAB 3 Metode + Daftar Pustaka	1. Kata kunci 2. Jumlah jurnal dikurangi / apa adanya 3. Tabel dikasih nama nomer tabel 4. Metode jurnal dilengkapi		
5	Senin, 22 Maret 2021	Evaluasi keseluruhan proposal	Daftar pustaka dikasih laman jurnal yang dipilih		
6	Senin, 29 Maret 2021	Arahan persiapan seminar proposal	-		

NAMA MAHASISWA : Feby Jatu Puty Nur Wahyudien

NIM : P27820418041

JUDUL :

NO	HARI TANGGAL	MATERI BIMBINGAN	REVISI	TTD MAHASISWA	TTD DOSEN
7	Jumat, 30 Maret 2021	1. Arahan penyusunan KTI 2. Kontrak prosedur bimbingan	-		
8	Senin, 03 Mei 2021	BAB 4 Hasil	1. Menyesuaikan jurnal dan topik 2. Ganti jurnal yang sesuai		
9	Rabu, 05 Mei 2021	BAB 4 Analisis	Setiap poin dijadikan kotak kotak yang ringkas		
10	Senin, 17 Mei 2021	BAB 5 Pembahasan	1. Ganti kata-kata yang tidak diperlukan 2. Lebih dijabarkan lagi		
11	Kamis, 20 Mei 2021	BAB 5 Pembahasan	Ditambahi opini sendiri diikuti teori yang sesuai yang dibahas		
12	Senin, 24 Mei 2021	Abstrak dan BAB 6 Penutup	1. Analisis ditambahi faktor-faktor 2. Metode ditambahi rincian jurnal 3. Saran disesuaikan manfaat		

Lampiran 5. Lembar Perbaikan Seminar Proposal KTI

Politeknik Kesehatan Kemenkes Surabaya Program Studi D.3 Keperawatan Sidoarjo Jl. Pahlawan No. 173 A Sidoarjo	Catatan Perbaikan Seminar Proposal KTI Prodi D3 Keperawatan Sidoarjo Tahun Akademik : 2020/2021

NAMA MAHASISWA : Feby Jatu Puty Nur Wahyudien
NIM : P27820418041
JUDUL KTI : Literature Review efektifitas pasif Rom terhadap peningkatan kekuatan otot pada pasien stroke non-hemoragik

NO	REVISI	TANDA TANGAN PENGUJI
1	Loetfia Dwi Rahariyani, S.Kp., M.Si Saran : 1). Memperbaiki judul Proposal 2). Memperbaiki Rumusan Masalah 3). Memperbaiki Tujuan dan menambahkan kisi kisi 4). Kriteria Inklusi dan Ekslusi lebih Detail, disertakan Indikator.	
2	Kusmini S,S.Kp,M.Kep,Sp.Kep.An Saran : 1). Memperbaiki Penulisan kata pengantar nama penguji 2). Latar belakang ditambahi spesifik 3). Penulisan Karya Tulis Ilmiah diganti Proposal 4). Daftar Pustaka diurutkan 5). Jurnal ke 4 diganti	

Mengetahui
Pebimbing Utama KTI

Dr. Yessy Dessy Arna, M.Kep., Sp.Kom
NIP. 197612042001122001

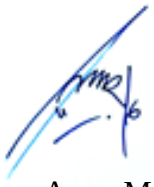
Lampiran 6. Lembar Perbaikan Seminar Hasil KTI

Politeknik Kesehatan Kemenkes Surabaya Program Studi D.3 Keperawatan Sidoarjo Jl. Pahlawan No. 173 A Sidoarjo	Catatan Perbaikan Seminar Hasil KTI Prodi D3 Keperawatan Sidoarjo Tahun Akademik : 2020/2021

NAMA MAHASISWA : Feby Jatu Puty Nur Wahyudien
NIM : P27820418041
JUDUL KTI : Literature Review efektifitas pasif Rom terhadap peningkatan kekuatan otot pada pasien stroke non-hemoragik

NO	REVISI	TANDA TANGAN PENGUJI
1	Loetfia Dwi Rahariyani, S.Kp., M.Si Saran : 1). Yang landscape diganti ke portrait 2). NIP yng salah diganti, tanggal disesuaikan 3). Tambahkan bagan hasil analisis 4). Latar belakang abstrak diperbaiki 5). Pembahasan ditambahi	
2	Kusmini S,S.Kp,M.Kep,Sp.Kep.An Saran : 1). Hasil pembahasan ditambahi teori dan opini 2). Jurnal yang tidak setuju dijelaskan kenapa 3). Tabel dijelaskan dan ditambahkan bagan 4). Abstraksi dibenarkan	

Mengetahui
Pebimbing Utama KTI



Dr. Yessy Dessy Arna, M.Kep., Sp.Kom
NIP. 197612042001122001

Lampiran 7. Jurnal 1

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Original Article

The Effect of Early Passive Range of Motion Exercise on Motor Function of People with Stroke: a Randomized Controlled Trial

Zahra-Sadat Hosseini[1], Hamid Peyrovi[2*], Mahmoodreza Gohari[3]

[1]Emergency Intensive care of neurosurgery, Poursina Hospital, Guilan University of Medical Sciences, Rasht, Iran
[2]Nursing Care Research Centre, School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran
[3]Department of Statistics, School of Health, Iran University of Medical Sciences, Tehran, Iran

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*Corresponding Author:
PhD in Nursing, Email: peyrovi . h@iums.ac.ir

ABSTRACT

Introduction: Frequent and regular exercises in the first six months of stroke may cause return of a significant portion of sensory and motor function of patients. This study aimed to examine the effects of passive range of motion exercise in the acute phase after stroke on motor function of the patients.

Methods: A randomized controlled trial study was conducted. The patients with first ischemic stroke were randomly allocated to either experimental (n=33) or control (n=19) group. Passive range of motion exercises was performed in the experimental group during the first 48 hours of admission as 6 to 8 times of 30 minute exercise. Before intervention, and one and three months after intervention, motor function were measured by muscle strength grading scale (Oxford scale) and compared. SPSS version 13.0 for Windows was used for statistical analysis. Frequency distribution was used to describe the data. For comparisons, paired t-test, independent t-test was used, and repeated measures test was used.

Results: In acute phase, the intervention in the experimental group led to significant improvement of motor function between the first and third month in both the upper and lower extremities. In control group, improvement was observed only in the muscle strength of upper extremity in the first and third month compared to pre-intervention measurement. The greatest improvement was observed in the interval from base to one month in the upper extremity, and base to the first month and the first to the third month in the lower extremity.

Conclusion: It is recommended to use early passive range of motion exercise as part of care for people with stroke during the acute phase of the disease.

Citation: Hosseini ZS, Peyrovi H, Gohari MR. The effect of early passive range of motion exercise on motor function of people with stroke: a randomized controlled trial. J Caring Sci 2019; 8 (1), 39-44. doi:10.15171/jcs.2019.006

Introduction

Cerebrovascular disease is the second leading cause of death and the third most common cause of disability in the world.[1] In developed countries, one out of four men over 85 years of age, and one out of every five women over 85 experience the stroke.[2] The annual incidence of stroke in the United States is equivalent to 700,000, with the prevalence of 5.5 million.[3] The results of a study in Iran showed that 139 out of 100,000 people annually suffer from stroke, which is a significant rate compared to that of the Western countries. Based on the results of this study, the incidence of stroke in the age group 45 to 84 years is higher compared to Western countries.[4] The occurrence of motor defects in upper and lower extremities following stroke and damage to the motor cortex is common. Hemiparesis, paralysis, weakness, abnormal muscle tone, spasm, abnormal postures, abnormal function of synergic muscles, and loss of interjoint coordination are the most common injuries due to damage to the motor cortex.[5] Out of eighty percent of patients who experience acute upper extremity paresis after stroke, only one third reach full recovery of their function.[6,7] Those patients with longer period of disability need to be cared for by a caregiver who is most often a family member. Family member caregivers are also affected by the stroke; a negative change in caregivers' lives after taking responsibility of caring for their stroke survivors has been reported.[8] According to the theory proposed by Monakow in the twentieth century, local damage to brain tissue causes suppressed function of the motor cortex, and temporary reduction of blood flow and metabolism in the opposite hemisphere, which is called Diaschisis; recovery results from the gradual reversal of the Diaschisis process.[9] Over the past decade, numerous neuroanatomical studies in animals as well as neurophysiological studies of the nervous system and other non-invasive studies in human has provided strong evidence of cerebral cortex flexibility features. The imaging studies of the nervous system after brain injury confirms the brain's motor system restitution during the recovery period. Several functional neuroimaging studies suggest that activity within the sensorimotor network, not exclusively ipsilesional motor cortex, is most abnormal early on after a hemiparetic stroke, and that motor recovery is related to normalization of its activity.[10] It has been shown that in the chronic phase after cerebral infarction, restructuring functional circuits are working; this provides for the local expansion of cerebral activation areas and recruitment of parallel projecting cortical areas in the ipsilesional and contralesional hemispheres.[11] It has been hypothesized that the mechanism of effect of active and passive motion exercises on the nervous system is reactivation of the existing nerve connections, development of new connections, and axonal regeneration.[12] Doing a range of

motion exercises after stroke leads to changes in the sensorimotor cortex and improved motor functions in the patients.[13] Lack of attention to the rehabilitation in the acute phase after stroke has led most of the providers of rehabilitation services to focus on compensatory strategies to improve the function instead of restoration of motor control.[14] Reconstructing and organizing the cerebral cortex at an early stage of stroke and afterward is considered as a potential factor for improvement in the performance of these patients; also, the range of motion exercise after stroke leads to changes in the sensory and motor cortex and improves motor function in patients.[12] Early mobility (sitting, standing and walking) in the acute phase after a stroke, and repeating these activities until the patient's discharge can improve the patients' ability and reduce their need for further care as well as improve self-care activities.[2] According to Cramer (as cited by Hancock and Shepstone, 2011), the golden time to initiate rehabilitation program is in the early days of the onset of symptoms of stroke and the continuation of these measures for several weeks.[15] Also, the findings of the studies on therapy-induced brain plasticity in chronic stroke patients may not be generalizable to patients early on after stroke.[16]

Early passive range of motion exercises improves motor function of the people with stroke within three months after the event. The objective of this study was to examine the effect of early passive range of motion exercises on the motor function of people with stroke.

Materials and methods

An unblinded randomized controlled trial design was used, with two groups and three measurement times (before intervention, one month and three months after intervention). We randomized patients who were admitted to the emergency and neurology units in an unblinded randomized controlled trial to examine the effects of early passive range of motion exercise on motor function of people with stroke. The study population was patients over 18 years with a diagnosis of ischemic stroke, who had been referred to Poursina teaching hospital in the city of Rasht, Iran, within 6 hours after the onset of symptoms. The patients were recruited based on the inclusion criteria. The inclusion criteria included no history of previous strokes, the diagnosis of stroke (except for transient ischemic attack and hemorrhagic stroke) by a physician, experiencing the first 6 hours of onset of stroke, level of consciousness 14 to 16 based on the FOUR (Full Outline of Unresponsiveness), moderate stroke (score 5-15) according to the NIHSS (National Institute of Health Stroke Scale), age over 18 years, the absence of aphasia according to NIHSS criteria, stable vital signs, no significant fracture and orthopedic defects of the extremities, the absence of acute coronary syndrome, respiratory failure or heart failure based on hospital records, absence of life-threatening conditions, and no contraindication of mobility. The exclusion criteria included death of the patient during the intervention period, the number of passive range of motion exercises less than 6 times, exercise intolerance, patient discharge before completing 48 hours of intervention, and unstable clinical conditions.

The patients were randomly allocated to either experimental or control groups based on a randomization ratio of 1: 2 in favor of the experimental group by the main researcher. For allocation, a six-sided dice was used. The sides 1-4 were allocated to the experimental group, with the sides 5-6 allocated to control group. Each potential participant was allocated to the groups by rolling the dice. After random allocation, 45 and 25 patients were allocated to the experimental and control groups, respectively. This study was not blinded to the participants and researcher. A demographic characteristics form and muscle strength grading scale (Oxford scale) was used to collect the data. Muscle strength is graded 0 to 5. The lowest score is given to flicker of movement. The grades 2, 3, 4 and 5 concerned, respectively to through full range actively with gravity counterbalanced, through full range actively against gravity, through full range actively against some resistance and through full range actively against strong resistance.[17]

Muscle strength testing involves testing key muscles from the upper and lower extremities against the examiner's resistance and grading the patient's strength on a 0 to 5 scale accordingly: No muscle activation. 1) Trace muscle activation, such as a twitch, without achieving full range of motion. 2) Muscle activation with gravity eliminated, achieving full range of motion. 3) Muscle activation against gravity, full range of motion. 4) Muscle activation against some resistance, full range of motion. 5) Muscle activation against examiner's full resistance, full range of motion.

