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EFFECT OF INCREASING MUSCLE STRENGTH IN ACUTE ISCHEMIC STROKE WITH EARLY PASSIVE EXERCISE IN DR. MOEWARDI SOLO HOSPITAL

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Abstract

Introduction: Cerebrovascular disease is the second leading cause of death and the third most common cause of disability in the world. In developed countries, one in four men over the age of 85, and one in every five women over the age of 85 have a stroke. Research in Iran shows that 139 out of 100,000 people each year suffer a stroke. Damage to the cerebral can be classified into Ischemic Stroke (IS), which consists of 87% of cases and is caused by thrombotic occlusion of arteries and veins; or Intracerebral Hemorrhagic Strokes (ICHS), which comprise 13% of cases and are caused by rupture of blood vessels by hypertension or aneurysms, trauma, and translucent brain injury. Ischemic stroke is the death of brain tissue due to impaired blood flow to the brain, caused by clogged cerebral or cervikal arteries.
Case Presentation: 72 year-old female office came to the hospital with complaints of difficulty moving the left side of her limbs, difficulty speaking, and the condition was so weak that it was difficult to respond. She is being hospitalized about 7 days and her condition still weak and hard to response.
Management and Outcome: This therapy is carried out 3 times with a duration of exercise of 20 minutes. Muscle strength examination in acute stroke cases is measured using the Oxford Scale and level of neurological deficits measured using National Institute of Health Stroke Scale (NIHSS).
Discussion: Muscle strength is strongly related to the neuromuscular system which is how much the nervous system can activate muscles to contract, so the more muscle fibers are activated, the greater the strength that the muscles produce. Thus, the more muscle fibers are activated, the greater the force produced by the muscles. In addition, the benefits of early passive exercise in stroke patients can also increase or maintain flexibility and muscle stiffness, maintain heart and respiratory function, prevent stiffness in joints, stimulate blood circulation, and prevent deformities, stiffness and contracture.
Conclusion: physiotherapy program in acute stroke cases who are still hospitalized three times using Early Passive Exercise can increased muscle strength, and for neurological deficits still in the very heavy category. This therapy is advised to continue to be done in order to achieve the goal of patient recovery.

Keyword: ischemic stroke, acute stroke, early passive exercise.

Introduction

Cerebrovascular disease is the second leading cause of death and the third most common cause of disability in the world. In developed countries, one in four men over the age of 85, and one in every five women over the age of 85 have a stroke. The results of research in Iran show that 139 out of 100,000 people each year suffer a stroke (Hosseini, Peyrovi, & Gohari, 2019).

Damage to the cerebral can be classified into Ischemic Stroke (IS), which consists of 87% of cases and is caused by thrombotic occlusion of arteries and veins; or Intracerebral Hemorrhagic Strokes (ICHS), which comprise 13% of cases and are caused by rupture of blood vessels by hypertension or aneurysms, trauma, and translucent brain injury. Although ICHS is less common, ICHS is five times more fatal than IS (De Athayde Costa E Silva et al., 2020).

Ischemic stroke is the death of brain tissue due to impaired blood flow to the brain, caused by clogged cerebral or cervikal arteries (Brenner & University, 2018). Ischemic stroke occurs in blood vessels that have blockages that cause reduced blood flow in brain tissue, brain thrombosis, atherosclerosis, and cerebral embolism which is a blockage of blood vessels arising from the formation of plaque so that there is a narrowing of blood vessels (M.Syikir, Rusman, Andi, 2017).

According to the theory put forward by Monakow in the twentieth century, local damage to brain tissue leads to depressed motor cortex function, and a temporary reduction of blood flow and metabolism in the opposite hemisphere of the brain (Ogonowska & Uczciwek, 2018).

The occurrence of motor defects in the upper and lower extremities after stroke and damage to the motor cortex is common. Hemiparesis, paralysis, weakness, abnormal muscle tone, spasm, abnormal posture, synergistic muscle abnormal function, and loss of interjoint coordination are the most common injuries due to damage to the motor cortex (Lee, Jakubowski, Spear, & Rymer, 2019). Therefore, initial stimulation is given to the patient to stimulate the mechanism of brain plasticity, which as a result of which will be reproduced later in the rehabilitation period. It has been hypothesized that the mechanisms of effect of active and passive motion training on the nervous system are the reactivation of existing neural connections, the development of new connections, and the regeneration of aksonal (Vér et al., 2016). Physiotherapy is a key component of stroke rehabilitation focusing on restoring physical function for stroke patients and playing a positive role in improving independent life. Intensive physiotherapy after a stroke has been associated with decreased morbidity and mortality and an increase in daily life activities. Physiotherapists serve as an important driver of mobility in the acute phase of stroke care. In fact,

early mobilization and functional training provided by physiotherapists are considered the most important aspects of acute care at the Stroke Union (Olaleye & Lawal, 2017).

