

Management of Physiotherapy in Post Stroke Patients Hemiparese Sinistra et Causa Non-Hemorrhagic with Infrared and Exercise Therapy

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ABSTRACT

Stroke is a neurological deficit that occurs suddenly caused by a vascular disorder in the form of a lack of oxygen supply to the brain, resulting in damage or necrosis of brain tissue. Problems that arise in stroke sufferers include weakness on their side of the body, which causes balance disturbances until independence is reduced so that they will need the help of others. Therefore, the provision of infrared and exercise therapy interventions aims to increase muscle strength, improve body balance and restore functional activity ability. This study uses a case study approach, raises patient cases and collects data through the Physiotherapy process. The modalities provided are infrared and exercise therapy in the form of resisted exercise, CIMT, and bridging exercise. After 4 times of Physiotherapy, there was an increase in muscle strength. Still, there was no improvement in balance based on the Berg Balance Scale, and there was no increase in functional activity based on CAHAI and Barthel Index. Management of physiotherapy with infrared and exercise therapy carried out in the post-stroke hemiparese Sinistra et causa NonHemorrhagic for 4 times of therapy can increase muscle strength. Still, there has been no improvement in functional activity abilityDA.

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Introduction

The rise of unhealthy lifestyles such as consuming high-calorie fast food and snacks containing high-fat content, becoming addicted to alcohol and soft drinks, overwork, lack of exercise, and depression to staying up often have successfully led to stroke becoming the number one cause of disability and the third most cause of death in the world after heart disease and cancer. both in developed and developing countries.

According to World Stroke Organization (2022), Noting that the prevalence of stroke in men is (77.0 million) outstripping the number in women (66.0 million) at the global level; the estimated number of incidence and prevalence of stroke is higher in women (6.4 million stroke incidents and 56.4 million general strokes) than in men (5.8 million stroke incidents and 45.0 million general strokes). The gender difference is quite striking in the number of stroke-related deaths. Although the incidence rate by age standard does not differ significantly between men and women, the death rate according to the age standard is greater in men than in women.

According to Kementerian Kesehatan Republik Indonesia & Badan Kebijakan Pembangunan Kesehatan (2023), Data in the 2023 Indonesia Health Survey (SKI) shows that the prevalence of stroke based on doctor's diagnosis in the population aged 15 years and over throughout Indonesia is recorded at 638,178 residents. The province with the highest prevalence of stroke is West Java, which has 114,619 residents—followed by East Java province with 98,738 residents. The third place is occupied by Central Java Province, with a total of 88,180 people with stroke. Stroke is the cause of death in almost all hospitals in Indonesia. The incidence of stroke increased sharply by 14.5% in Indonesia. Even today, Indonesia is the country with the most significant number of stroke sufferers in Asia.

Stroke is an acute neurological disorder caused by cerebral circulatory disorders, which suddenly (within a few seconds or minutes) causes symptoms and signs that correspond to the focal area in the brain that is damaged. Cerebral circulatory disorders can be caused by blood clot blockages, narrowing of blood vessels, blockages, and narrowings, or rupture of blood vessels, leading to a lack of adequate blood supply (Fitriyani & Salsabila, 2018).

After data collection at Permata Medika Hospital, a patient named Mr. S Diagnosa Post Stroke Hemiparese Sinistra et causa Non-Hemorrhagic, had problems, namely a decrease in muscle strength and a decrease in functional ability such as walking. Physiotherapy can play an important role in overcoming these problems to overcome problems in the patient's condition and restoring the ability to function in the condition of Post Stroke Hemiparese Sinistra, et causa Non-Hemorrhagic patients using infrared and exercise therapy in the form of resistance exercise, bridging exercise, and constraint-induced movement therapy (CIMT).

This study offers a novel approach by focusing on the combined use of infrared therapy, resistance exercise, bridging exercise, and CIMT in non-hemorrhagic post-stroke patients. While each modality has been studied separately, this research aims to investigate their combined effects on improving muscle strength, balance, and functional activity in a real-world case study. The study also highlights the long-term potential of these therapies when applied together, providing new insights into how this combination can maximize recovery outcomes for post-stroke patients with non-hemorrhagic hemiparesis.