To ensure validity, the instruments were reviewed by 10 faculty members. In order to ensure the reliability of the muscle strength criteria, motor function of 10 patients was measured by the principal researcher and another individual and the correlation between the scores was measured (r=0.989). The study was conducted from July 2013 to January 2014 at Poursina teaching hospital affiliated to Guilan University of Medical Sciences in Rasht, Iran. Having obtained the required permission, the main researcher entered the emergency and neurology wards and explained the purpose of the study and details of the procedure to the head nurse and personnel. After written informed consents were obtained from the patients, the demographic data and basic information were extracted from the patients' hospital records. Before the intervention, and one month and three months after the intervention, the motor function of the patients in both groups was assessed and recorded, using muscle strength grading scale. To do so, the researcher moved the joints passively and examined the spasticity and muscle tone. In the experimental group, passive range of motion exercises in the involved extremities were done within the first 48 hours after stroke according to "passive range of motion exercises for the post-stroke" protocol four times a day by the main researcher who was an MSc nursing student, with each session lasting for 15-40 minutes. In case of activity intolerance and

instability in vital signs, the intervention was stopped and postponed to a later time.

In this case, the patient practice turn was not eliminated and only delayed until the patient's condition returned to stable. Therefore, the exercise interval in some patients was changed. A maximum of eight and a minimum of six were planned and executed for all patients. The reason for not applying exercise during the night time was to prevent interruptions and avoid causing sleep disorders in patients. The intensity of exercise (the number of repeats for each passive motion and the duration of each exercise session) started from average and continued with low intensity and was gradually increased, depending on the patient tolerance.

Exercise was tailored to each person's health status and in some cases, each turn was different. In the control group, only the routine therapeutic program was implemented and motor function assessment was achieved in the time intervals similar to those of the experimental group. Motor function of patients in the experimental and control groups were measured at the end of the first month after the exercises, and then three months later by the same researcher. The steps of the study are shown in Figure 1.

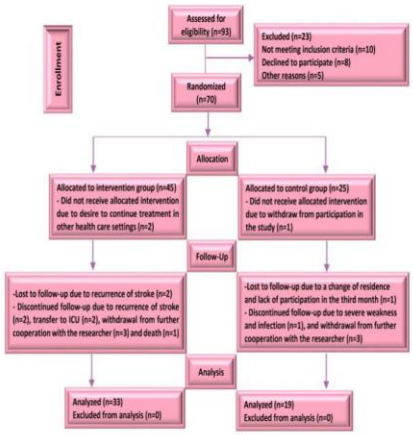

Figure 1. Flowchart of the study

The project was approved by the ethics committee of TUMS Institutional Board (647/p). The study was enrolled in Iranian Registry of Clinical Trials (IRCT) under the ID IRCT2017020213785N4. The researchers also gained the approval of the hospital under study to access patients with stroke. All participants in the study were informed of the aim of the study in detail and were assured of its confidentiality. They gave a written informed consent documenting that their participation in the study is voluntary, and that they would have right to withdraw from the study whenever they wanted. The researchers avoided coercion, undue influence, and unjustifiable pressures. The SPSS version 13 was used.

Analytical and descriptive statistics were used to analyses the data. Frequency distribution was used to describe the data. To compare motor function between the experimental and control groups, independent t-test was used. In addition, the repeated measures test was used to determine the effectiveness of the intervention over time. An alpha of 0.05 was used as the cut-off for significance.

Results

The study was conducted at Poursina teaching hospital affiliated to Guilan University of Medical Sciences in Rasht, Iran, from July 2013 to January 2014. After being informed of the study's aim, along with other relevant details, 70 patients agreed to participate in the study. Of all the patients in the study, 18 cases were excluded from the study due to the following reasons: withdrawal from further cooperation with the researcher (n=7), recurrence of stroke that affected limbs and made comparison impossible (n=2), withdrawal from the study to continue treatment in other health care settings (n=4), decreased level of consciousness and transfer to ICU (n=2), death following cardiac arrest (n=1), exclusion due to a change of residence and lack of participation in the third month (n=1), and hospitalization for severe weakness and infection (n=1). In the end, 33 patients in the experimental group and 19 patients in the control group terminated the study. Table 1 shows the characteristics of the patients in the two groups, and the result of the chi-square test for evaluating group comparability. The groups were homogeneous in terms of demographic variables.

Table 1. Frequency distribution of demographic characteristics of the experimental and control groups

Variable	Group		P
	Control (n=19) N (%)	Experimental (n=33) N (%)	
Gender			0.77*
Male	9 (47.4)	17 (51.5)	
Female	10 (52.6)	16 (48.5)	
Age			0.38**
30-60	5 (26.3)	13 (39.4)	
61-90	14 (73.7)	20 (60.6)	
History of hypertension			0.27*
Yes	11 (57.9)	24 (72.7)	
No	8 (42.8)	9 (27.3)	
History of diabetes			0.62*
Yes	7 (36.8)	10(30.3)	
No	12 (63.2)	23 (69.7)	
History of hyperlipidemia			0.19*
Yes	5 (26.3)	4 (12.1)	
No	14 (73.7)	29 (87.9)	
History of ischemic heart disease			0.46*
Yes	3 (15.8)	3(9.1)	
No	16 (84.2)	16 (90.9)	
History of acute coronary syndrome			0.44*
Yes	0 (0.0)	1 (3.0)	
No	19 (100.0)	32 (97.0)	
Side of disability			0.38*
Right	8(57.9)	15(45.5)	
Left	11(42.1)	18(54.5)	

*Chi-square test,**Fisher exact test

Table 2 depicts the motor function of upper and lower extremities in the experimental and control groups. One and three months after the intervention, the mean scores for motor function of the upper and lower extremities in the experimental group was higher than that of the control group, but the difference was not statistically significant. Therefore, we examined if the changes in motor function of the groups are different. A comparison of the groups in terms of changes in the motor function during the first month after the intervention showed that the upper extremity muscle strength in the experimental group improved more than that in the control group 1.09 (0.84) vs. 0.58 (0.90), P=0.045 (Table 3). Also, for lower extremity, the muscle strength in the experimental group improved more than that in the control group during the first month after the intervention 0.76 (0.71) vs. 0.00 (1.11), (P=0.004). As shown in table 3, changes in motor function of both upper and lower extremities were not statistically significant between the experimental and control groups three months after the intervention and within the time period of the first and third month after the intervention. Our findings seem to suggest that the intervention in the acute phase after stroke improved motor function in both upper and lower extremities, one month after intervention. It is important to note that, we found a statistically significant improvement, through within-group comparisons, in the upper extremity motor function of the control group, one month (P= 0.012) and three months after the intervention (P=0.004) relative to the basement measurement. This finding shows that part of the improvement in the motor function of the experimental group might well be attributed to time rather than the intervention (Figure 2 and 3).

Table 2. Comparison of the mean upper and lower extremity motor function between the experimental and control group during time

Motor function	Group		P*
	Control (n=19) Mean (SD)	Experimental (n=33) Mean (SD)	
Baseline of upper extremity motor strength	2.47 (1.31)	2.36 (1.58)	0.79
Baseline of lower extremity motor strength	2.53 (1.39)	2.64 (1.30)	0.77
Upper extremity motor strength in the first month	3.05 (1.72)	3.45 (1.54)	0.38
Upper extremity motor strength in the third month	3.11 (1.49)	3.39 (1.56)	0.51
Lower extremity motor strength in the first month	2.53 (1.84)	3.39 (1.50)	0.70
Lower extremity motor strength in the third month	2.84 (1.66)	3.21 (1.58)	0.42

*Independent t-test

Table 3. Comparison of the mean change of upper and lower extremity motor function in experimental and control group

Motor function	Group		P*
	Control (n=19) Mean (SD)	Experimental (n=33) Mean(SD)	
Baseline and first month upper extremity motor strength	0.58 (0.91)	1.09 (0.84)	0.04
Baseline and third month upper extremity motor strength	0.63 (0.83)	1.03 (0.68)	0.06
First and third month upper extremity motor strength	0.63 (0.62)	1.03 (0.68)	0.06
Baseline and first month lower extremity motor strength	0.00 (1.11)	0.75 (0.71)	0.004
Baseline and third month lower extremity motor strength	0.32 (1.20)	0.58 (0.80)	0.32
First and third month upper extremity motor strength	0.32 (0.67)	-1.18 (0.64)	0.01

*Independent t-test

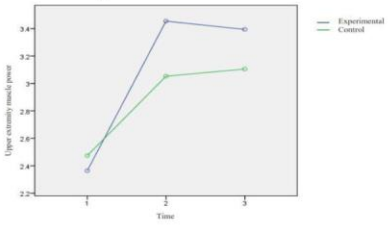

Figure 2. Comparison of the effect of time on upper extremity motor power improvement in experimental and control group

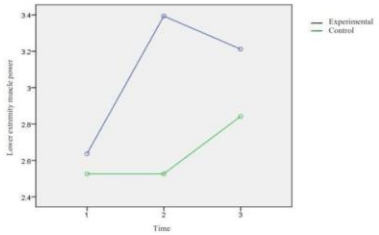

Figure 3. Comparison of the effect of time on lower extremity motor power improvement in experimental and control group

Discussion

In the experimental group, improvement in muscle strength score in the first and third months were observed in both upper and lower extremities in comparison with the baseline measurement. The greatest improvement in the experimental group occurred in the first month relative to the baseline measurement in the upper extremity. Although in the first and third months after the intervention, the mean score of motor function in the experimental group was higher than that of the control group, the difference was not statistically significant. It seems that the improved muscle function is affected by the continuation of the rehabilitation programs along with the mechanisms of spontaneous recovery. Based on the findings, in the control group, the improved muscle strength in the first and the third month after baseline measurement was observed only in the upper extremities. Not surprisingly, the slight improvement in muscle strength score was mostly affected by the spontaneous mechanism and most patients suffered from significant muscle weaknesses until the third month. In the experimental group, the highest change was related to the muscle strength of the upper extremity one month after the intervention, and that of the lower extremity, three months after the intervention. The highest change observed in the control group was related to the muscle strength of upper and lower extremities three months after the intervention.

Most of the patients in the control group experienced improvements in a longer period (three months) compared to the experimental group. On the basis of the results, it seems that passive exercise in the acute phase after stroke according to the protocol implemented in this study was not considered as a powerful and decisive factor in improving motor function in the experimental group. In a study by Tsai and Yeh, who investigated the effect of long stretch on the status of muscle spasticity at a medical session, a modified version of Ashworth scale was employed to measure the dependent variable. This study focused on the ankle range of motion in dorsal flexion status before, immediately after, and 45 minutes following the intervention, and the intervention was reported to have been effective in improving the range of motion of the ankle.[18] In the study by Lum and et al., based on the Fugl Meyer test, the greatest improvement was observed in the proximal movements of upper extremities of the subjects treated by motor exercise applied by the robot in the first month. In the second month, the group under intervention had a better muscle strength compared with the control group. After six months, the groups did not differ in terms of Fugl Meyer examination, but the experimental group showed more improvements in terms of Functional Independence Measure score.[19] Another study showed that there was no difference between the control group and the group treated by constraint-induced movement in terms of Action Research Arm Test (ARAT) score in the acute phase in patients with stroke, and that the arm function improved within 90 days in both groups. According to this study, Constraint-Induced Movement showed more limited benefits based on ARAT assessment of base to 90 days after treatment as compared to the treatment group with the standard dose in patients with stroke.[20]

Hankey investigated the motor function in patients with stroke through repetitive task specific training, and reported no improvements in hand and arm function and maintaining balance while sitting.[21,22] In a study conducted by Hejazi, with the aim of examining the effect of sensory retraining (fine touch in the finger tips) on the hemiplegic upper extremities in 5 patients with chronic stroke, Fugl Meyer test score changed from 3.31 to 5.67 in the sixth week. Also, upper extremity motor defects and manual skills of patients improved (based on motoricity Index test and box and block test, respectively).[23]

Beebe and Lang studied the effect of active range of motion exercise on predicting the movement function after three months on patients with stroke and found that active range of motion in the first month is highly related with the upper extremity function in the third month. The results confirmed the significant positive effect of time on active range of motion of upper extremity in the first and third month.[6] In a study conducted by Bovolenta, the effect of robot-aided therapy in patients with stroke between T_0 (immediately before treatment) and T_1 (immediately after treatment), improved the upper extremity function. During the first month after stroke, the highest improvement occurs in motor function; and thereafter, through gradually reducing stimulation, continued improvement in motor function of patients is probably due to spontaneous mechanisms of recovery over time. In the present study, after passing through the acute phase, the patients received less or irregular rehabilitation programs. Regular rehabilitation programs along with spontaneous mechanisms of recovery during the first three months after the stroke are significantly effective in improving motor function of patients.[24]

Conclusion

The use of passive exercises not only prevents the local complications, but also improves motor function after stroke. In the present study, both groups experienced improvements in the upper and lower muscle strength during the first month. At first glance, it seems that the intervention in the experimental group in the acute phase after stroke was ineffective in improving motor function of this group and both groups had the same behavior in terms of improved muscle strength. However, the changes in motor function score confirmed the effectiveness of the intervention in the intervals from baseline measurement to the first month in both upper and lower extremities, and from the first to the third month in the lower extremities. In other words, despite the improved motor function in both groups, changes in motor function were more significant in the experimental group due to the effect of intervention.