According to Cramer, the golden time to start a rehabilitation program is in its early days. Also, the findings of studies on therapeutically induced brain plasticity in chronic stroke patients may not be generalized to patients early after stroke. Early passive range exercise improves motor function of stroke patients within three months after the event (Hosseini et al., 2019). This study aims to determine the effect of early passive range of motion exercises on muscle strength of stroke patients.

Case Presentation

On Wednesday 2 June 2021, 72 year-old female office came to the hospital with complaints of difficulty moving the left side of her limbs, difficulty speaking, and the condition was so weak that it was difficult to respond. Then the patient was taken to Moewardi Hospital and further examination was carried out. The results of the examination doctor stated that the patient had an Ischemic Stroke and was advised to be hospitalized. In addition to ischemic stroke, in the lungs of patients are also found to be lumps that have not been identified. Currently (June 9, 2021) the patient's condition is still being treated in the stroke ward with a very weak condition, unable to respond, low level of consciousness, and difficulty moving the left body. Previously the patient had never felt any complaints. Patients have a history of hypertension and diabetes mellitus. The patient denies having no family history of illness and a history of the disease in the past. Examination revealed that the patient's left limb had weakness and had not yet occurred spastic. patient's blood pressure when examined 140/85 mmHg. The results of muscle strength examination with oxford scale resulted in a value of 0 and the neurological degree measured using National Institute of Health Stroke Scale (NIHSS) resulted in a score of 37 which means having a very heavy neurological deficit.

Management and Outcome

The patient undergoes treatment with an early passive exercise range of motion on the entire regio on the left side of the body. This therapy is carried out 3 times with a duration of exercise of 20 minutes. Muscle strength examination in acute stroke cases is measured using the Oxford Scale by involving testing the main muscles of the upper and lower extremities against the examiner's resistance and assessing the patient's muscle strength on a corresponding scale of 0 to 5 : No muscle activation. 1) Signs of muscle activation, such as twitching without reaching the full range

of motion. 2) There is activation of muscles without defying gravity but reaching full range of motion. 3) Activation of muscles against gravity, full range of motion. 4) Activation of muscles against some resistance, full range of motion. 5) Activation of muscles against full prisoner examiner, full range of motion (Hosseini et al., 2019). The results of the muscle strength measurement can be seen in figure 1.

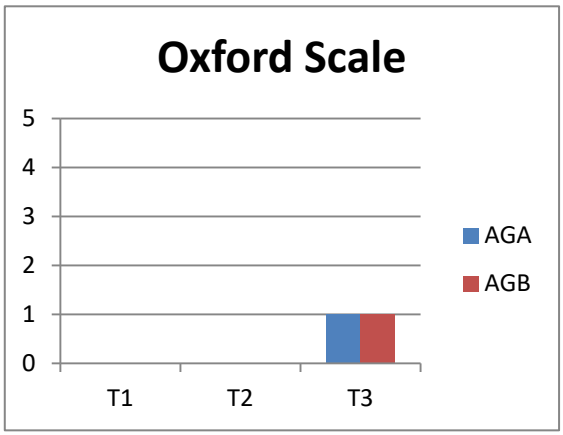

Figure 1 Examination of Muscle Strength

In addition to muscle strength examination, examination of the level of neurological deficits also needs to be considered to determine the severity of stroke suffered. NIHSS is the most widely used measuring instrument to show the severity of stroke deficits and the dominant predictor of patient functional outcomes. NIHSS is also widely used to assess severity in patients with acute ischemic stroke. At present NIHSS is widely used routinely to assess the severity of stroke in stroke service centers (Saber & Saver, 2020). There are 11 items in the NIHSS assessment including: level of consciousness, best gaze, visual field testing, facial paresis, arm and leg motor function, limb ataxia, sensory, language, dysarthria, extinction, and inattention. NIHSS has a maximum score of 42 and a minimum score of 0. Interpretations of NIHSS are: >25 scores are very heavy, 14-25 weight, 5-14 medium, and < 5 light (Jojang, Runtuwene, & P.S., 2016). NIHSS measurement results can be seen in figure 2.