Based on the background description that has been submitted, the author is interested in raising the title "Management of Physiotherapy in Post Stroke Patients Hemiparese Sinistra et causa Non Hemorrhagic with Infrared, and Exercise Therapy." The formulation of the identified problem is how to manage physiotherapy in non-hemorrhagic hemiparese sinistra et causa post-stroke patients using infrared and exercise therapy. The purpose of this study is to explore and understand in depth the physiotherapy management process applied to patients with these conditions, especially in the use of infrared and exercise therapy, and to evaluate the effectiveness of these methods in improving clinical outcomes in patients.

Research Methods

Case Reports

From the anamnesis, data was obtained that the patient was Mr. S, aged 68 years, male, Muslim, domiciled in Boja, Kendal, Java, Tengah. Before falling ill, the patient used to be a farmer; now, the patient rests at home and only becomes the head of the household after falling ill. Before falling ill, patients like to consume durian fruit and chicken innards satay. The patient was diagnosed with post-stroke hemiparesis sinistra et causa non-hemorrhagic disease. Clinical records were obtained from the results of the first CT scan on October 10, and the results of infarction in the right corona radiata were obtained. Then, the patient gets a medicamentosa from a neurologist.

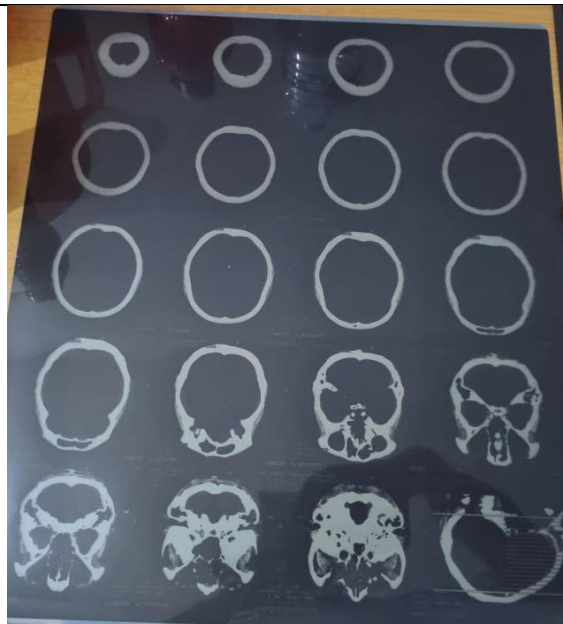


Figure 1. CT Scan Results

Source: (Personal Documentation, 2024)

Patients complained that the left hand and leg felt heavy, weak, unstable, and unbalanced when doing movements. The patient can walk but is still not balanced, so other people must give the patient a handle to remain balanced when walking.

Initially, the patient suffered a stroke until he was unconscious on October 10, 2023; on that day, the patient was taken to the ER of Permata Medika Hospital; due to the patient's condition, the doctor gave an introduction to perform a CT scan, and hospitalization for 12 days. After the patient's condition is stable, the patient can go home, and the doctor gives a referral to a neurologist for the patient to carry out routine control. The neurologist then gave an introduction to the medical rehabilitation doctor so that patients routinely received Physiotherapy services.

During the routine of receiving physiotherapy services at the hospital. Permata Medika patients have shown many positive developments. At first, the patient cannot move the left side of the body, has difficulty controlling the left side of the face, and has difficulty speaking, eating, and drinking. Patients are highly dependent on others for daily activities and require wheelchairs because they are unable to walk. Although the patient's condition and abilities have improved, there are still some complaints. The patient had a stroke for the first time and had no previous history of severe illness, except for hypertension, which he had suffered from since the age of 62, which was known since the patient participated in the Posyandu program.

The physical examination is the initial examination, and the following results are obtained: Normal vital signs are obtained. The patient's right and left shoulders look symmetrical when standing, sitting, and lying down. The patient's back is good, not bending over when sitting. The patient is seen walking by holding on to others to maintain balance. Only the right hand is used by the patient to hold on when walking, so the one who gives the patient a grip is always on the patient's right side. When walking, the patient's posture is seen to be bent. The patient's legs tremble when starting a step while walking. From the palpation examination, it was obtained hasil suhu lokal pasien

normal, tidak terdapat nyeri tekan, tidak terdapat odem, tidak terdapat spasme, tidak terdapat tightness, terdapat perbedaan tonus otot.

There are three basic types of motion checks: active, passive, and active motion checks against obstacles. Active Movement: indicates that although the patient shows good ROM in most joints and movements, there are some deficiencies in trunk movement, especially on the left side. Passive Movement: indicates that the patient has good passive movement ability with normal end feel, although there are variations on the type of end feel for certain movements. Active Movement Against Resistance: Pain is felt against resistance.