This study had limitations. After discharge, the patients may have participated in physiotherapy sessions, which might have influenced the results of the study. The researchers recorded these events in both

groups and no statistically significant difference was found between the groups in terms of participating in physiotherapy sessions after discharge.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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Lampiran 8. Jurnal 2

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Pengaruh Latihan *Range Of Motion* (ROM) Pasif Terhadap Peningkatan Kekuatan Otot Pada Pasien Stroke Non Hemoragik Di Ruang Rawat Inap Di RSUD Kota Tangerang

Endah Sri Rahayu[1], Nuraini Nuraini[2]

[1] Mahasiswa Prodi Ners FIKes, Universitas Muhammadiyah Tangerang
[2]Dosen Prodi Sarjana Keperawatan FIKes, Universitas Muhammadiyah Tangerang

Email: anney.passolong@gmail.com

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Abstrak

Stroke merupakan salah satu masalah kesehatan yang cukup serius dalam kehidupan modern saat ini. Menuru World Health Organization (WHO) menjelaskan bahwa stroke merupakan penyebab kematian utama secara global. Diperkirakan 17.7 juta orang meninggal karena stroke pada tahun 2015 mewakili 31% dari semua kematian global. Penelitian ini bertujuan untuk mengetahui Pengaruh Latihan Range Of Motion (Rom) Pasif Terhadap Peningkatkan Kekuatan Otot Pada Pasien Stroke Non Hemoragik Di Ruang Rawat Inap Di RSUD Kota Tangerang. Desain penelitian quasi eksperimen dengan jumlah sampel 14 orang. Analisa data univariat dan bivariat dengan menggunakan uji Wilcoxon. Sampel diukur dengan dengan menggunakan Lembar Observasi sebelum dan sesudah Latihan Range Of Motion (ROM). Latihan Range Of Motion ini dilakukan selama 1 minggu dalam 7 hari dilakukan 2 kali latihan pagi dan sore selama 15 menit. Berdasarkan uji Paried Test terdapat pengaruh Latihan Range Of Motion (ROM) Pasif terhadap peningkatan kekuatan otot pada pasien stroke non hemoragik dengan didapatkan p value = 0.01< α 0,05. Hal ini membuktikan bahwa ROM pasif berpengaruh dalam meningkatkan kekuatan otot responden. Peneliti menyarankan bagi Rumah Sakit sebaiknya menetapkan standard operasional prosedur untuk penanganan khusus menggunakan ROM Pasif agar hasil yang diperoleh dapat maksimal dan seragam untuk semua masalah kekuatan otot.

Kata Kunci: *Stroke; non hemoragik; ROM Pasif; Kekuatan Otot*

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Effect of Passive Range Of Motion (ROM) Exercise on Increased Muscle Strength in Non-Haemorrhagic Stroke Patients in Inpatient Rooms at RSUD Kota Tangerang

Abstract

Stroke is one of the serious health problems in modern life today. According to the World Health Organization (WHO) explained that stroke is the leading cause of death globally. An estimated 17.7 million people die of strokes in 2015 representing 31% of all global deaths. This study aims to determine the effect of Passive Range of Motion (Rom) Exercise on Increasing Muscle Strength in Non-Hemorrhagic Stroke Patients in the Inpatient Room at Rsud Kota Tangerang. Quasi-experimental research design with a sample of 14 people. Univariate and bivariate data analysis using the Wilcoxon test. Samples are measured using Observation Sheets before and after Range Of Motion (ROM) Exercises. This Range Of Motion exercise is carried out for 1 week in 7 days, done 2 times in the morning and afternoon for 15 minutes. Based on the Paried Test, it was found that there was an effect of Passive Range Of Motion (ROM) Exercise on increasing muscle strength in non-hemorrhagic stroke patients with p value = 0,01 <α 0,05. This proves that passive ROM has an effect on increasing the muscle strength of the respondent. Hospitals should set standard operating procedures for special handling using Passive ROM so that the results obtained can be maximal and uniform for all the problems of the word muscle strength.

Keywords: *Non-hemorrhagic ; stroke ;Passive ROM ; Muscle Strength*

PENDAHULUAN

Stroke adalah gangguan fungsi system saraf yang terjadi mendadak dan disebabkan oleh gangguan peredaran darah otak. Gangguan peredaran darah otak dapat berupa tersumbatnya pembuluh darah otak atau pecahnya pembuluh darah di otak. Otak yang seharusnya mendapat pasokan oksigen dan zat makanan menjadi terganggu. Kekurangan pasokan oksigen keotak akan memunculkan kematian selsaraf. Gangguan fungsi otak ini akan memunculkan gejala stroke (Pinzon, 2010).

World Health Organization (WHO) menjelaskan bahwa stroke merupakan penyebab kematian utama secara global. Diperkirakan 17.7 juta orang meninggal karena stroke pada tahun 2015 mewakili 31% dari semua kematian global. Lebih dari tiga perempat kematian akibat stroke terjadi di Negara dengan penghasilan rendah dan menengah (WHO, 2015 dalam Nugroho; 2018)

Berdasarkan hasil Riset Kesehatan Dasar (Riskesdas) tahun 2018, prevalensi penyakit stroke di Indonesia semakin meningkat disetiap tahunnya. Prevalensi kasus stroke di Indonesia sudah mencapai 10,9% per mil, dibandingkan pada tahun 2013 angka kejadian stroke di Indonesia mencapai 7,0%. Kasus stroke tertinggi yang terdiagnosis tenaga kesehatan adalah usia 75 tahun keatas yaitu 50,2 % dan terendah pada kelompok usia > 55 tahun yaitu sebesar 32,4 %. Prevalensi stroke berdasarkan jenis kelamin lebih banyak pada laki-laki 11,0 % dibandingkan dengan perempuan 10,9% (Riskesdas, 2018).

Berdasarkan data yang didapat dari Riskesdas tahun 2013, prevalensi penyakit stroke di Banten meningkat sebanyak 5,1 % per mil. Pada Kasus stroke paling tinggi berdasarkan umur pada usia >75 tahun yaitu sebanyak 43,1 %. Kasus ini sering terjadi pada laki-laki di bandingkan dengan perempuanyaitu 7,1 %. (Riskesdas, 2013).

Stroke merupakan penyakit neurologis yang dapat menyebabkan hilangnya kemampuan fungsi mototrik pada penderitanya. Serangan stroke mengakibatkan kemampuan motorik pasien mengalami kelemahan atau hemiparesis (Nasir, 2017 dalam Santoso 2018).

Salah satu dampak yang terjadi pada pasien stroke adalah mengalami kelemahan di salah satu sisi tubuh yang terpengaruh stroke. Kelemahan ini bisa

menimbulkan ketidak seimbangan dan kesulitan pada saat berjalan karena gangguan pada kekuatan otot, keseimbangan dan koordinasi gerak (Irdawati, 2008 dalam Sukmaningrum 2012).

BAHAN DAN METODE

Penelitian ini menggunakan penelitian *desain kuantitatif* dengan *metode quasi eksperimen*. Dan menggunakan rancangan *pre-post test group control*, pada penelitian ini peneliti melakukan latihan *ROM* pada suatu kelompok tanpa pembanding. Efektifitas perlakuan dinilai dengan cara membandingkan nilai *pre* dan *post test* di RSUD Kota Tangerang yang di identifikasi pada satu satuan waktu. Waktu Penelitian ini dimulai dari bulan Mei sampai bulan Juli 2019. Sampel yang di ambil saat penelitian sebagian dari populasi pasien yang di rawat di RSUD Kota Tangerang ada sebanyak 14 pasien.

Data yang digunakan pada penelitian ini adalah data primer yang di peroleh dari MRI RSUD Kota Tangerang dan data sekunder yang langsung diperoleh oleh peneliti ketika penelitian berlangsung. Instrumen yang digunakan dalam penelitian ini adalah Alat ukur derajat kekuatan otot dan Lembar observasi*table checklist.*

Metode analisis yang digunakan adalah univariat dan bivariat. Hasil analisa data akan dimulai dari analisa univariat yang meliputi umur, pendidikan dan mengidentifikasi kekuatan otot sebelum dan sesudah dilakukan latihan *Range Of Motion* (ROM). Sedangkan analisa bivariate menggunakan uji Non Parametrik dengan *Wilcoxon Match Pair Test* yaitu mengidentifikasi adakah pengaruh latihan *Range Of Motion* (ROM) pasif terhadap peningkatan kekuatan otot pada pasien stroke non hemoragik di ruang rawat inap di RSUD Kota Tangerang.

HASIL DAN BAHASAN

Pada analisis univariat mengambarkan frekuensi karakteristik responden yang meliputi umur, pendidikan. Sampel terdiri dari 14 responden stroke non hemoragik di ruang rawat inap di RSUD Kota Tangerang.

Tabel 1
Distribusi Frekuensi Responden Berdasarkan Umur di ruang rawat inap di RSU Kota Tangerang (n=14)

No	Umur	Jumlah	Presentase (%)
1	Dewasa akhir (36-45 tahun)	5	35,7
2	Lansia awal (46-55 tahun)	9	64,3
	Total	14	100.0

Hasil dari Penelitian ini menunjukkan bahwa Usia responden yang mengalami stroke non hemoragik berusia 46-55 tahun yaitu sebanyak 9 responden (64,3%). Menurut Brunner & Suddarth (2016) menjelaskan bahwa pada penderita stroke non hemoragik sering terjadi pada usia 36-45 tahun, 45-55 tahun dan > 55 tahun. Hal ini sesuai dengan penelitian yang dilakukan oleh Claudia et al (2013), menyatakan bahwa dari hasil penelitian responden yang mengalami kasus stroke non hemoragik paling banyak pada katagori umur < 40 tahun (13.3%), 41 – 60 tahun (46.7%), >60 tahun (40.0%). Resiko terkena stroke meningkat sejakusia 45 tahun. Setelah mencapai usia 50 tahun, setiap penambahan usia tiga tahun meningkat. Penelitian yang dilakukan Zainuddin (2014), Hasil penelitian menunjukkan bahwa jumlah kasus stroke non hemoragik tertinggi pada kelompok usia usia dibawah 45 tahun cukup banyak yaitu 11,8%, pada usia usia 45-64 tahun berjumlah 54,2%.

Tabel 2
Distribusi Frekuensi Responden Berdasarkan Pendidikan Terakhir di ruang rawat inap di RSUD Kota Tangerang (n=14)

No	Pendidikan	Jumlah	Presentase (%)
1	SD	2	14,3
3	SMP	2	14,3
4	SMA	7	50,0
5	Perguruan Tinggi	3	21,4

Hasil dari Penelitian ini menunjukkan bahwa tingkat pendidikan responden yang mengalami stroke non hemoragik sebagian besar dengan pendidikan terakir yaitu di tingkat SMA sebanyak 7 orang responden (50%).

Pada penelitian ini belum menjumpai jurnal atau literature mengenai faktor resiko yang mempunyai hubungan pendidikan dengan kejadian stroke non hemoragik, tetapi rendahnya pendidikan bisa dikaitkan dengan tingkat pengetahuan mengenai stroke non hemoragik.

Pada analisis bivariat digunakan untuk menganalisa pengaruh latihan *Range Of Motion* (ROM) pasif terhadap penigkatan kekuatan pada otot pada pasien stroke non hemoragik. Uji bivariat ini menggunakan *Wilcoxon Match Pair Test* dan dikatakan berpengaruh apabila p value <0,05.

Tabel 3

Distribusi Frekuensi Kekuatan Otot Pre Test dan Post Test Latihan *Range Of Motion* (ROM) di ruang rawat inap di RSUD Kota Tangerang (n=14)

Kekuatan otot	Sebelum intervensi		Sesudah intervensi	
	Jumlah	%	Jumlah	%
Derajat 0	0	0	0	0
Derajat 1	0	0	0	0
Derajat 2	2	14,3	1	7,1
Derajat 3	8	57,1	6	42,9
Derajat 4	4	28,6	7	50,0
Derajat 5	0	0	0	0
Jumlah	14	100,0	14	100,0

Tabel 4

Hasil Uji Statistik Wilcoxon Match Pair Test

Test Statistik	Kekuatan Otot Post Test-Kekuatan Otot Pre Test
Z	-0,232
Asymp. Sig. (2-tailed)	0,01

Pada pengujian statistik menggunakan uji Non Parametrik *Wilcoxon Match Pair Test* diperoleh Asmp. Sig. (2-tailed) sebesar 0,01(nilai p value). Untuk menentukan hipotesis diterima atau ditolak dengan membandingkan nilai taraf signifikan p value dengan taraf kesalahan 5% (0,05) jika p value lebih besar dari 0,05 maka hipotesis ditolak dan jika p value lebih kecil dari 0,05 maka hipotesis

diterima. Hasil perhitungan didapatkan nilai p value sebesar 0,01<0,05 yang berarti Ha ada Pengaruh Latihan *Range Of Motion* (ROM) Pasif Terhadap Peningkatkan Kekuatan Otot Pada Pasien Stroke Non Hemoragik Di Ruang Rawat Inap Di RSUD Kota Tangerang tahun 2019.

