
Original Article

**CASE STUDY OF THE DUAL EFFECTIVENESS OF ROM AND RUBBER BALL
HANDHELD ON THE RECOVERY OF MOBILITY OF ISCHEMIC STROKE
PATIENTS**

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ABSTRACT

Background: Stroke is a serious global health issue, ranking as the leading cause of disability and the second leading cause of death worldwide. One of the most common impacts of stroke is impaired physical mobility, particularly when damage occurs to the brain's motor centers or neural pathways that control body movement. In stroke patients, this impairment can manifest immediately after the acute phase and persist into the rehabilitation phase if not properly addressed. One effective intervention to overcome physical mobility problems in stroke patients is the application of a combination of Range of Motion (ROM) exercises and rubber ball gripping therapy. This approach not only accelerates motor function recovery but also prevents complications due to immobility and enhances patient independence.

Objectives: This study aimed to analyze the application of combined ROM and rubber ball gripping therapy in managing physical mobility impairment in stroke patients, particularly in improving movement function and supporting a comprehensive rehabilitation process.

Methods: This research used a descriptive case study design with a nursing care process approach to provide an in-depth overview of the intervention implementation in the patient.

Results: The implementation of nursing interventions in the form of combined ROM exercises and rubber ball gripping therapy on Mr. E, who experienced physical mobility impairment due to a non-hemorrhagic stroke over six days, showed positive outcomes.

Conclusion: The combined implementation of Range of Motion (ROM) exercises and rubber ball gripping therapy proved effective in improving muscle strength and motor function in ischemic stroke patients with impaired physical mobility. This intervention not only facilitated the recovery of movement but also supported patient independence and provided a feasible approach for continued rehabilitation at home.

Keywords: Gripping Exercise, Muscle Strength, Physical Mobility, Range of Motion, Stroke.

INTRODUCTION

Stroke is one of the neurological diseases that is the leading cause of long-term disability worldwide (Pane et al., 2024). Clinically, stroke is defined as a sudden impaired brain function due to circulatory disorders, either due to blockage (ischemic stroke) or bleeding (hemorrhagic

stroke) (Alloubani et al., 2020). The most common impact of stroke is impaired physical mobility, especially when there is damage to the brain's motor centers or the nerve pathways that control body movements (Mizuno et al., 2024). Physical mobility disorder is defined as a person's inability to move independently. Patients with this condition often experience joint stiffness, physical weakness, pain when moving, muscle weakness, and difficulty moving limbs (Nugraheni & Anita, 2025). In stroke patients, this disorder can appear directly after an acute attack and last until the rehabilitation phase if it is not treated properly. Limited mobility not only affects basic activities such as walking or moving places, but also risks causing other complications such as decubitus, pneumonia due to immobilization, and depression due to loss of independence (Marliana et al., 2023).

Stroke is becoming one of the serious global health problems, as it ranks as the leading cause of disability and the second leading cause of death in the world. Based on the report (WHO, 2022), there was an increase in the incidence of stroke by 70% between 1990 and 2019. This increase is also accompanied by a 43% increase in the death rate due to stroke and 89% in the number of cases of long-term disability it causes. In Indonesia, data from the Indonesian Health Survey (SKI, 2023) shows that the prevalence of stroke nationally reaches 8.3 per 1,000 population, with a higher rate recorded in East Java Province, which is 12.4 per 1,000 population. Meanwhile, the number of patients at Bhakti Dharma Husada Hospital Surabaya in April amounted to 26 patients, while in May, there were 28 patients. This fact reflects that stroke is still a major challenge in the public health system, which requires serious treatment, especially in an effort to prevent complications and manage poststroke conditions such as physical mobility disorders.

The occurrence of a stroke is initiated by a disruption of blood flow to the brain, known as ischemia. Cerebral ischemia occurs when the blood supply to part of the brain is stopped or significantly reduced, leaving brain tissue deprived of oxygen and nutrients. Ineffective tissue perfusion due to the formation of thrombus (blood clots) or embolism (material that clogs blood vessels) will inhibit the supply of oxygen and nutrients to brain cells. If blood flow is not restored immediately, brain cells can suffer permanent damage within minutes to hours (American Stroke Association, 2024). If not treated immediately, the condition can develop into a cerebral infarction, which is the permanent death of brain tissue. This damage has a direct impact on the central nervous system, specifically the area that regulates motor function, so that the patient can experience a conscious decrease or loss of movement control. One common clinical manifestation is hemiparesis, which is weakness on one side of the body (Wulandari & Herlina, 2021). Hemiparesis causes limitations in physical activity, decreases the ability to move independently, increases the risk of falling, and increases the patient's dependence on the help of others. This condition makes nursing intervention very important, both in the stage of restoring physical function and preventing further complications (Nugraheni & Anita, 2025).

One of the interventions to overcome physical mobility disorders in stroke patients is the application of *Range of Motion* (ROM) interventions, which are joint movement exercises that aim to maintain flexibility, prevent stiffness, and improve muscle strength and function (Banihani & Choukou, 2024). This intervention can be combined with handheld therapy of rubber balls. Rubber ball handheld therapy specifically stimulates hand muscle strength and improves coordination of movement (Andayani & N, 2025). The combination of these two

therapies not only accelerates the recovery of motor function but also prevents complications due to immobilization and improves patient independence. Based on this, this study aims to analyze the application of a combination of ROM intervention and rubber ball handheld therapy to physical mobility disorders in stroke patients, especially in improving movement function and supporting the overall rehabilitation process.