Other checks:

- Intra-personal: Patients want to recover quickly, and they are also able to understand the problems of the disease they are facing and communicate well with the physiotherapist.
- Basic Functional: Patients can change sleeping positions independently, both in supine and prone positions and tilted left and right, but they still need the help of others for some basic functions, such as waking up from sleeping to sitting, switching from sitting to standing and walking.
- Functional Activity: The results of the functional activity ability examination in the hands using the Chedoke Arm and Hand Inventory (CAHAI) showed a value of 23, which indicates that the patient has difficulty performing activities that require muscle strength. Meanwhile, the evaluation of overall functional activity ability using the Barthel Index obtained a score of 70, which indicates that the patient is at a moderate level of dependence on the help of others in carrying out daily activities. These two examinations conclude that patients still face significant challenges in terms of muscle strength and functional dependence, requiring further support to improve independence in daily activities.
- Activity Environment: The patient's home environment supports the condition of the patient's house floor, which is already ceramic and flat, which supports the patient's recovery. Patients also do movement exercises at home, and the patient's family and neighbors always motivate and support the patient so that he can recover.

Special Inspection and Measurement

- Sensory test using thermal tests: The patient does not have sensitivity disorders on both the healthy side and the affected side, so it is safe to give infrared modalities.
- Normal physiological reflex tests and no pathological reflexes, thus explaining that the patient's weak hands and feet are purely due to the weakened muscle strength and all muscles are still functioning normally, while the patient's legs trembling when walking are the result of the patient's weak muscles and not caused by pathology.
- Muscle Strength Test: MMT tests show a significant decrease in muscle strength on the affected side when compared to the healthy side.
- Examination with the Berg Balance scale: A score of 22 was obtained, which means the patient needs help to walk. This is in line with static inspection, where the patient needs the help of others to maintain balance when walking.

Physiotherapy Diagnosis

Physiotherapy diagnosis aims to assess the patient's physical capacity and functional abilities based on the interpretation of the data collected. From the results of the examination, there are several physiotherapy problems identified:

- **Body Structure:** There is a decrease in muscle strength in the limbs of the side of the sinistra. There is a balance disorder. There is a decrease in the ability to perform functional activities in the form of waking up from sleep to sitting, standing, walking, toileting, opening jars, pouring water into glasses, and wringing wet clothes.
- **Activities:** Patients experience disturbances and difficulties performing daily functional activities such as difficulty sitting, walking, taking care of themselves and toileting.
- **Participation:** Patients experience disorders and difficulties in activities in the community, such as travelling, community service, and socializing directly with neighbours and relatives; patients also stop doing strenuous activities for a while.

This diagnosis provides a comprehensive picture of the patient's condition and is a basis for planning appropriate physiotherapy interventions.

Physiotherapy Program

This physiotherapy program in non-hemorrhagic hemiparesis sinistra et causa post-stroke patients has several goals that are divided into short-term and long-term. Short-term goals include improving muscle strength, balance, and the ability to perform functional activities such as waking up from sleep to sit, standing, and wringing wet clothes. Meanwhile, the long-term goal is to continue short-term achievements and increase the patient's independence to walk unassisted and pour water into a glass. Based on clinical assessments, the physiotherapy actions carried out include using infrared for healing therapy and exercises to strengthen muscles, train movement stability, and improve balance to improve the patient's functional activity ability. As a promotive and preventive measure, patients are encouraged to do independent exercises at home in the morning or evening, get enough rest, and avoid lifting heavy objects. If the patient feels dizzy, has shortness of breath, or has sudden blurred vision, the exercise should be stopped immediately to avoid complications.

Physiotherapy Treatment

The implementation of Physiotherapy was carried out four times: on T1, which was carried out on February 2, 2024, infrared treatment and exercise therapy were carried out; on T2, on February 9, 2024, infrared treatment and exercise therapy were given; on T3, on February 16, 2024, infrared and exercise therapy were carried out; and on T4, on February 23, 2024, infrared and exercise therapy were carried out.

