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Research Article

The Effect of Bridging Exercise on Muscle Strength and Body Balance in Stroke Patients at National Brain Center Hospital Prof. DR. Mahar Mardjono East Jakarta

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Abstract

Aims: The study aimed to determine the effect of bridging exercise on muscle strength and body balance in stroke patients at national brain center hospital Prof. DR. Mahar Mardjono East Jakarta.

Methods: This study used experimental design aimed to test the application of bridging exercise to body balance and muscle strength in stroke patients. This study was conducted in one group with pre and post-test design. This study was conducted at National Brain Center hospital Prof. DR. Mahar Mardjono East Jakarta. The bridging exercise was conducted at 2-weeks, with light to moderate intensity, three times a week, with 30 to 45 minutes every session.

Results: The result of the statistical test with the Paired Samples t-Test P value resulted in 0.001. These result mean that bridging exercise has a significant effect on muscle strength in stroke patients with a mean difference of -0.63 (CI: -0.91-0.34) and a significantly improved the balance of patients with a mean difference of 17 (CI 12.1-21.9) and a high magnitude of effect (1.69).

Conclusion: These result mean that bridging exercise has a significant effect on muscle strength in stroke patients.

Keywords:

Bridging Exercise, Muscle Strength, Body Balance, Stroke Patients

INTRODUCTION

A stroke is defined as a disruption of the blood supply to the brain which is usually due to rupture of a blood vessel or blockage by a blood clot. This causes disruption of oxygen and nutrient supply in the brain to damage brain tissue. World Health Organization (WHO) data in 2012 shows about 31% of 56.5 million people or 17.7 million people worldwide died from heart and blood vessel diseases. Of all deaths from cardiovascular disease, 7.4 million were caused by coronary heart disease, and 6.7 million were caused by stroke. Stroke is the third leading cause of death in developed countries, where 10 to 12% of all deaths are caused by stroke with a crude

mortality rate of 50 to 100/100000 patients (1).

Meanwhile, in 2018 the prevalence of stroke increased from 7% to 10.9%. Riskesdas data in 2018 stated that the East Kalimantan region was the highest area for stroke with (14.7%), followed by Yogyakarta (14.3%), Bangka Belitung and DKI Jakarta respectively (11.4%) and Bali was in 17th position with (10.8%). The results of Basic Health Research in 2018, showed 10.9% or 713,783 Indonesians experienced stroke. While West Java Province has a prevalence of stroke patients based on a doctor's diagnosis as much as 11.4% or counted 131,846 West Java residents who have had a stroke. While in

Sumedang Regency the number of stroke patients in 2019 counted 3,988 people, with the highest number of sufferers found at Tanjungsari Health Center, Cimanggung Health Center, and Buahdua Health Center.

Stroke patients experience abnormalities of the brain so that the nervous system that controls and triggers movements of the neuromuscular system. Clinically, the symptoms that often appear are the presence of hemiparesis or hemiplegi which causes the loss of normal postural reflexes for balance and body rotation for functional movements of the extremities. Post-stroke sensory and motor disorders cause balance disorders including decreased muscle strength. As well as impaired motor control in stroke patients resulting in loss of coordination, as well as loss of body balance ability and posture, and also cause permanent physical disability. According to rika et al (2,3) the consequences that often occur in stroke patients are hemiplegia or hemiparesis, even 80% of strokes suffer from hemiparesis which means one side of the body is weak or even paralyzed. Which is caused due to nerve damage due to post stroke.

Strokes that do not get good treatment will cause various levels of disorders, such as decreased muscle tone, loss of sensibility in some limbs (4,5). Decreased muscle strength caused by reduced muscle contractions due to obstruction of blood supply to the brain. So this is what causes neuromuscular disorders in stroke patients so that physical mobility disorders occur.

