

Effect Of Active Cylindrical Exercise On The Grip Power In Stroke Patient

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Abstract

Stroke is one of the non-communicable diseases that is increasing in prevalence. One of the effects of stroke patients is weakness on one side of the body. Therefore stroke patients need rehabilitation which is fast and precise with the range of motion exercises joints; one of them is grip strength. The recommended exercise is the Active Range of Motion Cylindrical Grip. This study aimed to determine the effect of cylindrical grip on the gripping power in stroke ischemic patients. The method used is Pre-Experiment with pre and post-test one-group design. This research uses Purposive Sampling of as many as 16 ischemic stroke patients. Active Range of Motion Cylindrical Grip exercise given as much as two times a day in 10 minutes for four days. The analysis used is a non-parametric test of Wilcoxon. Results of non-parametric test analysis Wilcoxon obtained p-Value = 0.001 ($\alpha < 0.05$). This value indicates a significant influence between the strength value grips. It is expected that health workers can apply Active Cylindrical Grip ROM exercise as an alternative to increasing the gripping power in ischemic stroke patients who experience weakness and can improve the quality and service of healing ischemic stroke.

Keywords: Cylindrical Grip, Grip Power, ROM Active, Stroke Ischemic

Introduction

The health problems that occur are disorders of disorders that arise as a result of disease, namely the process of slowly eliminating the ability of tissues to repair and replace, as well as maintain standard structure and function, resistance to injury, including infection, resulting in disease not contagious including hypertension, stroke, and frequent diabetes mellitus (Benjamin et al., 2018). The importance of knowledge about non-communicable conditions in the background with the increasing tendency of the prevalence of non-communicable diseases in society, especially Indonesian culture.

Based on the Indonesian Stroke Foundation data, Indonesia's most significant number of strokes and ranks first in Asia. The number of deaths caused by stroke ranks second at the age above 60 years and fifth at 15-59 years (Yastroki, 2012). West Java is one of the provinces with a stroke prevalence above the national majority, from 8 / mile in 2013 to 11.4 / mile in 2018 (Risksdas, 2018). In the health profile of West Java Province in 2017, stroke ranks second in the disease pattern of patients hospitalized in the hospital at the age range of 45 to 75 years with a total of 7,674 stroke cases hospitalized.

Stroke or cerebrovascular injury (CVA) is a loss of brain function caused by the cessation of blood supply to a part of the brain, resulting in temporary or permanent loss of movement, thinking, memory, speech, or sensation (Brunner, 2010). Clinically there are two types of stroke, namely hemorrhagic and non-hemorrhagic stroke. Hemorrhagic stroke is a stroke characterized by rapidly evolving clinical signs of focal (global) brain dysfunction with symptoms lasting 24 hours or more, resulting in death without any other apparent cause other than vascular. Non-hemorrhagic stroke is a process of ischemia due to embolism, and cerebral thrombosis usually occurs after rest. There is no bleeding; ischemia can cause hypoxia, and secondary edema can occur.

Stroke risk factors are divided into major and minor elements. the primary factor is the dominant factor is usually the participant's disease, and the minor factor is that caused by lifestyle. Some of the problems that arise

due to stroke are biological, psychosocial, financial, economic, and spiritual. Symptoms that occur in stroke patients are neurological deficits that can be local or general and may be temporary or permanent; the stages of stroke are usually paralysis or decreased tendon reflexes in the extremities, the strength of the extremities is weakened, i.e., shrinkage of muscle mass or loss of muscle mass and weakness of grip strength.

Muscle strength is the ability of muscles to generate tension and energy while trying to maximize both dynamically and statically. In other words, muscle strength is the maximum ability of muscles to contract. Handgrip requires a combination of actions from several hand and forearm muscles, and this action is essential for daily activities. One exercise given to restore hemiparesis or seizure weakness in ischemic stroke patients is Range Of Motion (ROM), a practice performed to maintain or improve the normal and complete level of joint movement ability to increase muscle mass and muscle mass tone. ROM training given early can stimulate an increase in muscle strength (Putrawan & Kuswardhani, 2011).

Exercises to stimulate motor in the hands can be in the form of grip function exercises. The movement of clenching or holding hands tightly will move the muscles to help re-stimulate the brain's control over those muscles (Levine, 2009). According to Irdawati (2008), gripping exercises will stimulate muscle fibers to contract, with only a few muscular contractions each day, with cylindrical holding exercises will train sensory and motor receptors. Cylindrical Grip active ROM training is given to patients with inclusion criteria: no surgery, have a minimum muscle strength of 3.