The implementation of infrared (IR) therapy begins with the preparation of the device, where the wires, lights, and outlets are checked to ensure everything is in good condition, safe, and functional. The patient's preparation is carried out by positioning the patient in a comfortable prone position on the bed, freeing the area to be treated from clothing, and explaining the infrared effect, which is a feeling of warmth. Before therapy begins, heat and cold sensitivity tests are performed with mercury tubes. The physiotherapist is next to the patient, explaining the purpose of using infrared and the duration of the therapy. During the implementation, infrared is directed to the shoulder, elbow, wrist, hip, knee, and ankle areas with a distance of about 60 cm, adjusted to the patient's

tolerance. Therapy is performed for 30 minutes, with feedback every 5 minutes, and infrared is transferred to another area every 5 minutes to provide an even intervention across the targeted area.



Figure 2. InfraRed Management

Source: (Personal Documentation, 2024)

Exercise therapy in patients involves several techniques to improve motor function. Resistance exercises are performed by fixation of the proximal part of the joint to be moved, followed by the application of a moving load according to the patient's ability to strengthen the muscles. In addition, bridging exercises begin with flexion positions on the hips and knees, with the soles of both feet attached to the bed. The patient inhales, then exhales while lifting the hips as much as possible so that the buttocks do not touch the bed, holding the position for 5 seconds before slowly lowering the hips to the original position. In addition, Constraint Induced Movement Therapy (CIMT) includes movements such as moving boxes containing coins on a flat plane and at different heights, as well as inserting coins into boxes of the same and different heights. These techniques are designed to improve the patient's strength, balance, and functional abilities.



(a)



(b)



(c)

Figure 3. (a) Resistance Exercise; (b) Bridging Exercise; (c) CIMT

Source: (Personal Document, 2024).

Evaluation

Based on the evaluation of muscle strength using the MMT method after four times of therapy, there was an increase in strength in the shoulder flexor muscles of the sinistra from a value of 3 to 4 at T4. However, other muscles have not developed significantly from T1 to T4. Balance measurements using the Berg Balance Scale showed that the patient's balance had not improved and still needed help while walking. The CAHAI evaluation showed no progress in the functional activity ability of the affected hands from T1 to T4. In addition, the Barthel index indicated that there was no improvement in the overall functional activity ability of patients from T1 to T4, with patients still classified as moderately dependent.

Final Therapy Results

After four sessions of therapy on a 68-year-old patient with a post-stroke case of hemiparesis sinistra et causa non-hemorrhagic disease, the results were obtained that the strength of the shoulder flexion muscles increased. However, there was no significant change in the patient's balance or an improvement in overall functional activity ability.

Results and Discussion

Based on the action of Physiotherapy using infrared and exercise therapy that has been carried out on the patient on behalf of Mr. S, aged 67 years, with a medical diagnosis of post-stroke ec No Hemorrhagic disease, after being treated 4 times on February 2, 9, 16 and 23, 2024, the following evaluation was obtained:

Muscle Strength Evaluation with MMT

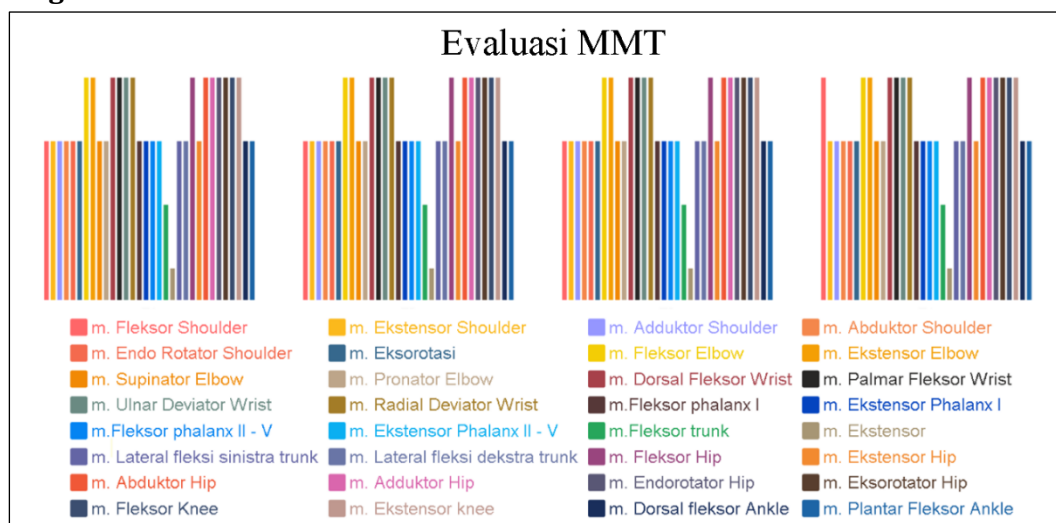


Figure 4. Graph of muscle strength evaluation with MMT

Source: (Personal Documents, 2024)