The results of a preliminary study conducted at the National Brain Center Hospital, researchers observed and interviewed five patients in the neurology treatment room, the results of observations and interviews were found that the patient's family said they still did not understand how to care for stroke patients at home. It can be seen that patients who will go home while standing or walking are still rocking. Rehabilitation programs carried out in hospitals are also inadequate to help post-stroke patients, especially

patients who rarely re-control. Many post-stroke patients do not re-control due to cost, distance, and time constraints. Bridging exercise will be able to be applied by post-stroke patients with the help of family when at home. With regular exercise will be able to increase muscle strength and patient balance so as to accelerate the patient's ability to walk.

Data on the number of ischemic stroke patients are taken from data on the 10 most diseases in PON Hospital and for ischemic stroke patients in the first sequence sequence. Data on the number of ischemic stroke patients were obtained in 2022 with details in January as many as 366, February as many as 280, March as many as 377, April buran as many as 323, May as many as 362, June as many as 350, July as many as 377, August as many as 363, September as many as 372, October 393, November as many as 346, and in December as many as 381 so the total patients during 2022 were 4290 with an average of 357 / month.

Post-stroke attacks take a long time to recover and obtain maximum self-adjustment function. One way that can be given to stroke patients is joint mobilization with Range of Motion exercises. Regular physical exercise is an effort of rehabilitation therapy that is generally recommended to be done post-stroke in addition to drug medication efforts. Physical therapy is generally done in the form of sitting exercises alone, standing up from a seat, and walking. Other physical therapy includes activities of daily living (ADL) such as bathing, eating, urinating, dressing and dressing up, as well as practicing hobby activities such as cooking and gardening (6,7).

Bridging exercise is an appropriate technique to strengthen the muscles around the lumbar and pelvic veterbra columna, especially for stroke patients with impaired balance and increase muscle strength. Bridging exercise refers to muscle control used to maintain stability around the lumbar and pelvic columna veterbra. This study was conducted to evaluate the effects

of Bridging exercise programs that can improve core muscle stability in stroke patients. In the treatment of stroke patients, posture control is very necessary to perform movements functionally in maintaining an upright sitting position. The procedure for this exercise is to sleep on your back with both legs bent, and both hands crossed in front of the chest or it could be that both hands are beside the body. Tighten the abdominal muscles and then lift the pelvic from a neutral position until the pelvic does not touch the floor with the main purpose to help improve muscle strength and body balance (8,9).

Based on the description above, it is an important reason for further research related to the effect of bridging exercise on muscle strength and body balance in stroke patients at the National Brain Center Hospital.

METHODS

Study design

This study used experimental design aimed to test the application of bridging exercise to body balance and

muscle strength in stroke patients. This study was conducted in one group with pre and post-test design. This study was conducted at National Brain Center Hospital Prof. DR. Mahar Mardjono East Jakarta. The bridging exercise was conducted at 2-weeks, with light to moderate intensity, three times a week, with 30 to 45 minutes every session.

Sample

Sample in this study was patients diagnosed with stroke hospitalized at National Brain Center Hospital Prof. DR. Mahar Mardjono East Jakarta. The inclusion criteria were age above 18 years old, able to do exercise, muscle stage above 4 (scale 1 to 5). Patients with complication were excluded from this study. The convenience sampling was used to select participants.

Data analysis

A descriptive statistic was used to describe demographic and clinical outcome of the study. The statistical test used is the Paired Samples t-Test to determine the change before and after intervention. SPSS version 23 was used to analyze the data.

RESULTS

a. Respondent Characteristics

Table 1. Frequency Distribution of Respondent Characteristics by Age, Sex, and Education (n=19).