Research on the Range of Motion has been done on stroke patients. A study was conducted on the effect of rubber ball exercise on the grip strength of Non-Hemorrhagic stroke patients. This indicates that there is a significant difference before and after the ROM exercise with the rubber ball for 10 minutes, with a p-value = 0.0001 (Dwi & agus Ariana, 2016; Prok, Gessal, & Angliadi, 2016). Range Of Motion Cylindrical Grip exercise can increase upper extremity muscle strength in Non-Hemorrhagic stroke patients

in hospital (Irawati, Sekarsari, & Marsita, 2017). In other research, hand and spherical grip exerted a more effective influence than therapy administration (Hapsari, Sonhaji, & Nurulia, 2020). Further research about Range of Motion on Stroke Patients have been done in a hospital and increase upper extremity muscle strength in Non-Hemorrhagic stroke patients (Ariastuti, Okvi, Kurniawati, & Aini, 2015; Aridamayanti, Nursalam, & Kurnia, 2020). Based on the background, this study's purpose was to determine the effect of cylindrical grip on the gripping power in stroke ischemic patients.

Research Method

The research design conducted is pre-experiment with pre-post test design. The method of this research is done observation (pretest) so that the researcher can test the changes that occur after the treatment. In this design, there is no control group. In this study, the population in this study is ischemic stroke patients obtained from medical record data in the hospital room of Cibabat Cimahi Hospital in 2018. Those diagnosed with ischemic stroke and hemiparesis are 148 people. The sampling technique used is purposive sampling with inclusion and exclusion criteria. The inclusion criteria in this study include: Upper extremity muscle strength ≥ 3 , awareness compos mentis be cooperative. Exclusion criteria: patients with paralysis not caused by a stroke, such as Parkinson's disease, fractures, dislocations, dermatoid arthritis, and AIDS. Based on these criteria with an extensive calculation of the sample using paired numerical scale analysis. The sample in this study was as many as 16 people with $Z\alpha = 15\%$ and $Z\beta = 20\%$.

The primary data used is the motor ability data of ischemic stroke patients collected directly by the researcher. First, fill in the initial assessment format that contains demographic data such as an address, medical record number, respondent initials, and time of stroke, which the researcher will fill. In this study, the process of data collection and collection was obtained using the following instruments: initial data assessment format/ characteristics of respondents that include:

demographic data such as respondent initials, medical record number, address, and stroke time filled by the researcher, format to assess grip strength with handgrip dynamometer, SOP training ROM Active Cylindrical Grip, Cylindrical devices, such as pipes lined with cloth for the comfort of patients. The handgrip measurement tool is a handgrip dynamometer and stopwatch. Ethical clearance for this research from Cibabat Hospital No. 070/1270/RSUD Cibabat.

Researchers observed by measuring the gripping force with a handgrip dynamometer before and after the intervention throughout the hospital. This study uses a group of interventions that have hemiparesis and have 3 (hand) muscle strength. Before and after being given intervention in the Active Cylindrical Grip ROM exercise, the researchers performed grip strength measurements on the research sample. Muscle measurements were served the first day before the intervention. Then the last measurement was performed on the 4th day after the intervention.

The data analysis used in this study is univariate and bivariate. Univariate analysis is used to explain or describe the mean grip strength (upper extremities/fingers) before and after given Active ROM Cylindrical Grip exercise in stroke patients in the hospital, and bivariate analysis is performed on two variables allegedly related or correlated. This test was conducted to prove the absence of the influence of categorical variables numerically because the independent variable in this study is the Active ROM Cylindrical Grip. The dependent variable in this study is the grip strength in ischemic stroke patients. This study using a non-parametric test with Wilcoxon Test.

Research Results

In the study conducted in the hospital room, Cibabat Cimahi Hospital to 16 ischemic stroke patients obtained more female respondents than male respondents, as much as 37.5% (6 people) and female respondents as much as 62.5% (10 people).

Table 1 Description of the mean value (mean) of the patient's gripping strength before and after performing the Active Cylindrical Grip ROM exercise in the hospital

Variable	Mean	S. D	Min - Max	95% CI
Pre	8,88	5,504	3,0 – 20,1	5,95 – 11,82
Post	11,06	7,259	3,0 – 26,4	7,20 – 14,93

From the results of the analysis, it is found that the mean grip strength of ischemic stroke patients before the active Exercise Cylindrical Grip ROM is 8.88 kg with the lowest grip strength is 3.0 kg and the highest grip strength is 20.1 kg, the standard deviation is 5,504 kg. The analysis results obtained average value (mean) grip strength of ischemic stroke patients after performing ROM Active Cylindrical Grip is 11.06 kg with the lowest grip strength is 3.0 kg and the highest grip strength is 26.4, the standard deviation of 7,259 kg.