Resistance exercise is beneficial for stroke patients in restoring muscle strength and producing proprioceptive nerve adaptation in the medium and long term. In addition to the increase in strength that implies the development of muscle size, this exercise modifies the makeup of muscle fibres. There

is also an increase in coordination between muscles, manifested in an increase in the relaxation capacity of the antagonist muscles during agonist contractions (Veldema & Jansen, 2020; Xing et al., 2018).

Based on Figure 4, it can be seen from the measurement of muscle strength using MMT that there is an increase in shoulder flexor muscle strength at T4 from a value of 3 to 4. Meanwhile, there has been no development in other muscles. This is because muscles undergo physiological changes after being hit by a stroke, making the development of muscle strength in patients tend to be slow and difficult to predict their development in the future. Physiological changes in these muscles are the cause of why there is a change in strength in the shoulder muscles at T4 but there is no development in other muscles.

These physiological differences in post-stroke muscles have been described in a journal written by Beckwée et al. (2021), entitled "Muscle changes after stroke and their impact on recovery: time for a paradigm shift? Review and commentary" which states that muscles undergo physiological changes after being hit by a stroke and each person has different potential to be able to recover so it is natural if the development in the patient looks slow. The role of Physiotherapy is to maximize the recovery potential, to increase patient independence and improve the patient's quality of life.

In line with the research conducted by Al-Hchaim & Mohammed (2023), with the title "Effectiveness of Regular Resistance Exercise on Muscle Strength of Patients with Stroke" was tested on 90 stroke patients for 9 months. Dividing the 90 stroke patients into 2 groups, namely the group that was not given resistance exercise and the group that was given resistance exercise. It was found that the results showed that only 2.6% of patients had an average MMT score of 5 without being given resistance exercise. And as many as 67% have an average MMT score of 5 by being given resistance exercise. These results showed that not all patients had the same development, and not all muscles could be recovered to an MMT value of 5, and there were patients who showed only improvement in some parts of the muscle but no development of strength in other muscles.

Balance evaluation

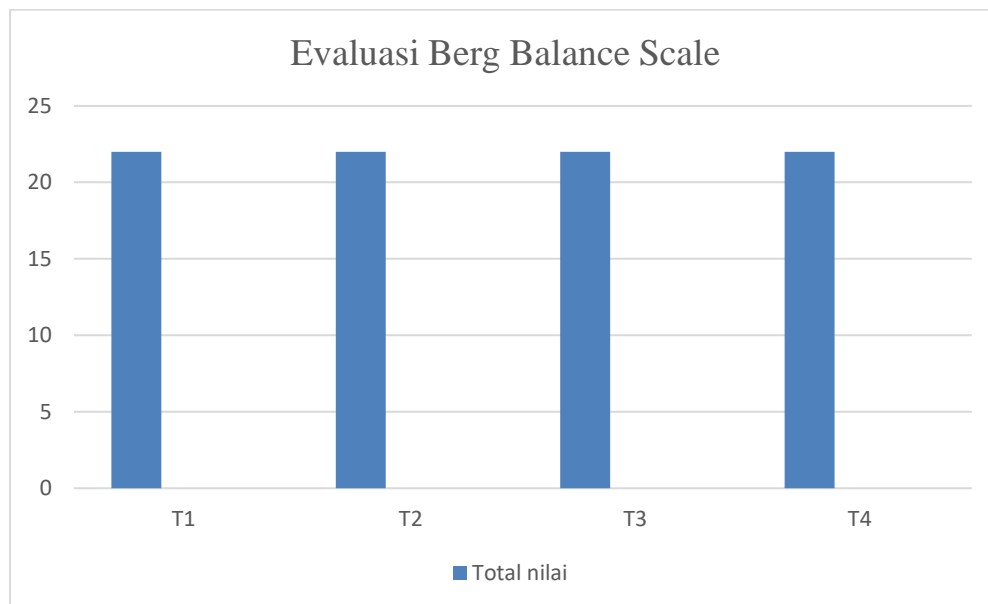


Figure 5. Balance evaluation graph

Source: (Personal Document, 2024)

Bridging exercise has many advantages in stroke rehabilitation because it can increase the activation and cooperative contraction of the core stability muscles, facilitate the function and movement of the limbs, improve daily functional activities, and control body balance (Adi et al., 2023; Susilo et al., 2023).