Variable	N (%) / Mean(sd)
Age, mean (sd) Age Range	44-67
Gender, n (%)	
Male	15 (78,9)
Female	4 (21,1)
College	
Elementary	10 (52,6)
Education	9 (47,4)

The majority of patients aged 44 years (0.78) with an age range of 44-67 years, were male (78.9), with an average education level of primary education namely junior high and high school (52.6)

b. Effect of bridging exercise on muscle strength and balance in stroke patients

Table.2 Effect of bridging exercise on muscle strength and balance in stroke patients before and after intervention

Variable	N	Mean (dif)	SE (dif)	95% CI	Effect Size	P value
Muscle strength	19	-0,63	0,13	-0,91-0,34	-1,06	0,001*
Balance	19	17	2,34	12,1-21,9	1,69	0,001*

DISCUSSION

a. Characteristics of Respondents

This result is in accordance with research conducted by Hanum (10) that out of a total of 110 respondents stroke sufferers 86.4% (95 people) were female and 13.6% (15 people) were male. Although stroke mostly affects people aged 65 years or older, about 10% of strokes are experienced by those who are 45 years old and women are more at risk than men. According to (American Heart Association) every year there are more than 100,000 men under 65 years will suffer a stroke. That is, men are estimated to be more at risk than women. Other causes in men more at risk of having a stroke are lifestyle such as smoking, high blood pressure, high cholesterol and diabetes.

According to researchers, gender is very influential on muscle strength and balance disorders that will have an impact on the risk of falling in stroke patients, especially in women. Given to women there are certain hormones that can cause balance disorders which will later affect the incidence of fall risk in stroke patients. For the average level of basic education, namely junior high school and high school, it is 10 (52.6). This is relevant to Patricia (11) research, (interview results that most have low education (junior high and high school) as many as 53 people with a percentage of 53.6% so that the knowledge obtained is only limited to listening to explanations delivered by

puskesmas officers. This is in accordance with the theory put forward by Notoatmodjo (12) that education is an effort to provide knowledge so that positive behavior increases, in this case regarding the prevention of fall risk.

According to researchers, education can affect muscle strength and balance disorders. Because stroke patients who have a higher level of education may have more knowledge levels so that they experience a lower risk of falling because they can better understand a risk and threat that will occur. For the age of respondents, the average mean deferran is 1.05 (0.77) with a minimum age of 44 years and the highest is 67 years old. The results of this study are in accordance with data obtained from the American Stroke Association, stroke can attack all ages, the older the greater the risk of having a stroke. The risk of stroke doubles after age 55. Every 10 years old is both male and female.

Based on data from Basic Health Research in 2013 shows the prevalence results of around 65% of strokes occur in individuals over the age of 65 years. Based on research conducted by Kabi, Tumewah, & Kembuan (13) on 60 stroke patients in Manado, the number of stroke patients is in middle age (30-50 years) and old age (61-65 years). This is in line with research conducted by Usrin, Mutiara, & Yusad (14) on 244 stroke patients who found that 233 respondents (95.5%) were at the age of 40-60 years and the rest (4.5%) were at

the age of <40 years. This is relevant to research by Sacco (15) said that increasing age is closely related to a person's physical immobility which will later affect the incidence of fall risk, where old age can cause stiffness in the muscles, pain and pain when moving for elderly patients.

b. Muscle Strength

Based on the results of the application of EBNP showed that the frequency of muscle strength of respondents with a mean difference of -0.63 (CI: -0.91-0.34) and a high magnitude of effect based on Cohen's d (-1.06). According to Akuthota in Seong-Hun Yu (9), that bridging exercise is proven to improve the stability of the lumbar and pelvic vertebrae column. The results of a study conducted by Seong-Hun Yu (9), on 20 hemiplegic patients showed that bridging exercise effectively increased the activity of the column muscles of the lumbar and pelvic vertebrae given 5 times a week.

In stroke patients there is a decrease in muscle strength. This will cause the patient to be unable to use his muscles maximally so that patients tend not to use them. When muscles are not used, there will be a decrease in muscle strength of about 5% in each day or after 2 weeks can decrease by about 50%. This situation will aggravate the patient's condition and will further interfere with the patient in ambulation, let alone carry out daily activities.