Penelitian ini menunjukkan bahwa responden yang memiliki kekuatan otot derajat 2 sebelum intervensi sebanyak 2 responden (14,3%), responden yang memiliki kekuatan otot derajat 3 sebanyak 8 responden (57,1%) dan responden yang memiliki kekuatan otot 4 sebanyak 4 responden (28,6%), bahwa responden yang memiliki kekuatan otot derajat 2 sebelum intervensi sebanyak 1 responden (7,1%), responden yang memiliki kekuatan otot derajat 3 sebanyak 6 responden (42,9%) dan responden yang memiliki kekuatan otot 4 sebanyak 7 responden (50%). Berdasarkan dari hasil penelitian bahwa terdapat Pengaruh Latihan *Range Of Motion* (ROM) Pasif Terhadap Peningkatan Kekuatan Otot Pada Pasien Stroke Non Hemoragik.

Hasil penelitian hampir sama dengaan penelitian yang dilakukan oleh Zainuddin (2014) mengenai "Pengaruh Latihan (Rom) Pasif Terhadap Kekuatan Otot Ekstremitas Pada Pasien Stroke Di Ruang Ra4 Rsup H. Adam Malik Medan Tahun 2014", Berdasarkan tingkat kekuatan otot sebelum dilakukan latihan Range of Motion (ROM) pasif, responden dengan tingkat kekuatan otot 1 sebanyak 8 responden (67%) dan tingkat kekuatan otot 2 sebanyak 4 responden (33%). Berdasarkan tingkat kekuatan otot sesudah dilakukan latihan Range of Motion (ROM) pasif, responden dengan tingkat kekuatan otot 1 sebanyak 2 responden (17%), tingkat kekuatan otot 2 sebanyak 3 responden (25%) dan tingkat kekuatan otot 3 sebanyak 7 responden (58%).

Hasil penelitian yang dilakukan Zainuddim (2014) membuktikan bahwa berdasarkan dari hasil uji statistic yang dilakukan baik memakai uji non parametric ataupun uji parametrik mempunyai perhitungan hasil yang sama yaitu adanya pengaruh latihan *Range Of Motion* (ROM) pasif terhadap peningkatan kekuatan otot pada pasien stroke non hemoragik.

Penderita stroke yang mengalami kelemahan otot dan tidak segera mendapatkan penanganan yang tepat dapat menimbulkan komplikasi, salah satunyaadalah kontraktur. Kontraktur menyebabkan terjadinya gangguan

fungsional, gangguan mobilisasi, gangguan aktivitas sehari-hari dan cacat yang tidak dapat disembuhkan (Asmadi, 2008).

Penderita stroke dapat mengalami kesulitan saat berjalan karena gangguan pada kekuatan otot, keseimbangan dan koordinasi gerak, sehingga kesulitan dalam melakukan aktivitas sehari-hari. Latihan gerak mempercepat penyembuhan pasien stroke, karena akan mempengaruhi sensasi gerak di otak (Irdawati, 2008).

Menurut pendapat Smeltzer & Bare (2009), bahwa regulitas dalam latihan bagi pasien stroke merupakan hal yang paling penting karena perbaikan kekuatan otot dan pemeliharaan rentang gerak dapat dicapai hanya melalui latihan harian.Menurut Guyton (2007), mekanisme kontraksi dapat meningkatkan otot polos pada ekstremitas. Latihan ROM pasif dapat menimbulkan rangsangan sehingga meningkatkan aktivasi dari kimiawi neuromuskuler dan muskuler.

Kekuatan otot merupakan kemampuan otot untuk menghasilkan tegangan dan tenaga selama usaha maksimal baik secara dinamis statis atau kemampuan maksimal otot untuk berkontraksi (Trisnowiyanto, 2012). Kekuatan otot sangat berhubungan dengan sistem neuromuskuler yaitu seberapa besar kemampuan sistem saraf mengaktifasi otot untuk melakukan kontraksi. Dengan demikian semakin banyak serabut otot teraktivasi, maka semakin besar pula kekuatan yang di hasilkan oleh otot tersebut (Irfan, 2010).

SIMPULAN DAN SARAN

Berdasarkan hasil penelitian dan analisa dengan menggunakan *metode quasi eksperimen* tentang Pengaruh Latihan *Range Of Motion* (ROM) Pasif Terhadap Peningkatan Kekuatan Otot Pada Pasien Stroke Non Hemoragik Di Ruang Rawat Inap Di RSUD Kota Tangerang maka diperoleh kesimpulan bahwa dari hasil penelitian diperoleh bahwa sebagian besar responden sebelum diberikan intervensi mengalami kekuatan otot derajat 2 yaitu sebanyak 2 responden (14,3%), responden yang mengalami kekuatan otot derajat 3 sebanyak 8 responden (57,1%) dan responden yang mengalami kekuatan otot derajat 4 yaitu sebanyak 4 responden (28,6%). setelah diberikan intervensi menjadi kekuatan otot derajat 2 sebanyak 1 responden (7,1%), yang mengalami kekuatan otot 3 sebanyak 6 (42,9%) dan responden yang memiliki kekuatan otot derajat 4 sebanyak 7 responden (50%).

Terdapat pengaruh latihan Range Of Motion (ROM) Pasif terhadap peningkatan kekuatan otot pada pasien stroke non hemoragik dibuktikan dengan hasil uji Non Parametrik Wilcoxon Match Pair Test nilai P value = 0,01 dengan nilai kepercayaan< 0,05.

Saran

Berdasarkan hasil dan pembahasan serta kesimpulan yang dibuat, maka terdapat saran yang dapat peneliti berikan sebagai berikut:

Hasil uji analisis diatas, menunjukan adanya pengaruh latihan *Range Of Motion* (ROM) terhadap kekuatan otot pada pasien stroke non hemoragik yang dirasakan pasien setelah diberikan pelatihan ROM di ruang rawatinap di RSUD Kota Tangerang. Maka diharapkan bagi intitusi Rumah Sakit agar dapat memberikan edukasi terkait dengan latihan ROM kepada pasien stroke non hemoragik agar pasien juga dapat mengurangi rasa kaku pada otot-ototnya.

Pada institusi Pendidikan, hasil penelitian ini diharapkan dapat memberikan masukan atau konstribusi sebagai bahan informasi untuk sumber ilmu pengetahuan khususnya ilmu keperawatan medical bedah, sehingga mampu meningkatkan kualitas dan kuantitas keperawatan di masa yang akan datang. peneliti selanjutnya diharapkan peneliti lain dapat menggali secara lebih luas baik secara kualitatif dan kuantitatif mengenai pengaruh latihan R*ange Of Motion* (ROM) Pasif terhadap peningkatan kekuatan otot pada pasien stroke non hemoragik diruang rawat inap di RSUD Kota Tangerang.

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ARTIKEL PENELITIAN

Penerapan Latihan *Range of Motion* (ROM) Pasif terhadap Peningkatan Kekuatan Otot Ekstremitas pada Pasien dengan Kasus Stroke

Application of Passive Range of Motion (ROM) Exercises to Increase the Strength of the Limb Muscles in Patients with Stroke Cases

Agusrianto[1], Nirva Rantesigi[2*]
[1,2] Prodi Keperawatan Poso Poltekkes Kemenkes Palu

Abstract

Stroke is a condition that occurs when the blood supply to the brain is interrupted due to blockage or rupture of brain blood vessels with symptoms such as hemipareseis, slurred speech, difficulty walking, loss of balance and decreased muscle strength. The aim of knowing the application of passive Range of motion (ROM) exercises in non-hemorrhagic stroke patients with limb paralysis. This research method used a descriptive method with a case study approach in which one stroke patient was given passive ROM exercises. The results showed that data on decreased consciousness, BP 170/120 mm / Hg and decreased limb muscle strength. Nursing diagnosis of physical mobility impairment, the nursing intervention given was passive ROM exercises twice a day aimed at increasing muscle strength. Evaluation after six days of intervention, the patient could move his hands and feet. In the upper/ lower right limb from scale 2 to scale 3 and the upper / lower left limb from 0 to 1. The conclusion after being given passive ROM exercises, stroke patients experienced increased muscle strength in both extremities.

Keywords: *stroke, passive ROM, nursing care*

Abstrak

Stroke adalah suatu kondisi yang terjadi ketika pasokan darah ke otak terganggu karena sumbatan atau pecahnya pembuluh darah otak dengan gejala seperti hemiparesis, bicara pelo, kesulitan berjalan, kehilangan keseimbangan dan kekuatan otot menurun. Tujuan penelitian ini untuk mengetahui penerapan latihan *Range of Motion* (ROM) pasif pada pasien non haemoragik stroke dengan kelumpuhan ekstremitas. Metode penelitian ini menggunakan metode deskriptif dengan pendekatan studi kasus yaitu 1 orang pasien non hemoragik stroke dan diberi latihan ROM pasif. Hasil penelitian didapatkan data penurunan kesadaran, TD 170/120 mm/Hg dan kekuatan otot ekstremitas menurun. Diagnosa keperawatan hambatan mobilitas fisik, intervensi keperawatan yang diberikan adalah latihan ROM pasif dua kali sehari bertujuan dapat meningkatkan kekuatan otot. Evaluasi setelah enam hari pemberian intervensi pasien dapat menggerakkan tangan dan kakinya. Pada ektremitas kanan atas/bawah dari semula skala 2 menjadi skala 3 dan ektremitas kiri atas/bawah dari semula skala 0 menjadi skala 1. Kesimpulan sesudah diberikan latihan ROM pasif pasien stroke mengalami peningkatan kekuatan otot pada kedua ekstremitas.

Kata Kunci: stroke, ROM pasif, asuhan keperawatan

*Korespondensi:
Nirva Rantesigi, email: nirvarantesigi@gmail.com

PENDAHULUAN

Stroke merupakan penyebab kedua kematian dan penyebab keenam yang paling umum dari kecacatan. Sekitar 15 juta orang menderita stroke yang pertama kali setiap tahun, dengan sepertiga dari kasus ini atau sekitar 6,6 juta mengakibatkan kematian (3,5 juta perempuan dan 3,1 juta laki-laki). Stroke adalah manifestasi klinis dari gangguan fungsi otak baik vokal maupun global (menyeluruh), yang berlangsung capat, berlangsung lebih dari 24 jam atau sampai menyebabkan kematian, tanpa penyebab lain selain gangguan vaskular dengan gejala klinis yang kompleks (Marlina, 2017).

Masalah yang sering muncul pada pasien stroke adalah gangguan gerak, pasien mengalami gangguan atau kesulitan saat berjalan karena mengalami gangguan pada kekuatan otot dan keseimbangan tubuh atau bisa dikatakan dengan imobilisasi (Rahayu, 2015). Imobilisasi merupakan suatu gangguan gerak dimana pasien mengalami ketidakmampuan berpindah posisi selama tiga hari atau lebih, dengan gerak anatomi tubuh menghilang akibat perubahan fungsi fisiologik. Seseorang yang mengalami gangguan gerak atau gangguan pada kekuatan ototnya akan berdampak pada aktivitas sehari-harinya. Efek dari imobilisai dapat menyebabkan terjadinya penurunan fleksibilitas sendi. (Aziz, 2012). Salah satu bentuk latihan rehabilitasi yang dinilai cukup efektif untuk mencegah terjadinya kecacatan pada pasien stroke adalah latihan *range of motion* (ROM). Secara konsep, latihan ROM dapat mencegah terjadinya penurunan fleksibilitas sendi dan kekakuan sendi (Rahayu, 2015).

Latihan *range of motion* (ROM) adalah latihan yang dilakukan untuk mempertahankan atau memperbaiki tingkat kesempurnaan kemampuan menggerakan persendian secara normal dan lengkap untuk meningkatkan massa otot dan tonus. Latihan ROM biasanya dilakukan pada pasien semikoma dan tidak sadar, pasien dengan keterbatasan mobilisasi tidak mampu melakukan beberapa atau semua latihan rentang gerak dengan mandiri, pasien tirah baring total atau pasien dengan paralisis ekstermitas total. Latihan ini bertujuan mempertahankan atau memelihara kekuatan otot, memelihara mobilitas persendian, merangsang sirkulasi darah dan mencegah kelainan bentuk (Derison *et al*, 2016).

METODE

Penelitian ini menggunakan metode deskriptif dengan pendekatan studi kasus, yaitu analisis penerapan latihan ROM pasif pada asuhan keperawatan kasus non hemoragik stroke yang mengalami kelumpuhan ekstremitas. Lokasi penelitian di ruang neuro stroke center RSUD Poso dan waktu penelitian dilakukan pada tanggal 25 Juni s/d 30 Juni 2018. pada penelitian ini melibatkan satu orang pasien yang mengalami non haemoragik stroke dengan kelumpuhan ekstremitas. Penerapan latihan ROM pasif dilakukan dua kali sehari pagi dan sore hari dengan waktu pemberian 15-20 menit untuk meningkatkan kekuatan otot. Pengumpulan data yang digunakan meliputi wawancara, observasi, catatan individu, atau rekam medik dan perawatan. Data yang telah terkumpul dianalisis untuk melihat masalah keperawatan yang dialami klien serta meninjau keefektifan intervensi yang telah dilakukan untuk menyelesaikan masalah keperawatan.