Based on Figure 5, it can be seen that after doing therapy for 4 meetings that lasted for 1 month, the patient has not made any progress in balance, with a score of 22. Muscles that play an important role in maintaining the stability of the body's balance include the core muscles, so that even though the part of the brain and nerves that are responsible for controlling balance does not have lesions, but because the core muscles are weak, the patient is unable to maintain the balance of his body. In these cases, the cause of balance disturbances is a decrease in strength in the core muscles, which can be seen in the MMT evaluation. Strengthening all muscles and maintaining balance will not see significant results in 4 meetings for 1 month.

In this case, it has been explained in a study conducted by Chen et al. (2022), entitled "Immediate effects of neuromuscular joint-facilitation bridging exercises on walking ability and balance function in stroke patients" that bridging exercises will not show significant results immediately, but will be beneficial in the long run. Bridging exercise will be beneficial for muscles, nerves, and joints in stroke patients, but will not make post-stroke patients able to walk independently within one month of exercise.

Evaluation of functional activity ability

Evaluation Chedoke Arm and Hand Activity Inventory (CAHAI)

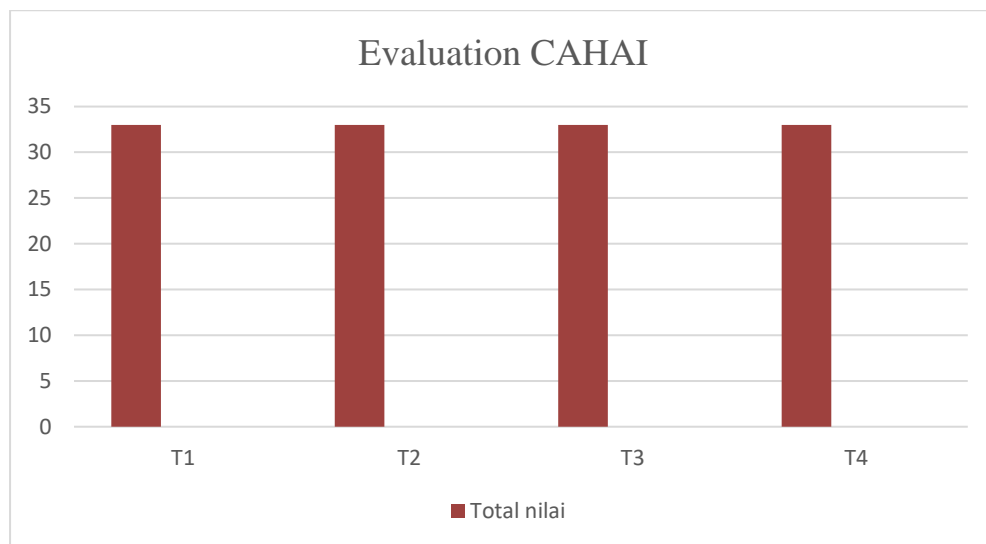


Figure 6. CAHAI evaluation chart

Source: (Personal Document, 2024).

Constraint-induced movement Therapy (CIMT) is a highly effective exercise therapy method for hemiparesis stroke patients. By limiting the movement and stimuli received in a healthy arm, CIMT helps patients cope with learning to use the affected limb (Kwakkel, 2015).

From Figure 6, it can be seen that after 4 times of therapy carried out within 1 month, there has been no improvement in the ability of functional activity in the affected hand. This is because the patient does not carry out the home program that has been given and only does therapy once a week so the patient only practices 4 times a month, namely only when the patient is doing therapy in the hospital.

This has been explained by Tedla et al. (2022), in his research entitled Effectiveness of Constraint-Induced Movement Therapy (CIMT) on Balance and Functional Mobility in the Stroke Population: A Systematic Review and Meta-Analysis. CIMT will be effective in training the patient's functional activity ability if the patient consistently exercises every day.

The relationship between the time spent on exercise therapy and functional activity ability is also described in a journal written by Clark et al. (2021), entitled " The Effect of Time Spent in Rehabilitation on Activity Limitation and Impairment aer Stroke (Review)" states that to get optimal results, the time spent on exercise therapy is 10 hours per week.