So a special exercise program is needed that functions to maintain muscle strength or strengthen the weak muscle part, for example with bridging exercises. Post-stroke patients who have muscle weakness have various types of ADLs, for example, patients who previously could not wear their own pants after being given Bridging Exercise exercises can already wear their own pants without the help of others. As for patients who if they want

to get out of bed are helped by someone to get up sitting but after being given Bridging Exercise exercises can get up standing sitting by themselves without the help of others. Efforts to treat physiotherapy on glutei muscle weakness in post-stroke patients can be done using Bridging Exercise therapy techniques, because based on this study has shown the effect of bridging exercise therapy techniques on increasing glutei muscle strength in post-stroke patients.

In addition, this is consistent with the idea of bridging exercise, which states that bridging plays a significant role in maximizing the function of the core muscles (especially the erector spine muscle group, the abdominal muscle group, and the pelvic muscle group) while simultaneously carrying out a variety of primary activities to enhance muscle strength. The year 2013's Seong-Hun Yu. When provided to individuals who have suffered a stroke, bridging exercises are an effective method for isolating and strengthening the gluteus and hamstring muscles, which are located at the rear of the upper leg. Bridging exercises are used for stability and strengthening exercises that target the abdominal muscles as well as the lower back and hip muscles. If they are performed correctly, they are employed for these purposes at the same time. Bridging exercises are considered to be fundamental rehabilitation exercises since they are designed to promote stability or balance, as well as spinal stabilization, which then leads to an improvement in muscle strength.

c. Balance

On the basis of the findings of the application of EBNP, it is demonstrated that the frequency of balance among respondents is different 17 (with a confidence interval ranging from 12.1-21.9), and the magnitude of the effect is strong (1.69). Because Bridging

Exercise serves to increase the stability of the pelvic area and exercises to strengthen the abdominal muscles and muscles of the lower back and hip. Bridging Exercise is considered to be a fundamental exercise to improve stability or balance and stabilization of the spine. The improvement of sitting and standing balance that occurred after receiving eight treatments is a result of this. Research carried out by Seong-Hun Yu (2013) on twenty stroke patients demonstrated that bridging exercise significantly enhanced the activity of the lumbar and pelvic vertebral column muscles when performed five times per week. This finding is in agreement with the findings of the aforementioned research.

Within the context of stroke patients, nurses have the ability to do a variety of forms of exercise, one of which is bridging exercise (BE). According to Anderson (16), BE is frequently utilized in the field of lumbopelvic stabilization therapy due to its ability to assist in the coordination of muscle development both in general and locally. According to the findings of research conducted by Song and Heo (9) on the effects of BE modification for post-stroke patients, it has been determined that BE improves the balance of stroke patients who experience hemiplegic symptoms.

Bridging exercise is one of the exercise therapies that can be used, particularly to get patients to improve their balance. According to (17), bridging exercise is a type of exercise that promotes the strengthening and stabilization of the gluteus, hip, and lower back. Bridge exercises are used for stability and strengthening exercises that target the abdominal muscles as well as the lower back and hip muscles, including the hamstring, m. iliopsoas, m. rectus femoris, m. gluteus medius, m. gluteus minimus, m. semitendinosus, m. semimembranosus, and m. bicep

femoris. If performed correctly, bridging exercises are used for these exercises. In conclusion, bridging exercises are considered to be fundamental exercises that should be performed in order to enhance stability, balance, and the stabilization of the spine.

d. The effect of bridging exercise on muscle strength in stroke patients

The Paired Samples t-Test yielded a P value of 0.001. The findings indicate that the use of bridging exercise has a notable impact on muscle strength in stroke patients, with a mean difference of -0.63 (CI: -0.91-0.34) and a substantial effect size according to Cohen's d (-1.06). This aligns with the concept of Bridging Exercise, which emphasizes the crucial role of Bridging in optimizing the functioning of core muscles, including the erector spine muscle group, abdominal muscle group, and pelvic muscle group. The primary objective of Bridging Exercise is to enhance muscle strength. The research conducted by Dian Anggraini (18) provides evidence that the Bridging Exercise intervention has a notable impact on muscle strength, both before and after the intervention.