HASIL DAN PEMBAHASAN

Gambaran Kasus

Pasien bernama Ny. N, usia 50 tahun jenis kelamin perempuan, berstatus sebagai ibu rumah tangga, agama islam, alamat Desa Lembomawo, nomor *medikal record* 102XXX dengan diagnosa *Non Hemoragik Stroke*. Pengkajian dilakukan tanggal 25 Juni 2018 klien masuk dengan keluhan utama tiba-tiba pingsan, dan tidak sadar. Pemeriksaan fisik didapatkan hasil kesadaran *somnolen*, klien tampak lemah, tanda-tanda vital didapatkan hasil TD : 170/120 mmHg, Suhu 36,7 C, Nadi 84 kali/menit dan pernapasan 24 kali/menit. Klien sulit menelan, terpasang selang NGT, terpasang oksigen nasal kanule 5 LPM, dispnea. Pada sistem muskuloskeletal klien kehilangan kontrol pergerakan anggota tubuh sebelah kiri, tonus otot kurang, kekuatan otot pada ekstremitas kiri atas dan bawah dengan nilai 0 (tidak ada kontraksi otot) sedangkan kekuatan otot pada ekstremitas kanan atas dan bawah dengan nilai 2 (tidak mampu melawan gaya gravitasi).

Terpasang kateter urine dengan jumlam per 24 jam 500-1000 ml. Pemeriksaan saraf kranial : N 1, pasien tidak mampu membedakan bau minyak kayu putih dan parfum. N II, klien dapat membuka mata pada saat dipanggil namanya dengan rangsangan nyeri. N III, IV, VI, pupil berbentuk isokor, reguler, tidak ditemukan edema, pupil mengecil dan kembali jika terkena cahaya, tidak ada pembatasan cahaya. N V, pasien tidak dapat menggerakan rahang ke kanan dan kekiri. N VII, klien mampu menutup mata, pasien tidak mampu menggerakan bibirnya. N VIII, tidak ada gangguan fungsi/ pendengaran, pasien membuka mata pada saat di panggil. N IX, pasien bisa merefleksikan rasa muntah. N X, pasien mengalami gangguan menelan sehingga pasien di pasang NGT. N XI, pasien tidak dapat memfleksikan kepala ke bahu. N XII, klien tidak bisa menjulurkan lidah keluar. Hasil laboratorium Gula darah puasa 92 mg/dl,Cholesterol 300 mg/dl, SGOT 27 mg/dl, SGPT 31mg/dl, Tryseligerida 86 mg/dl, Urea 29 mg/dl, Urea nitrogen 13 mg/dl, Creatinin 0,7 mg/dl, asam urat 4,0 mg/dl, Hb: 11,9 gr%, Leukosit 11.200/mm3.

Analisis Kasus

Hasil pengkajian pasien berumur 50 tahun, diketahui ada beberapa faktor resiko terkena stroke yang tidak dapat atupun dimodifikasi. Faktor-faktor tersebut antara lain faktor usia, jenis kelamin, ras, dan genetik/keturunan. Faktor usia beresiko mengalami stroke meningkat seiring bertambahnya usia. Resiko semakin meningkat setelah usia 55 tahun. Usia terbanyak terkena serangan stroke adalah usia 65 tahun ke atas. Jumlah kematian yang disebabkan oleh stroke menduduki urutan kedua pada usia diatas 60 tahun dan urutan kelima pada usia 15-59 tahun. Penyebab lainnya adalah hipertensi, kolesterol tinggi, obesitas, stress emosional, aktivitas yang tidak sehat (kurang olahraga) dan kebiasaan makan berkolesterol (Muttaqin, 2012).

Stroke adalah gangguan fungsi saraf akut yang disebabkan oleh gangguan peredaran darah otak. Gangguan fungsi saraf tersebut timbul secara mendadak (dalam beberapa detik) atau secara cepat (dalam beberapa jam) dengan gejala dan tanda yang sesuai daerah fokal otak yang terganggu. Oleh karena itu salah satu manifestasi klinis dari non hemoragik stroke adalah defisit motorik yaitu hemiparesis (kelemahan wajah, lengan, dan kaki pada sisi yang sama), hemiplegi (paralisis wajah, lengan dan kaki pada sisi yang sama), ataksia (berjalan tidak mantap, dan tidak mampu menyatukan kaki), disartria (kesulitan berbicara) ditunjukkan dengan bicara yang sulit dimengerti yang

disebabkan oleh paralisis otot yang bertanggung jawab untuk menghasilkan bicara dan disfagia atau kesulitan dalam menelan (Junaidi, 2011).

Diagnosa keperawatan yang sering muncul pada pasien dengan kasus Non hemoragik stroke adalah ketidakefektifan bersihan jalan nafas, risiko kerusakan integritas kulit, ketidakefektifan pola nafas, hambatan mobilitas fisik, risiko jatuh, risiko ketidakefektifan perfusi jaringan perifer, risiko aspirasi, nyeri akut, hambatan komunikasi verbal, ketidakseimbangan nutrisi kurang dari kebutuhan dan defisit perawatan diri. Rumusan diagnosa pada kasus ini adalah hambatan mobilitas fisik berhubungan dengan keterbatasan dalam pergerakan fisik mandiri dan terarah pada tubuh atau satu ekstremitas atau lebih, dengan batasan karakteristik : penurunan waktu reaksi, kesulitan membolak-balik tubuh, keterbatasan rentang pergerakan sendi, tremor yang diinduksi oleh pergerakan, melambatnya pergerakan, gerak tidak teratur atau tidak terkoordinasi. (Wilkinson, 2007). Data yang berhubungan dengan masalah keperawatan klien adalah kehilangan kontrol pergerakan anggota tubuh sebelah kiri, tonus otot kurang, kekuatan otot pada ekstremitas kiri atas dan bawah dengan nilai 0 (tidak ada kontraksi otot) sedangkan kekuatan otot pada ekstremitas kanan atas dan bawah dengan nilai 2 (tidak mampu melawan gaya gravitasi).

Otot merupakan alat gerak aktif, sebagai hasil kerja sama antara otot dan tulang. Tulang tidak dapat berfungsi sebagai alat gerak jika tidak digerakan oleh otot, hal ini karena otot mempunyai kemampuan berkontraksi (memendek saat kerja berat & memanjang saat kerja ringan) yang mengakibatkan terjadinya kelelahan otot, proses kelelahan ini terjadi saat waktu ketahanan otot atau jumlah tenaga yang dikembangkan oleh otot terlampaui. Kekuatan otot adalah kemampuan dari otot baik secara kualitas maupun kuantitas mengembangkan ketegangan otot untuk melakukan kontraksi (Risnanto *et al*, 2014).

Intervensi mandiri perawat pada masalah keperawatan tersebut adalah dengan penerapan latihan ROM pasif yang biasanya dilakukan pada pasien semikoma dan tidak sadar, pasien dengan keterbatasan mobilisasi, tidak mampu melakukan beberapa atau semua latihan rentang gerak dengan mandiri, pasien tirah baring total atau pasien dengan paralisis ekstermitas total (Murtaqib, 2013). Latihan ROM pasif merupakan gerakan dimana energi yang dikeluarkan untuk latihan berasal dari orang lain atau alat mekanik. Perawat melakukan gerakan persendian klien sesuai dengan rentang gerak yang normal, kekuatan otot yang digunakan pada gerakan ini adalah 50%. ROM pasif ini berguna untuk menjaga kelenturan otot-otot dan persendian dengan menggerakkan otot individu lain secara pasif, misalnya perawat membantu mengangkat dan menggerakkan kaki pasien. Sendi yang digerakkan pada ROM pasif adalah seluruh persendian tubuh atau hanya pada ekstremitas yang terganggu dan klien tidak mampu melaksanakannya secara mandiri (Maimurahman *et al*, 2012).

Penerapan latihan *Range Of Motion* (ROM) Pasif di jadwal rutin dua kali sehari pagi dan sore hari selama enam hari dengan waktu pemberian 15-20 menit. Hal ini bertujuan meningkatkan atau mempertahankan fleksibilitas dan kekutan otot, mempertahankan fungsi jantung dan pernapasan, mencegah kekakuan pada sendi, merangsang sirkulasi darah, dan pencegah kelainan bentuk, kekakuan dan kontraktur. Dalam melakukan gerakan ROM harus diulang sekitar 8 kali gerakan dan dikerjakan minimal 2 kali sehari, dilakukan secara perlahan dan hati-hati agar tidak menyebabkan kelelahkan. Ada beberapa hal yang harus diperhatikan dalam merencanakan program latihan ROM diantaranya umur pasien, diagnosis, tanda vital, dan lamanya tirah baring. Dokter sering memprogramkan ROM untuk dilakukan pada 12 bagian tubuh

diantaranya leher, jari-jari, lengan, siku, bahu, tumit, kaki, dan pergelangan kaki, dapat juga dilakukan pada semua persendian, dalam melakukan ROM harus sesuai dengan waktunya, misal setelah mandi atau perawatan rutin telah dilakukan (Rahayu, 2015).

Hasil evaluasi setelah enam hari penerapan latihan ROM pasif didapatkan ada peningkatan kekuatan otot yang dicapai yaitu pada ekstremitas kanan atas/bawah dari semula skala 2 naik menjadi skala 3 yang artinya dapat mengangkat tangan dan kaki tetapi tidak dapat melawan gaya graitasi dan pada ekstremitas kiri atas/bawah dari semula skala 0 menjadi skala 1 yang artinya hanya dapat menggerakkan jari-jari tangan dan kaki.

Kekuatan otot ialah kemampuan otot atau kelompok otot untuk melakukan kerja dengan menahan beban yang diangkatnya. Otot yang kuat akan membuat kerja otot sehari-hari efisien dan akan membuat bentuk tubuh menjadi lebih baik. Otot-otot yang tidak terlatih karena sesuatu sebab, misalnya kecelakaan, akan menjadi lemah oleh karena serat-seratnya mengecil (atrofi), dan bila hal ini dibiarkan maka kondisi tersebut dapat mengakibatkan kelumpuhan otot. (Risnanto *et al*, 2014). Kekuatan otot sangat berhubungan dengan sistem neuromuskuler yaitu seberapa besar kemampuan sistem saraf mengaktifasi otot untuk melakukan kontraksi, sehingga semakin banyak serat otot yang teraktifasi, maka semakin besar pula kekuatan yang dihasilkan otot tersebut (Muttaqin, 2012).

Latihan *range of motion* (ROM) merupakan latihan yang dilakukan untuk mempertahankan atau memperbaiki tingkat kesempurnaan kemampuan menggerakkan persendian secara normal dan lengkap untuk meningkatkan massa otot dan tonus otot. Latihan ROM adalah salah satu bentuk intervensi fundamental perawat yang merupakan bagian dari proses rehabilitas pada pasien stroke (Rahayu, 2015)

KESIMPULAN

Setelah diberikan asuhan keperawatan dengan tindakan mandiri keperawatan latihan ROM pasif selama 6 hari masalah hambatan mobilitas fisik dapat teratasi dengan kriteria hasil kekuatan otot pada kedua ekstremitas meningkat yaitu pada ekstremitas kanan atas/bawah dari skala 2 menjadi 3 dan ekstremitas kiri atas/bawah dari skala 0 menjadi 1.

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Lampiran 10. Jurnal 4

Jurnal Keperawatan Karya Bhakti
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Hal 39-44

TINDAKAN KEPERAWATAN MELATIH TEKNIK *RANGE OF MOTION* PASIF UNTUK MENURUNKAN HAMBATAN MOBILITAS FISIK PADA Ny. S DENGAN STROKE NON-HEMORAGIK

Siswanto[1], Malikhaturrofi'ah Al Mahfudhoh[2], Evy Tri Susanti[3]

Departemen Keperawatan Medikal, Akademi Keperawatan Karya Bhakti Nusantara
Magelang, (0293) 3149517, 081225287701
E-mail : ovimalikha@gmail.com

ABSTRAK

Latar Belakang : Penderita stroke dapat mengalami kesulitan saat berjalan karena gangguan pada kekuatan otot, keseimbangan, dan koordinasi gerak, sehingga kesulitan dalam melakukan aktivitas sehari-hari. Latihan gerak mempercepat penyembuhan pasien stroke, karena akan mempengaruhi sensasi gerak di otak. meningkatkan kekuatan otot perlu dilakukan latihan mobilisasi atau rehabilitasi, yang bertujuan untuk memperbaiki fungsi neurologis dan mencegah terjadinya kontraktur atau kekakuan otot dengan teknik *Range Of Motion (ROM).* **Tujuan** : mengetahui penerapan teknik *Range Of Motion (ROM)* dalam mengatasi hambatan mobilitas fisik pasien stroke non hemoragik. **Metode** : Penelitian deskriptif. Sampel 1 responden, Subyek adalah Ny. S, umur 62 tahun, mengalami kelemahan pada lengan kanan dan kaki sebelah kanan sejak 1 hari. **Hasil** : tindakan *Range Of Motion (ROM)* pasif dilakukan 2 kali sehari selama 3 hari dengan bantuan perawat ataupun mandiri, namun Ny. S belum mampu mengangkat lengan dan kaki kanannya. Kekuatan otot pada lengan kanan Ny. S masih skala 2 dan kekuatan otot kaki kanan masih skala 2, jadi belum ada perubahan selama 3 hari dilakukan tindakan. **Simpulan** : tindakan *Range Of Motion (ROM)* pasif belum terbukti efektif karena membuktikan bahwa dengan tidak adanya hasil yang dicapai atau belum ada perubahan, kekuatan otot Ny. S masih sama dengan saat sebelum dilakukan teknik *Range Of Motion (ROM)* pasif.