Table 2 Effect of Active ROM Cylindrical Grip exercise on ischemic stroke patients in the hospital room of Cibabat Cimahi Hospital.

Variable	Mean	S.D	S.E	P value
Pre	8,88	5,50	1,37	0,001
Post	11,06	7,25	1,81	

Based on table 2 above, it is found that the average gripping strength before being given the Active Cylindrical Grip ROM exercise is 8.88 kg with SD 5.50 and SE 1.37. Meanwhile, the average gripping power after being given Cylindrical Grip Active ROM training is 11.06 kg with SD 7.25 and SE 1.81. The statistical test results obtained the value of p-Value of grip strength is 0.001, which means p-Value of grip strength <alpha (0.05). It can be concluded that there is a significant influence of Cylindrical Grip Active ROM exercise on grip strength.

Discussion

In table 1 can be seen the mean (average) grip strength of ischemic stroke patients who have paralysis or grip weakness before performing the Active Cylindrical Grip ROM exercise is 8.88 kg, with the lowest grip strength is 3.0, the highest is 20.1 kg. According to MRC (Medical Research Council), average muscle strength before performing the Active Cylindrical Grip ROM is included in degree 3 (three), which can move the muscle joints and resist gravity's influence but is not strong against the given prisoner.

It is found that about 70-80% of patients with stroke experience hemiparesis, recovery of patients with hemiparesis varies, and more than 50% have chronic motor function disorders. Patients with hemiparesis may have difficulty moving their limbs and may lose balance. Consequently, patients find it difficult to perform daily activities (Fatkhurrohman, 2011).

Based on the observation results, there were 16 respondents out of 10 women and six men before doing the Active Cylindrical Grip

12 ROM exercise. Tingling sensation in the area of the arm that suffers from weakness/hemiparesis, and the patient also feels annoyed because it takes hard work to be able to move some of the components. Hemiparesis is most common due to the blockage of arteries that enclose the primary motor cortex. The blood that should be in the clogged arteries, thus reducing the supply of nutrients, especially oxygen supply, allows nerve cells to die, which can lead to paralysis of the session. In addition, clogged blood will suppress the pyramidal system, which interferes with nerve infusion and the command given by the precentral gyrus. So, it is necessary to practice active ROM Cylindrical Grip to increase grip strength; grip strength measurement is done before given intervention and after given intervention with handgrip dynamometer tool, by pulling handgrip dynamometer spring that has been set age, gender, and lousy number and will appear grip strength value in units of kilograms (kg).

Based on the study results, there was an increase in grip strength after being given the Active Cylindrical Grip ROM exercise.

Increased grip strength is caused by the occurrence of muscle strength that increases voluntary movement, where voluntary action occurs due to the transfer of electrical implants and gyrus presentalis to the spinal cord through neurotransmitters that reach the muscle and stimulate the occurrence of movement.

After a stroke, normal muscle tone disappears. Without treatment, the patient will compensate for the movement by using the part of his body that is not paralyzed for the rest of his life; the paralyzed part of the body will remain paralyzed or can only walk with spastic legs (paralyzed) and deformed hands. Therefore, the way to minimize disability is with exercise therapy, which is essential to joint Exercise (ROM).

ROM exercises are performed to normalize the joint range of motion that causes the cartilage surface between the two friction bones. Emphasis on cartilage due to movement will push water out of the cartilage matrix into the synovial fluid. In addition, the joint activity will maintain the synovial fluid, which is the lubricant of the joint, so that the joint can move to the maximum. And the shortened muscle tissue will return to stretch slowly when doing ROM exercises.

Observation results from 16 respondents from 6 men and ten women after being given in the form of active ROM Cylindrical Grip using a cylindrical tool such as a pipe coated with a wash lap to correct the fingers to grasp perfectly done 2x a day on each exercise are instructed to hold for 5 seconds then relax, and do it seven times in 10 minutes. After four consecutive days of intervention, one patient did not experience an increase in grip strength, and 15 respondents slowly experienced an increase in grip strength, no tingling; the coupling was shown to begin to accept the disease. Cylindrical Grip Active ROM is performed when the patient has grip weakness and can not move his fingers to grip thoroughly; this exercise is a type of Power Grip Active ROM where this exercise uses a cylindrical tool (pipe) as a prisoner during grip strength training.