Barthel Index Evaluation

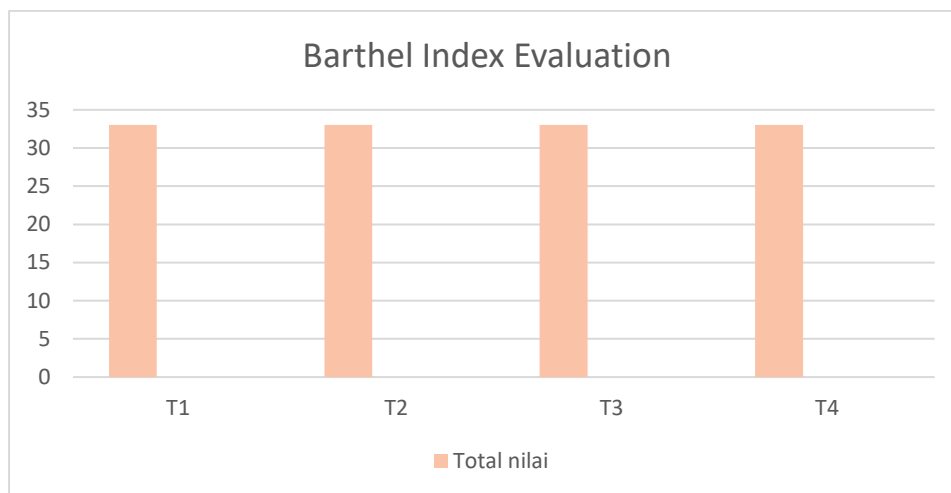


Figure 7. Barthel Index evaluation chart

Source: (Personal Documents, 2024)

From Figure 7, it can be seen that the patient has not improved his overall functional activity ability after 4 meetings of therapy carried out within 1 month with infrared modalities and exercise therapy in the form of resistance exercise, bridging exercise, and CIMT. This is because the cause of the patient's low activity ability is muscle weakness, and the patient does not carry out the home program. Although there is an increase in muscle, it does not determine definitively that the patient's ability to move also increases, especially if only one muscle group experiences an increase in strength.

The lack of improvement in functional activity ability is also due to the fact that it takes at least 6 months to be able to see significant results on the development of functional activity ability of post-stroke patients. So, it does not mean that the therapy provided does not yield results, but the results will be seen in the long term.

This has been explained in research conducted by E. Wurzinger et al. (2021), entitled "Dependency in Activities of Daily Living During the First Year After Stroke" states that the dependence of the majority of post-stroke patients on the functional ability of activities, will see significant development when 6 months after the patient is affected by a stroke and has the potential to recover within 1 year.

According to research conducted by Drummond et al. (2024), entitled "The Factors That Influence Stroke Survivors to Begin or Resume Exercise: A Qualitative Exploration" The results of exercise therapy for stroke patients are influenced by many factors, including how severe the stroke is, how long the patient has had a stroke, how consistent the patient has done the exercise program, and even the patient's daily routine before the stroke It also affects the results of the exercise therapy given to the patient.

Conclusion

The conclusion of the study on the management of physiotherapy in post-stroke patients with non-hemorrhagic hemiparesis sinistra et causa with infrared and exercise therapy shows that stroke, caused by disorders in the blood vessels in the brain, can disrupt the central nervous system, one of which triggers hemiparesis, which is weakness on one side of the body. This condition reduces the patient's independence and mobility, so it requires the help of others. If not treated immediately, hemiparesis risks causing complications to permanent disability. In patient Mr. S, a 68-year-old woman with a diagnosis of ischemic stroke, has been treated four times with results showing an increase in muscle strength in the flexor of the left elbow, but there has been no improvement in balance and functional activity ability. This emphasizes the importance of continuation of therapy to maximize recovery. Based on the results of physiotherapy management in non-hemorrhagic hemiparesis sinistra et causa post-stroke patients with infrared and exercise therapy, the authors provide some important suggestions. For patients, it is recommended to continue the home program that has been taught by the therapist to support continuous recovery but must pay attention to the condition of the body and stop the exercise if experiencing dizziness, heart palpitations, or shortness of breath. For the patient's family, emotional support and motivation are highly recommended so that the patient remains enthusiastic about undergoing the exercise so that his recovery can be more optimal and he can return to normal activities. Meanwhile, physiotherapists are expected to continue to follow existing procedures and increase knowledge in dealing with problems that may arise, so that the interventions provided are on target and can maximize the results of therapy.

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