Kata kunci : Mobilitas, Non-hemorogik, ROM, stroke

ABSTRACT

Background : Diabetes Mellitus is a chronic disease that causes multisystem disorders and has the **Background** : Stroke sufferers can experience difficulty when walking due to disturbance in muscle strength, balance, and coordination of movement, resulting in difficulties in carrying out daily activities. Motion training accelerates the healing of stroke patients, because it will affect the sensation of motion in the brain. increase muscle strength mobilization or rehabilitation exercises need to be done, which aims to improve neurological function and prevent contractures or muscle stiffness with thetechnique *Range of Motion (ROM).* **Objective** : to determine the application of thetechnique *Range of Motion (ROM)* in overcoming physical mobility barriers for non-hemorrhagic stroke patients. **Method** : Descriptive research. Sample 1 respondent, Subject is Ny. S, aged 62 years, has experienced weakness in the right arm and right leg since 1 day. **Results** : *Range of Motion (ROM) was* Passiveperformed twice a day for 3 days with the help of a nurse or independent, but Ny. S has not been able to lift his right arm and leg. Muscle strength in the right arm S is still on scale 2 and right leg muscle strength is still on scale 2, so there has been no change for 3 days of action. **Conclusion** :action *Range of Motion (ROM)* Passivehas not been proven

effective because it proves that in the absence of results achieved or no changes, the muscle strength of Ny. S is still the same as before thetechnique *Range Of Motion (ROM)* passive.

Keywords: Mobility, Non-hemorrhogic, ROM, stroke

Pendahuluan

Hambatan mobilitas fisik merupakan salah satu dampak dari Stroke Non Hemoragik. Pasien mengalami gangguan atau kesulitan saat berjalan karena mengalami gangguan pada kekuatan otot dan keseimbangan tubuh (Junaidi, 2016). Penderita stroke dapat mengalami kesulitan saat berjalan karena gangguan pada kekuatan otot, keseimbangan, dan koordinasi gerak, sehingga kesulitan dalam melakukan aktivitas sehari-hari. Latihan gerak mempercepat penyembuhan pasien stroke, karena akan mempengaruhi sensasi gerak di otak (Irdawati, 2018), untuk meningkatkan kekuatan otot perlu dilakukan latihan mobilisasi atau rehabilitasi, yang bertujuan untuk memperbaiki fungsi neurologis dan mencegah terjadinya kontraktur atau kekakuan otot dengan teknik *Range Of Motion (ROM)* (Mubarak, Lilis, Joko, 2015).

Prevalensi stroke di Jawa Tengah pada tahun 2013 sebanyak 40.972 terdiri dari stroke hemoragik sebanyak 12.542 dan stroke non hemoragik sebanyak 28.430. Prevalensi stroke di Kota Magelang merupakan jumlah kasus tertinggi pada tahun 2013 sebesar 14.459 kasus (Dinkes Jateng, 2013).

Menurut Marwati & Farid (2013) mengatakan bahwa pengaruh *Range Of Motion (ROM)* terhadap peningkatan kekuatan otot pada pasien stroke pada tahun 2013 terbukti adanya pengaruh yang signifikan dari latihan *Range Of Motion (ROM)* terhadap peningkatan kekuatan otot pada pasien stroke.

Berdasarkan uraian di atas peneliti tertarik untuk mengambil kasus pada Ny. S 62 tahun dengan hambatan mobilitas fisik dengan keluhan megalami kelemahan pada ekstremitas bagian kanan atas dan ekstremitas bagian kanan bawah. Menurut Irdawati (2018) pasien stroke mengalami gangguan pada kekuatan otot sehingga untuk meningkatkan kekuatan perlu dilakukan mobilisasi. Penulis mengambil teknik *Range Of Motion (ROM)* untuk mengatasi masalah hambatan mobilitas fisik tersebut. Tujuan karya ilmiah ini dikarenakan meskipun terdapat ruang rehabilitasi di rumah sakit, namun tidak ada jadwal pasti petugas rehabilitasi datang ke ruangan atau pasien diantar ke ruang rehabilitasi untuk mendapatkan tindakan *Range Of Motion (ROM).*

Metode

Studi kasus ini adalah studi kasus tentang "Tindakan Keperawatan Melatih Teknik *Range Of Motion (ROM*) Pasif Untuk Menurunkan Hambatan Mobilitas Fisik Pada Ny. S Dengan Stroke Non Hemoragik Di Ruang Seruni RST Tk. II 04.05.01 dr. Soedjono Magelang". Metode studi kasus ini meliputi observasi, wawancara, dan latihan dalam teknik *Range Of Motion (ROM)* pasif dilakukan dengan cara integratife, komprehensif agar memperoleh pemahaman yang mendalam tentang teknik *Range Of Motion (ROM)* pasif pada individu beserta masalahnya supaya pasien dapat mengatasi hambatan mobilitas fisiknya.

Subyek studi kasus ini adalah Ny. S, umur 62 tahun, alamat rumah Candimulyo Magelang. Klien mengalami kelemahan pada lengan kanan dan kaki sebelah kanan sejak 1 hari sebelum masuk rumah sakit dan mengalami penurunan kesadaran. Riwayat pengobatan terdahulu klien mempunyai riwayat hipertensi dan riwayat stroke pernah dirawat di RST Tk. II 04.05.01 dr. Soedjono Magelang dengan kelemahan ekstremitas sebelah kiri.

Lokasi studi kasus ini dilaksanakan di ruang Seruni RST Tk. II 04.05.01 dr. Soedjono Magelang, selama satu minggu dimulai dari tanggal 7 Juni 2018 sampai tanggal 9 Juni 2018.

Alat-alat yang digunakan antara lain, pedoman pengkajian asuhan keperawatan, alat-alat pemeriksaan fisik : stetoscope dan spignomanometer, termometer, dan jam tangan analog, serta standar Operasional Prosedur (SOP) tentang tehnik *Range Of Motion (ROM)* terlampir.

Studi kasus ini menggunakan teknik *Range Of Motion (ROM)* pasif, karena klien mengalami penurunan kesadaran sehingga tidak dapat melakukan tindakan *Range Of Motion (ROM)* secara mandiri, dalam pelaksanaannya dilaksanakan tindakan sebanyak 1 kali dalam shift pagi yaitu jam 10.00 WIB dan sebanyak 1 kali dalam shift sore yaitu jam 16.00 WIB, klien juga dilakukan tindakan alih baring setiap 2 jam sekali untuk mencegah terjadinya kerusakan integritas kulit selama sakit, serta selama melakukan tindakan keluarga klien juga diajarkan teknik *Range Of Motion (ROM)*) pasif agar dapat membantu klien secara mandiri dan diajarkan untuk melakukan alih baring terhadap Ny. S setiap 2 jam sekali. Penulis dapat melakukan observasi dan pendampingan setiap hari untuk melaksanakan teknik *Range Of Motion (ROM)* pasif.

Analisa data. Data yang diperoleh dari keluarga klien di studi kasus ini terlebih dahulu divalidasi melaluli perawat yang bertugas di Ruang Seruni RST 04.05.01 Tk II dr. Soedjono Magelang. Keluarga mengatakan bahwa Ny. S mengalami kelemahan pada kaki dan tangan sebelah kanan sudah sejak 1 hari sebelum masuk rumah sakit, Ny. S tampak lemah, tampak berbaring di tempat tidur, Ny. S mengalami

penurunan kesadaran, pemeriksaan *Gasglow Coma Scale (GCS) : Eye* : 2, *Motorik* : 4, *Verbal* : 2 (kesadaran Somnolen), kaki kanan dan lengan kanan tidak mampu menahan beban minimal seperti gravitasi, kekuatan otot lengan kanan skala 2 dan kekuatan otot kaki kanan skala 2.

Pembahasan

Gangguan mobilitas fisik adalah keterbatasan dalam kebebasan bergerak untuk pergerakan fisik tertentu pada bagian tubuh baik satu atau lebih ekstremitas. Batasan karakteristik untuk menegakkan diagnosa tersebut adalah postur tubuh yang tidak stabil selama melakukan kegiatan rutin harian, keterbatasan kemampuan untuk melakukan ketrampilan motorik kasar dan motorik halus, tidak ada koordinasi atau pergerakan yang tersentak-sentak, keterbatasan ROM, kesulitan berbalik, dan perubahan gaya berjalan (NANDA, 2012).

Tindakan keperawatan yang dilakukan adalah dengan melatih teknik *Range Of Motion (ROM)* pasif dan rencana keperawatan menurut *Nursing Interventions Classification* (2016). *Range Of Motion (ROM)* merupakan tindakan/latihan yang dilakukan untuk mempertahankan atau memperbaiki tingkat kesempurnaan kemampuan menggerakkan persendian secara normal dan lengkap untuk meningkatkan massa otot dan tonus otot (Potter&Perry, 2005).

ROM pasif yaitu latihan yang dilakukan oleh pendamping seperti perawat atau keluarga, pendamping berperan sebagai pelaku ROM atau melakukan ROM terhadap pasien tersebut, sebagai implementasi dalam peningkatan kekuatan otot pada pasien stroke iskemik (Widyawati, 2010).

Efek dari latihan ini akan berdampak setelah latihan akan terjadi peningkatan kekuatan otot (Chaidur, Zuardi 2012). Latihan *Range of Motion* merupakan program rehabilitasi yang bertujuan untuk mencapai kemampuan fungsional semaksimal mungkin untuk menghindari atau mencegah stroke berulang. Hasil penelitian menunjukkan pentingnnya latihan Range of Motion untuk meningkatkan kekuatan otot dan rentang gerak pada pasien stroke iskhemik, sehingga dapat diaplikasikan dalam praktik asuhan keperawatan.

Latihan disesuaikan dengan kondisi pasien dan sasaran utama adalah kesadaran untuk melakukan gerakan yang dapat dikontrol dengan baik, bukan pada besarnya gerakan. Otak mempunyai fungsi yang khas dalam mengendalikan fungsi sensorik dan motorik, yaitu bersifat kontralateral sensasi gerak di otak dan mendorong pasien untuk memikirkan gerakannya pada saat melakukan gerakan tersebut. Latihan gerak yang diberikan harus distimulasi untuk membuat gerak dan respon gerak sebaik dan senormal mungkin. Otak mempunyai fungsi yang khas dalam mengendalikan fungsi sensorik dan motorik, yaitu bersifat kontralateral. Konsep dominasi serebral menyimpulkan bahwa hemisfer kiri dianggap lebih dominan dari

hemisfer kanan. Sampai saat ini belum ada penelitian mengenai perbedaan pengaruh latihan gerak terhadap kekuatan otot pada pasien stroke non-hemoragik hemiparese kanan dibandingkan dengan hemiparese kiri. Karya ilmiah ini dilakukan untuk mengetahui perbedaan pengaruh latihan gerak terhadap kekuatan otot dan keseimbangan pada pasien stroke nonhemoragik hemiparese kanan dibandingkan dengan hemiparese kiri. Seseorang yang mengalami gangguan gerak atau gangguan pada kekuatan ototnya akan berdampak pada aktivitas sehari-harinya. Untuk mencegah terjadinya komplikasi 4 penyakit lain maka perlu dilakukan latihan mobilisasi. Mobilisasi adalah kemampuan seseorang untuk bergerak secara bebas, mudah, dan teratur yang bertujuan untuk memenuhi kebutuhan hidup sehat. Mobilisasi diperlukan untuk meningkatkan kemandirian diri, meningkatkan kesehatan, memperlambat proses penyakit khususnya penyakit degeneratif dan untuk aktualisasi diri (harga diri dan citra tubuh) (Mubarak, Lilis, Joko, 2015).

Ada beberapa prinsip dasar dalam melakukan latihan ROM. ROM harus diulang sekitar 8 kali dan dikerjakan minimal 2 kali sehari, ROM dilakukan perlahan dan hati-hati agar tidak melelahkan pasien, dalam merencanakan program latihan ROM, perhatikan umur pasien, diagnosis, tanda vital, dan lamanya tirah baring (Sager, M., Sylvain G., 2014), ROM sering diprogramkan oleh dokter dan dikerjakan oleh fisioterapi atau perawat, bagian-bagian tubuh yang dapat dilakukan ROM adalah leher, jari, lengan, siku, bahu, tumit, kaki, dan pergelangan kaki, ROM dapat dilakukan pada semua persendian atau hanya pada bagian-bagian yang dicurigai mengalami proses penyakit, melakukan ROM harus sesuai dengan waktunya, misalnya setelah mandi atau perawatan rutin telah dilakukan (Anderst, W. J., et all., 2013)

Untuk mengetahui tingkat keberhasilan tindakan, penulis melakukan evaluasi. Hasil evaluasi dari tindakan keperawatan yang telah dilakukan selama 3 hari pelaksanaan adalah terjadi respon perkembangan. Pada saat sebelum dilakukan tindakan teknik *Range Of Motion (ROM)* kekuatan otot Ny. S skala 2 pada ekstremitas sebelah kanan atas dan skala 2 pada ekstremitas sebelah kanan bawah, setelah dilakukan tindakan selama 3 hari kekuatan otot Ny. S belum ada perubahan kekuatan otot Ny. S skala 2 pada ekstremitas sebelah kanan atas dan skala 2 pada ekstremitas sebelah kanan bawah.