The results of the 16 respondents, six people showed a rapid increase of 3-6 kg, and ten people showed a slight increase of 0.4-1.6 kg after the Exercise of Active ROM

Cylindrical Grip. Some of the factors that can affect it are early handling, medication, rehabilitation therapy, coping, motivation to recover from family.

Based on the above description, it can be concluded that stroke patients with ROM active exercise Cylindrical Grip there is an increase because the patient continues to move his fingers that can not be transferred for four consecutive days with a frequency of 2x a day in 10 minutes with 7x repetitions in each exercise,

From the results of the analysis of research data conducted on 16 respondents on the stairs April 9 to April 20, 2018, in the hospital room Cibabat Cimahi Hospital obtained average value (mean) grip strength before training ROM Active Cylindrical Grip is 8.88 kg and average grip strength after doing Active ROM Cylindrical Grip exercise is 11.06 kg, it can be seen that the grip strength of the respondents increased 2.18 kg from 8.88 kg.

Based on table 2 shows from all respondents (16 respondents) obtained 1 (one) respondent have grip strength after doing the Active Cylindrical Grip ROM exercise did not change (same as) grip strength before doing the Active Cylindrical Grip ROM exercise. Meanwhile, 15 (fifteen) respondents after the Exercise ROM Active Cylindrical Grip have a higher grip strength (increased) than grip strength before the intervention.

Cylindrical Grip Active ROM training is a modular sensory stimulus of delicate touch and pressure at the end receptors of the encapsulated organ in the upper extremity. The response is delivered to the sensory cortex in the brain of the sensory pathway through the cell body on the C7-T1 nerve directly through the limbic system. Existing stimulus processing elicits a rapid response to the nerve to act on the stimulus. This mechanism is called feedback. In the short term, this exercise can increase grip strength, and in a long time, it can increase muscle strength, which is supported by previous research (Ariastuti et al., 2015; Aridamayanti et al., 2020).

In this study, the impact or influence that will occur directly can increase grip strength. Some of the factors that can affect are proper handling early, medication, rehabilitation therapy, coping, motivation to recover from

self and family. In cerebral hemorrhage (stroke), the disturbed perfusion site is determined by the area supplied by the blood vessels, so in therapy or Exercise ROM Active Cylindrical Grip, this researcher always involves his family members to provide motivation and enthusiasm in undergoing exercise programs given to speed healing.

In the recovery of limbs that experience weakness there are factors that affect the increase in grip strength; that is, the length of training can affect the results obtained. The duration of the exercise depends on the patient's condition. Still, the good is that the activity is not tiring. The time is not too long, but with as many repetitions as possible, the patient's coping with the disease, the cooperative attitude of the diving patient doing the Active ROM Cylindrical Grip exercise. While in patients who do not experience an increase in grip strength due to less suitable patients still can not accept the disease.

Repeated movement exercises create concentration to perform movements with the best quality possible. Repetitive and focused movements can establish new connections between motor systems and activate the spinal motor as the basis of recovery in stroke (Andarwati, 2013). Same with the other study, ROM can increase grip power for stroke ischemic patient (Aridamayanti et al., 2020; Irawati et al., 2017).

A related theory is a theory, which says that the Active ROM Cylindrical Grip exercise is an exercise to stimulate movement in the hand muscles in grip function exercises. This exercise is done in 3 stages: opening the hand, closing the fingers to grasp the object, and regulating the grip strength. This exercise is a functional exercise of grip strength by gripping a cylindrical object such as a pipe in the palm. Then, using the line on the ROM training, the grip of the distance between the hand's fingers becomes wider. And the muscles that influence this exercise are the abductor and adductor fingers and the flexors of the fingers.

Conclusion

There is an effect of Cylindrical Grip Active

ROM exercise on grip strength in ischemic stroke patients in hospital room Cibabat - Cimahi Hospital, after doing data analysis obtained significant difference between the median value of grip strength before and after with $p\text{-value} = 0.001$

The results of this study are expected to be one of the interventions in increasing grip strength. They can be used as a standard for hospitals, especially in inpatients diagnosed with stroke and hemiparesis, to experience faster functional improvement by doing an exercise that can increase grip strength; one of them is the Exercise of the Active ROM Cylindrical Grip so that the stroke patient increases his grip strength and in the long run will increase muscle strength and improve back to normal so that he can perform activities independently.

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