Stroke patients experience reduced muscle strength, leading to physical limits that impair their capacity to do activities of daily living (ADL). This self-care deficit significantly affects the patient's ability to independently care for themselves. Orem's nursing philosophy places significant emphasis on the significance of patient self-care in order to address self-care deficits. Orem stated that a self-care deficit refers to the discrepancy between an individual's capacity to carry out essential self-care activities (self-care agent). Orem underscored the significance of collaboration between nurses and patients, with the ultimate goal of fostering patients' autonomy in self-care, thereby elevating the role of



patients above that of nurses. Enhancing patient autonomy in self-care is anticipated to improve the patient's capacity to fulfill their activities of daily living, hence minimizing self-care deficiencies.

Conceptually, nursing care for stroke patients with stable conditions includes monitoring vital signs and neurological status, performing Bridging Exercise (BE) exercises, positioning, and observing complications. In the post-acute phase, nursing care is shown to maintain body functions and prevent complications. Stroke can have effects on various bodily functions. Motor deficits are the most obvious effects of stroke, which include impairment: mobility, respiratory function, swallowing and speech, gag reflex and functional ability.

e. The effect of bridging exercise on body balance in stroke patients

The Paired Samples t-Test yielded a P value of 0.001, as determined by statistical analysis. The findings indicate that the bridging exercise had a substantial positive impact on the balance of patients, with a mean difference of 17 (CI 12.1-21.9) and a large effect size (1.69). This aligns with the concept of Bridging Exercise, which emphasizes the crucial role of Bridging in optimizing the function of core muscles, including the erector spine muscle group, abdominal muscle group, and pelvic muscle group. The primary objective of Bridging Exercise is to enhance muscle strength. This remark aligns with the findings of Hayuningrum (19) research conducted in 2023, which reported statistically significant results with a p-value of 0.001, indicating a level of significance below the threshold of 0.05. Consequently, Bridging Exercise has a discernible impact on the balance of individuals who have experienced a stroke.

This aligns with the Bridging Exercise idea, which plays a crucial role in optimizing the function of core muscles during different activities, particularly for maintaining balance while sitting and standing. These muscles collaborate to provide a force that strives to uphold the spine in accordance with symmetrical body alignment and enhance its stability, so facilitating efficient and effective body movement.

The increase in core muscles can also cause an increase in nerve conductivity, so as to improve intermuscular coordination and can also increase reaction speed which will increase work mobility in balance function. This happens because when a muscle contracts, there is a stretch or stretch of the antagonistic muscles. In addition, the strength and flexibility of the two are interrelated. Automatically, if someone does strength training also affects flexibility, and vice versa, if someone does flexibility training will also affect strength. Core Stability Exercise can improve muscle strength, agility, speed, flexibility, and neuromuscular coordination, thereby improving the ability to maintain balance.

Various exercises such as exercises with special movements such as stimulus and exercises using Bridging Exercise and / or core stability exercise and other methods are exercises to activate brain memory. Various kinds of brain activation are rife, namely as an effort to activate the brain so that it is in accordance with what is desired.

Brain activation is very possible to do, because the brain has a very special property, namely the brain is an easily adaptable organ even though the neurons in the brain have died not regenerating. The ability of neuroplasticity and neurogenesis in the brain allows certain parts of the brain to take over the function of the damaged parts. So that parts of the brain like learning new abilities. This is the most important mechanism that plays a role in stroke recovery.



CONCLUSION

The results of the statistical test with the Paired Samples t-Test P value resulted in 0.001. These results mean that bridging exercise has a significant effect on muscle strength in stroke patients with a mean difference of -0.63 (CI: -0.91-0.34) and a magnitude of high effect based on Cohen's d (-1.06). In addition, bridging exercise also significantly improved the balance of patients with a mean difference of 17 (CI 12.1-21.9) and a high magnitude of effect (1.69). The bridging exercise intervention provided in EBNP did not have a negative impact on respondents either physically or psychologically respondents. The bridging exercise intervention provided can be implemented anytime and anywhere.

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