Ketidak berhasilan tindakan ROM ini dikarenakan adanya gangguan defisit neurologis yang menetap yang menyebabkan kecacatan fisik. Pasien tidak hanya mengalami kelumpuhan tetapi juga mengalami gangguan kognisi, gangguan komunikasi dan gangguan lapang pandang atau defisit dalam persepsi. Berbagai program dirancang untuk meningkatkan kemampuan.

Simpulan

Setelah dilakukan tindakan keperawatan teknik *Range Of Motion (ROM)* selama 3 x 8 jam belum terjadi perubahan pada kekuatan otot Ny. S. Pada saat sebelum dilakukan tindakan teknik *Range Of Motion (ROM)* kekuatan otot Ny. S skala 2 pada ekstremitas sebelah kanan atas dan skala 2 pada ekstremitas sebelah kanan bawah, setelah dilakukan tindakan selama 3 hari kekuatan otot Ny. S belum ada perubahan kekuatan otot Ny. S skala 2 pada ekstremitas sebelah kanan atas dan skala 2 pada ekstremitas sebelah kanan bawah.

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Lampiran 11. Jurnal 5

Effects of joint mobilization and stretching on the range of motion for ankle joint and spatiotemporal gait variables in stroke patients

Kyun-Hee Cho, MS,* and Shin-Jun Park, PhD†

Background and purpose: Stroke patients have limited ranges of motion and gait disturbances due to neurological deficits and connective tissue changes. We assessed the effects of joint mobilization and active stretching on ankle joint range of motion and gait in stroke patients. *Methods:* In total, 45 stroke patients were evenly divided into three groups: joint mobilization, active stretching, and combination (joint mobilization and active stretching) groups. Patients in each group received the corresponding interventions in a non-simultaneous manner for 6 weeks in total (3 days per week, 15 min per day). The range of motion of the ankle joint was measured using a goniometer, and spatiotemporal gait variables were measured using G-walk. All measurements were taken immediately before and after the 6-week intervention. *Results:* The joint mobilization group exhibited significantly increased range of motion for ankle joint after the intervention ($p < 0.05$), while the spatiotemporal gait variables were unchanged. In the active stretching group, both the range of motion of the ankle joint in the supine position and the spatiotemporal gait variables (cadence, speed, stride length) were significantly increased ($p < 0.05$). In the combination group, both the range of motion of the ankle joint and spatiotemporal gait variables (cadence, speed, stride length) were significantly increased ($p < 0.05$). *Conclusion:* Combination therapy of joint mobilization and active stretching improves the range of motion of the ankle joint and spatiotemporal gait variables in stroke patients, suggesting that ankle rehabilitation of stroke patients should include limited joint structure and muscles shortness.

Keywords: Stroke—Joint mobilization—Stretching—Spatiotemporal gait

Introduction

Most stroke patients experience incomplete paralysis and exhibit symptoms of gait dysfunction.[1] Since normal daily activities after rehabilitation involve walking, stroke patients require proper rehabilitation to improve their gait ability.[2]

Compared to healthy people, stroke patients exhibit reduced gait velocity, cadence, step length, and stride length, and increased stance phase and double-support.[3] Furthermore, an inappropriate swing phase of the lower limb on the paralyzed side increases the proportion of swing phase during the gait cycle, and there is an increased asymmetry while walking.[4] Degeneration of spatiotemporal gait ability in stroke patients is characterized by a weakened foot and ankle dorsiflexor, and stiffening of foot plantar flexor.[5–7]

Weakening and stiffening of soft tissues in stroke patients results in a change in the tissue stiffness and viscoelasticity, limiting passive or voluntary movement.[8–10] This reduced movement can result in secondary events, including the thickening of non-contractile tissue in the joint and the contracture of the joint.[11,12] Contracture of the ankle joint results in shortening of the muscle-tendon unit and muscle fascicles in the gastrocnemius muscle of

From the *Department of Physical Therapy, Graduate School, YongIn University, Republic of Korea; and †Department of Physical Therapy, GangdDong University, 205ho, hongikgwan, 278, Daehak-gil, Gamgok-myeon, Eumseong-gun, Chungcheongbuk-do, Republic of Korea.

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Corresponding author. E-mail: 3178310@naver.com.

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stroke patients.[13] Because of these reasons, joint mobilization and stretching interventions have been performed, in order to increase the range of motion for joint, via mechanical changes in the ankle joint, and improve gait ability in stroke patients.[14–16] Ankle joint mobilization of stroke patients increased dorsiflexion,[15] and stretching exercises of the gastrocnemius improved calf muscle length, stiffness and gait parameters.[14,16]

Joint mobilization is an orthopedic manipulation therapy used for its mechanical effects to relieve pain, improve mobility, and treat contractures via the 3rd stage of the translatoric movement and the convex-concave rule.[17] Joint mobilization includes traction, compression, and gliding, and is divided into grades I–III. Grade I means application distraction with minor intensity without separation of joint surfaces. Grade II separates articulating surfaces by stretching the periarticular tissue within the joint capsule. Grade III is sufficient distraction or gliding so that the joint capsule can sufficiently stretch.[17] According to the convex and concave rules, gliding the convex joint surface implies gliding in the opposite direction of the bone's moving direction; gliding the concave joint surface implies gliding in the opposite direction to the bone's moving direction. When distracting the concave joint surface, it is pulled along the long axis of the bone; however, when distracting the convex joint surface, the joint surface must be separated.[17]

Joint mobilization has not only the mechanical effect of disrupting the contracture by direct movement of the joint area, but also the arthrokinetic reflex effect to promote suppression or facilitation of the related muscles via facilitating the joint receptors.[18,19]

Moreover, the stretching movement used in this study is an active-stretching method involving active isometric contraction and passive stretching of the agonistic muscle, followed by an isometric contraction of the antagonistic muscle.[20] Applying isometric contraction to a shortened muscle tissue before the stretching movement has been reported to provide better muscle flexibility in comparison to the static stretching movement alone,[21] and these movements via stretching exercise can change the viscoelasticity of the tissue.[22] Furthermore, isometric contraction of the antagonist is effective for increasing the muscular strength by increasing the muscle activity and pennation angle.[23]

However, there are very few studies that compare the effectiveness of joint mobilization and stretching in the ankle joint of stroke patients. Although there is a report regarding the effects of active assist stretching and joint mobilization, it focuses on the effects of stretching on the rib cage joints, rather than on the ankle joint.[24] Joint stiffening weakens the muscle, and weakened muscle induces problems not only within the muscle but also in the joint.[12] Therefore, studies that apply joint movement to current rehabilitation therapies are required, focusing particularly on the muscle, and conducting comparisons between this movement and the stretching movement of the muscle. Therefore, this study was performed to compare the effectiveness of joint mobilization and active stretching – individually and in combination – in the treatment of ankle joint immobility of a stroke patient cohort, in order to determine a more effective intervention for these patients.

Materials and methods

Subjects

In this study, 45 people participated in the study considering a dropout of 20%. This study included 45 adults who were diagnosed with stroke and hospitalized in "A" rehabilitation center, Gyeonggi province. All of the subjects agreed to participate in the study, and the inclusion criteria were: subjects diagnosed with stroke at least 6 months ago; subjects with Modified Ashworth Scale (MAS) Test grades of <1-3; points. MAS grades mean the following: no increase in muscle tone (grade 0); slight increase in muscle tone (grade I, I+); more marked increase in muscle tone through most of the ROM (grade II); considerable increase in muscle tone (grade III); and passive movement is difficult (grade IV). Subjects who can walk for a distance of >10 m without walkers or mobility aids; and subjects with Korean-Mini Mental State Examination (K-MMSE) score of ≥24. The exclusion criteria were: subjects with a previous history of orthopedic disease or ankle surgery; those with any contraindication of ankle joint mobilization (e.g. hypermobility, inflammation, etc.); and those with ankle pain.

Study design

This study has a blinded-assessor, randomized controlled clinical trial design. Unrelated occupational therapies generated random numbers using computer; subjects were randomly divided into three groups: joint mobilization group (JMG, n = 15), active stretching group (ACG, n = 15), and joint mobilization and active stretching group (JMASG, n = 15). All interventions were conducted by eight physiotherapists who had more than 5 years of experience in physiotherapy of the nervous system and 10 years or less. Two physical therapists, independent of the study, evaluated the range of motion and gait.

This study was approved by Yongin Institutional ethical review board (ethical approval number 2-1040966-AB-N-01-20-1801-HSR-096-1), and all patients gave written informed consent for participation.

Measurement tools

Goniometer

A goniometer was used to measure the range of motion for the subject's ankle joint. The measurements were taken immediately before and after the 6-week intervention. The

measurements were made twice; first, the subject was sitting on a mattress with their knees bent in 90° angle, and second, the subject was in the supine position and their knees flat. The axis of the goniometer was positioned on the lateral side of the ankle bone, while the stationary arm was positioned in a parallel line lateral to the head of the fibula. The moveable arm was then lined up with the 5th metatarsal bone. The investigator forced passive movement of the sole towards the top of the foot, and then the angle of dorsiflexion was measured at the point where no further movement occurs with resistance to the motion.[25] Ankle ROM measurements were performed in the seated posture (knee-flexion posture) and supine posture (knee-extension posture) involving the two-joint muscle (gastrocnemius).[25] The goniometer is a highly reliable tool in measuring the range of motion for ankle joint, with an inter-observer reliability of 0.50−0.72 and intra-observer reliability of 0.74−0.90.[26]

Gait evaluation tool (G-walk)

The gait evaluation tool, called the G-walk (BTS, Italy), was used to assess the changes in spatiotemporal gait variables. The equipment required for the measurement comprised: a 3-axis accelerometer, a magnetometer, a G-sensor with built-in gyroscope, and a notebook equipped with BTS-G-studio software.

Prior to the assessment, the BTS G-Studio software program was turned on and connected to the G-Sensor. This sensor was placed in a holder within a belt for measurement, located on the 5th lumbar vertebrae. The subjects underwent a calibration phase in a static standing position to measure walking, a dynamic standing movement. Pressing the "Start" button on BTS G-Studio software results in a pop-up window called "Waiting for stabilization", and the subject remained standing still. When this window disappeared, the subject was asked to gait 8 m in a forward direction at a comfortable pace. When the gait was complete, we pressed the "stop" button on the software to complete the assessment.[27] The data collected in this study were analyzed for cadence (step/min), gait speed (m/s) and stride length (m), by selecting the paretic side.

The spatiotemporal gait variables (cadence, speed, stride length) were the output measurements of the assessment. An assistant observer accompanied the subjects who had a possibility of falling during the assessment.

Intervention methods

The subjects of this study were randomly divided into 3 groups (15 patients per group): the joint mobilization group, the active stretching group, and the combination group (joint mobilization and active stretching). The patients in each group received the corresponding interventions in a non-simultaneous manner, for 6 weeks in total − 3 days per week, and 15 min per day.

Joint mobilization group

Joint mobilization was performed on the ankle joint of the paralyzed side, with the subject in a supine position and the lower limb held in position with a strap. With the ankle joint positioned in a comfortable state, the therapist held the heel bone with one hand, from the fibula side. The thumb and the index finger of the other hand was wrapping above the talus bone, and both hands were used to make a movement of the talus bone in the posterior direction. The investigator performed the 3rd stage of the joint mobilization (gliding) to induce dorsiflexion of the ankle joint, and the talus bone remained pushed towards posterior direction without movement for a minute. This intervention was repeatedly performed for 15-min duration.[17]

Active stretching group

The subject was in a standing position, holding onto a table with their arms stretched forward for stability. The front leg was slightly bent, and the heel of the paralyzed lower limb that will be treated with active stretching was pointing towards the floor, taking a starting position at a slightly tightened point. Isometric contraction was maintained for 6 s, with the heel of the paralyzed lower limb touching the floor. After 2−3 s of relaxation, the investigator manually positioned the heel of the subject for further stretching, maintaining the position for 15−18 s. Then, isometric contraction of the antagonistic muscle (dorsiflexor) was maintained for 6 seconds, and the subject then returned to the starting position (standing position) for a 10-s resting period.[20] This intervention was repeated for a 15-min duration.