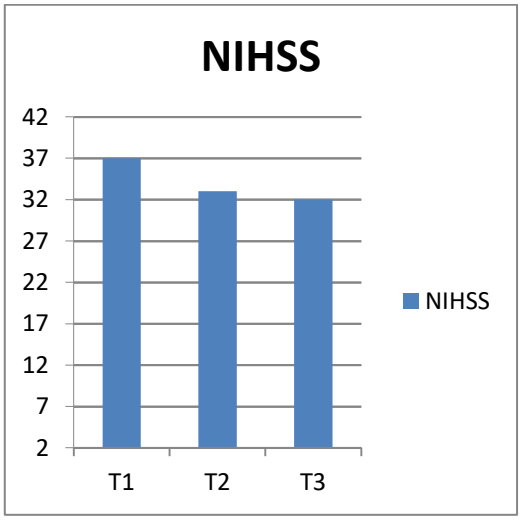

Figure 2 Neurological Deficit Examination

The graph above shows a decrease in NIHSS scores. In T1 NIHSS score 37, on T2 NIHSS score 33, while in T3 score 32. The interpretation of NIHSS score >25 is interpreted as very heavy neurological deficit. In nihss score from T1 to T3, stroke degree is still the same in the category of very heavy neurological deficit.

When the first exercise is performed, the patient's condition is still very weak, difficult to receive a response, and difficulty opening the eyes. Patients are also still fitted with infusions, catheters, and cutlery. This exercise is done carefully because the patient's condition is still bad. After the second therapy, the patient has started to respond by opening his eyes and moving his mouth. However muscle strength is still 0 and there is no sign of muscle tone. In the third therapy the patient's condition began to improve by responding using a head shake and there were signs of increased muscle tone in the upper extremity and lower exteremity.

Discussion

Early passive exercise intervention in acute ischemic stroke patients has a good effect on muscle strength. The occurrence of motor defects in the upper and lower extremities after stroke and damage to the motor cortex is common. Hemiparesis, paralysis, weakness, abnormal muscle tone, spasm, abnormal posture, synergistic muscle abnormal function, and loss of interjoint coordination are the most common injuries due to damage to the motor cortex (Lee et al., 2019). Therefore, initial stimulation is given to the patient to stimulate the mechanism of brain plasticity, which as a result of which will be reproduced later in the rehabilitation period. It has been hypothesized that the mechanisms of the effect of passive motion exercises on the nervous system are the reactivation

of existing neural connections, the development of new connections, and the regeneration of aksonal. In particular, afferent feedback from the afferent muscle spindle largely facilitates motoneuron, results in muscle activation in response to lengthening (stretch reflexes) and cannot be responsible for muscle activation in response to passive muscle shortening. Aferent Ib tendon organs are inhibitors to homonymous motoneuron and are usually debilitating, rather than fully suppressing the facilitation of muscles triggered by stretching.

Under certain conditions, afferent feedback from the afferent tendon organs can be facilitation (Levin, Solomon, Shah, Blanchette, & Feldman, 2018). Passively shortening muscle activation can be explained by paying attention to how inter-muscle interactions are controlled under normal conditions and how they change after a stroke. Shortening reactions are considered the result of internaleuron activation through stretched muscle afferents that facilitate muscle motoneuron and its antagonists (Kim, Lee, & Sohng, 2014). Muscle strength is strongly related to the neuromuscular system which is how much the nervous system can activate muscles to contract, so

the more muscle fibers are activated, the greater the strength that the muscles produce. Thus, the more muscle fibers are activated, the greater the force produced by the muscles (Wist, Clivaz, & Sattelmayer, 2016). In addition, the benefits of early passive exercise in stroke patients can also increase or maintain flexibility and muscle stiffness, maintain heart and respiratory function, prevent stiffness in joints, stimulate blood circulation, and prevent deformities, stiffness and contracture (Rita, 2016).

Conclusion

After a physiotherapy program in acute stroke cases who are still hospitalized three times using Early Passive Exercise, muscle strength (oxford scale) increased from T1 with a value of 0 to a value of 1 in T3. Then for the degree of stroke (NIHSS) in T1 to T3 is still in the very heavy category. This therapy is advised to continue to be done in order to achieve the goal of patient recovery.

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