The combination group (joint mobilization and active stretching)

For joint mobilization, the 3rd stage of the joint mobilization (gliding) was performed on the ankle joint of the paralyzed lower limb, and the talus bone remained pushed towards posterior direction without movement for a minute.[17] Afterwards, the subject assumed a standing position, and the isometric contraction was maintained for 6 s with the heel of the paralyzed lower limb (the side being treated with active stretching) touching the floor. After 2−3 s of relaxation, the investigator manually positioned the heel of the subject for further stretching, maintaining the position for 15−18 s. Then, isometric contraction of the antagonistic muscle (dorsiflexor) was maintained for 6 s, and then the subject returned to the starting position (standing position) for 10-s resting period.[20] This combination therapy was repeated for a 15-

min duration, with the joint mobilization being performed before the active stretching.

Statistical analysis

A sample size was obtained through a pilot study of subjects. An effect size of 0.55 was calculated using the mean and standard deviation of the 9 participants in the pilot study. Thus, in this study, a level of 0.05 and a power of 0.80 were achieved. The number of 3 groups (JMG, ASG, JMASG) was entered through G power and the total sample size was 36.

SPSS 20.0 for Windows was used to statistically analyze the effectiveness of joint mobilization, active-stretching, and the combination of the two interventions on improving the range of motion for ankle joint and gait in stroke patients. The data normality test used was the Shapiro-Wilks test, and the homogeneity test used was one-way analysis of variance (ANOVA). The characteristics of the subjects were analyzed using a chi-square test and descriptive statistics. The characteristics of the subjects were analyzed using frequency, mean and standard deviation, using the chi-squared test and descriptive statistics. The effect of the intervention was analyzed using two-way repeated-measures analysis of variance. The times were within-subject factors (pre- and post-intervention). The interventions × time were between-subject factors (JMG, ASG, JMASG). If significant interventions × time interactions or main effects were found, a post hoc were performed with LSD tests and paired t-tests. Statistical significance was set at $\alpha = 0.05$.

Study results

General characteristics

The general characteristics of the subjects are presented in Table 1.

Changes in range of motion

Changes in the range of motion of the ankle joint

Significant interventions × time interaction ($F = 4.001$, $P = 0.026$) were found for passive ankle dorsiflexion ROM in the seated position. Significant main effects of time ($F = 16.551$, $P = 0.001$) were detected. The combination group demonstrated significantly greater increases in ankle dorsiflexion ROM in the seated position than the joint mobilization and active-stretching groups ($p < 0.05$). No significant interventions × time interactions ($F = 2.240$, $P = 0.119$) were found for ankle dorsiflexion passive range of motion in the supine position. Significant main effects of time ($F = 20.900$, $P = 0.001$) were detected. All groups showed significant increases in ankle joint range of motion, with one exception: the range of motion in the active-stretching group, measured in the seated position (Table 2.).

Changes in gait

Changes in the spatiotemporal gait variables

There were significant interventions × time interaction found for cadence ($F = 3.635$, $P = 0.035$), velocity ($F = 4.534$, $P = 0.016$), and stride length ($F = 4.085$, $P = 0.024$). The combination group demonstrated significantly greater increases in cadence, velocity, and stride length than the joint mobilization group ($p < 0.05$).

Significant main effects of time were detected in cadence ($F = 20.022$, $P = 0.001$), velocity ($F = 25.524$, $P = 0.001$), and stride length ($F = 11.349$, $P = 0.002$). Both the active-stretching group and the combination group demonstrated significant changes in the spatiotemporal gait variables under post-intervention versus the pre-intervention condition ($p < 0.05$, (Table 3.).

Discussion

Stroke patients exhibit reduced movement and contracture due to the weakening of dorsiflexors and stiffening of

Table 1. *General characteristics of the subjects (mean ± SD).*

Classification		JMG ($n = 15$)	ASG ($n = 15$)	JMASG ($n = 15$)	p
Sex	Male	10	13	10	0.360
	Female	5	2	5	
Paretic side	Right	5	5	5	1.000
	Left	10	10	10	
Age (years)		64.53 ± 8.05	63.40 ± 7.09	64.66 ± 5.32	0.860
Height (cm)		165.40 ± 8.15	167.53 ± 7.43	164.33 ± 9.25	0.567
Weight (kg)		68.80 ± 8.16	69.33 ± 8.56	69.00 ± 7.91	0.984
Duration (months)		12.26 ± 3.30	11.20 ± 3.18	11.73 ± 2.76	0.644
K-MMSE (score)		26.46 ± 1.72	26.26 ± 1.57	27.06 ± 0.96	0.306
MAS (grade)		1.93 ± 0.88	2.00 ± 1.00	2.20 ± 1.01	0.736

JMG, joint mobilization group; ASG, active stretching group; JMASG, joint mobilization & active stretching group; K-MMSE, korean-mini mental state examination; MAS: modified ashworth scale.

Table 2. *Comparison of ankle dorsiflexion ROM pre- and post-intervention in three groups(mean ± SD)*

Classification			Pre-intervention	Post-intervention	Within-group change
Ankle dorsi flexion ROM (°)	Sitting position	JMG	7.60 ± 5.59	8.26 ± 6.04*	0.66 ± 0.97
		ASG	7.60 ± 4.37	8.13 ± 3.24	0.531 ± 0.88
		JMASG	6.00 ± 4.45	8.33 ± 3.73*	2.33 ± 2.60[ab]
	Supine position	JMG	−0.53 ± 5.35	0.06 ± 5.24*	0.60 ± 1.05
		ASG	−0.20 ± 6.14	1.80 ± 4.37*	2.00 ± 2.92
		JMASG	0.20 ± 4.70	2.60 ± 3.50*	2.40 ± 2.87

JMG, joint mobilization group; ASG, active stretching group; JMASG, joint mobilization & active stretching group.
Within group: *$p < 0.05$ when compared with pre intervention values.
Among groups: [a]$p < 0.05$ when compared with the JMG.
[b]$p < 0.05$ when compared with the ASG.

plantar flexors, and they eventually experience reduced gait duration and asymmetry.[28,29] Therefore, proper intervention is necessary to adjust the structural abnormalities of the ankle joint and the surrounding muscle tissues. This study aimed to assess the effectiveness of conventional monotherapies – joint mobilization and active-stretching – and the novel combination therapy (joint mobilization & active stretching performed together) on the improvement of the range of motion for ankle joint and gait in the cohort of stroke patients.

In the combination group, all variables regarding dorsiflexion and the range of motion for the ankle joint—both in the seated and supine position—were significantly increased ($p < 0.05$), suggesting that combination therapy is a more effective method than the two monotherapies (joint mobilization or active-stretching) for improving the range of motion for ankle joint in the seated position.

Isometric contraction, applied to the shortened muscle fibers immediately before the stretching motion, is reported to provide better muscle flexibility in comparison with static stretching movement,[21] as isometric contraction of shortened muscle fibers stimulates Golgi tendon organ (GTO) and induces suppression of muscle activity.[30] For voluntary isometric contraction of the antagonistic muscle to occur, muscle spindles are stimulated, and the signal reaches the Ia inhibitory interneurons via Ia-afferent nerve fibers. Then, alpha motor nerves of the agonistic muscle are suppressed, relieving the tension.[30] Moreover, it is reported that isometric contraction of the antagonistic muscle is an effective method to increase the muscular strength.[23] The increased muscular strength of the anterior tibial muscle is effective in improving gait ability, as in TUG.[31] These findings suggest that the active-stretching therapy performed in this study improves gait variables by relieving the tension of the gastrocnemius muscle and inducing the contraction of anterior talofibular muscle. In addition, the combination therapy group exhibited significant changes in all spatiotemporal gait variables, suggesting that the combination therapy is a more effective intervention method for the improvement of spatiotemporal gait variables compared to the joint mobilization therapy.

The stiffening of lower limb after stroke is worsened in the inner part of the ankle joint.[32] These alterations in the ankle joint of the paralyzed lower limb result in a thickening of the anterior talofibular ligament, a non-contractile tissue.[11] Because joint mobilization allows for expansion of the space within the joint by stretching of non-contractile tissue, the range of motion for ankle joint in stroke patients could be increased.[15] In this study, the joint

Table 3. *Comparison of spatio-temporal gait variables in pre- and post-intervention in three groups (mean ± SD).*

Classification		Pre-intervention	Post-Intervention	within-group change
Cadence (steps/min)	JMG	82.68 ± 17.95	84.00 ± 17.08	1.31 ± 4.53
	ASG	89.05 ± 16.87	95.94 ± 16.68*	6.89 ± 11.67
	JMASG	87.75 ± 16.42	98.12 ± 20.07*	10.37 ± 10.08[a]
Speed (m/s)	JMG	0.78 ± 0.20	0.81 ± 0.18	0.02 ± 0.06
	ASG	0.84 ± 0.17	0.90 ± 0.16*	0.05 ± 0.08
	JMASG	0.76 ± 0.22	0.88 ± 0.23*	0.12 ± 0.12[a]
Stride length (m)	JMG	1.11 ± 0.13	1.10 ± 0.11	-0.00 ± 0.05
	ASG	1.10 ± 0.19	1.16 ± 0.20*	0.06 ± 0.09
	JMASG	1.04 ± 0.24	1.12 ± 0.19*	0.08 ± 0.11[a]

JMG, joint mobilization group; ASG, active stretching group; JMASG, joint mobilization & active stretching group.
Within group: *$p < 0.05$ when compared with pre intervention values.
Among groups: [a]$p < 0.05$ when compared with the JMG
[b]$p < 0.05$ when compared with the ASG.

mobilization intervention group showed a significant increase in the range of motion of the ankle joint in both seated and supine positions ($p < 0.05$), a finding that is in line with previous studies.

These results imply that the interventions were effective in improving the range of motion of the ankle joint in stroke patients, who exhibited joint contracture due to the stiffening of plantar flexors. In previous studies, joint mobilization with motion of the ankle joint was effective in restoring ankle joint range of motion. Unlike this study, since joint mobilization is performed while moving in the standing position, it is difficult to apply it to subjects whose balance ability is low.[33]

One of the previous studies reported immediate pain relief, MAS reduction, and improved gait variables via passive movement of the ankle joint in a stroke patient experiencing paralysis,[16] which are contradictory outcomes to this study. However, in their study, there were effects on the muscle changes since they induced passive movement by dorsiflexion and plantar flexion of the ankle joint in a standing-up position using the body weight. Joint mobilization used in this study, on the other hand, is a passive treatment performed by the therapist to move the talus bone towards the posterior side, and therefore the active participation of the patient is limited. Consequently, while the range of motion for ankle joint was increased, gait variables could not be increased. These findings are similar to the previous study demonstrating that joint mobilization in stroke patients could increase the range of motion of the ankle joint but could not affect the time for standing-up or sitting-down motions.[34]

Neurological damages after the stroke results in weakening of the muscle, as well as shortening of the muscle fibers over time.[35] More specifically, the inner gastrocnemius muscle exhibits reduced pennation angle and muscle fiber length, which result in a reduced range of motion and increased stiffness of the ankle joint.[36] Furthermore, the articular cartilage on the paralyzed side of a stroke patient is thinner than the cartilage on the normal side,[37] and this was also observed in a patient with spinal injury.[38] Previous studies have suggested that physical inactivity is the cause for thinning of the articular cartilage.[37,38] These structural problems of the joint may result in a reduced range of motion of the joint.[38] This study showed that after 6 weeks of intervention, the active-stretching group exhibited significantly increased range of motion of the ankle joint when measured in the supine position ($p < 0.05$), while the range of motion measured in seated position was not significantly increased ($p > 0.05$). In previous studies, continuous stretching was intervened in the ankle joint of patients with stroke, the range of motion was significantly increased, and the spasticity of the calf muscle was confirmed to be consistent with our results.[39] Since the active-stretching intervention performed in this study was used to increase the muscle fiber length in gastrocnemius muscle, the range of motion of the ankle joint measured with flattened knees may have increased due to the elasticity contribution of gastrocnemius muscle – although not enough to completely counter the negative effect on the range of motion from the ankle joint problems.

In this study, we assessed the effectiveness of joint mobilization and active-stretching monotherapies and the combination therapy on improving the range of motion for ankle movement and gait variables in stroke patients. The findings of this study suggest that the combination therapy of the two monotherapies will bring a more positive effect for stroke patients with joint and muscle problems. Therefore, combination therapy may be a potent intervention in clinical settings for functional improvement (i.e. the range of motion for ankle joint, gait function) in stroke patients.

This study has some limitations. In this study, objective changes in the ankle joint and muscles of stroke patients before and after intervention of joint mobilization and active-stretching were not observed. In addition, the number of subjects was small and the daily life of the subject could not be controlled. Future studies must investigate changes in joints and muscles according to the treatment method of stroke patients.

Conclusion

The purpose of this study was to assess the effectiveness of joint mobilization and active-stretching monotherapies and the combination therapy of these two interventions on improving the range of motion for ankle joint and gait variables in stroke patients. Although joint mobilization monotherapy successfully increased the range of motion for ankle joint in all positions, it did not improve the gait variables. Active-stretching monotherapy increased the range of motion for ankle joint in the supine position and increased all gait variables. Meanwhile, the combination therapy of joint mobilization and active-stretching successfully increased the range of motion for ankle joint in all positions, as well as all gait variables. Therefore, in order to simultaneously improve the range of motion for ankle joint and gait variables in stroke patients, both joint mobilization and active-stretching should be performed in parallel.

Declaration of Competing Interest

None.

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