METHODS

Study Design

This study employed a descriptive case study design using a nursing process approach to provide an in-depth understanding of the application of Range of Motion (ROM) exercises combined with rubber ball gripping therapy in a non-hemorrhagic stroke patient experiencing impaired physical mobility. The case study design was chosen to allow detailed exploration of patient assessment, nursing diagnoses, intervention planning, implementation, and evaluation, thereby presenting a comprehensive picture of the effectiveness of the intervention in supporting functional recovery.

Settings

The study was conducted at Bhakti Dharma Husada Hospital Surabaya, specifically in the Arjuna ward of the internal medicine inpatient unit, which provides care for stroke patients. The setting was chosen because the ward regularly treats patients with non-hemorrhagic stroke, allowing for the observation and implementation of nursing interventions such as Range of Motion (ROM) exercises and rubber ball gripping therapy. The study was carried out over six consecutive days, from June 2 to June 7, 2025, in a controlled clinical environment that facilitated continuous monitoring, evaluation, and documentation of patient responses to the interventions.

Research Subject

The subject of this study was a 68-year-old male patient, referred to as Mr. E, who was diagnosed with non-hemorrhagic ischemic stroke and presented with impaired physical mobility. The patient reported sudden weakness in the left hand and leg, accompanied by speech difficulties and headaches, a few hours before hospital admission. Clinical examination revealed muscle weakness on the left side of the body, with muscle strength graded at 3/5, while the right extremities were graded at 5/5. The subject was fully conscious and cooperative during assessment but required assistance in performing daily activities. The selection of this patient was based on the presence of mobility impairment related to stroke, which aligned with the study objective to evaluate the effectiveness of combined Range of Motion (ROM) exercises and rubber ball gripping therapy in improving physical mobility.

Instruments

The instruments used in this study consisted of both clinical and observational tools to support comprehensive nursing assessment and evaluation. Physical examination was performed using a sphygmomanometer to measure blood pressure, a thermometer to assess body temperature, a pulse oximeter to monitor oxygen saturation, and a stethoscope to evaluate heart and lung sounds. Muscle strength was measured using the *Manual Muscle Testing (MMT) scale*, which grades muscle power from 0 to 5. In addition, a nursing observation sheet was employed to document daily progress, patient responses to interventions, and any complications. The interventions themselves required simple equipment, including a rubber ball for gripping

exercises, which was used to stimulate hand muscle strength and fine motor coordination. These instruments ensured accurate monitoring of the patient's condition and provided objective data for evaluating the effectiveness of the combined Range of Motion (ROM) and rubber ball gripping therapy.

Intervention

The intervention in this study consisted of a combination of Range of Motion (ROM) exercises and rubber ball gripping therapy, implemented over six consecutive days. ROM exercises were performed twice daily, focusing on passive and assisted joint movements of the upper and lower extremities to maintain flexibility, prevent stiffness, and improve muscle strength. The exercises were adapted to the patient's tolerance and gradually increased in intensity.

Rubber ball gripping therapy was introduced to specifically strengthen the hand muscles and enhance fine motor coordination. The patient was instructed to repeatedly squeeze and release a rubber ball in sets, with rest intervals to avoid fatigue. This activity was performed several times per day under nurse supervision to ensure safety and correct technique.

During the intervention, nurses provided education and motivation to both the patient and the family to encourage continued practice beyond hospitalization. The integration of ROM exercises and ball gripping therapy was designed not only to improve physical mobility and motor function but also to support the patient's independence in daily activities.

Data Collection

Data collection in this study was carried out through multiple approaches to obtain a comprehensive understanding of the patient's condition and response to the interventions. Primary data were obtained from direct patient assessment, including physical examination using the head-to-toe approach with IPPA (Inspection, Palpation, Percussion, Auscultation) methods, and measurement of vital signs such as blood pressure, temperature, pulse, and oxygen saturation. Muscle strength was assessed daily using the Manual Muscle Testing (MMT) scale, which allowed for monitoring of functional improvements throughout the intervention period.

In addition, observational data were collected using structured nursing observation sheets to record the patient's responses, progress, and tolerance to the Range of Motion (ROM) and rubber ball gripping therapy. Interviews with the patient and family were also conducted to explore subjective complaints, perceived benefits, and family support during the rehabilitation process. Secondary data were gathered from the patient's medical records, including medical history, laboratory results, and physician notes, to complement the clinical findings.

This multimodal data collection ensured the accuracy and reliability of the information, providing a holistic picture of the effectiveness of the intervention in improving physical mobility.

Data Analysis

Data analysis in this study was conducted using a descriptive approach, focusing on evaluating changes in the patient's physical condition before, during, and after the intervention. Quantitative data, such as muscle strength, were analyzed using the Manual Muscle Testing (MMT) scale, and the results were presented in tabular form to illustrate the progression over six consecutive days of intervention. Changes in muscle strength were compared between pre-

and post-intervention assessments to determine the effectiveness of the combined Range of Motion (ROM) and rubber ball gripping therapy.

Qualitative data, including patient and family interviews as well as nursing observation notes, were analyzed thematically to identify patterns of patient responses, perceived benefits, and challenges during therapy. The integration of both quantitative and qualitative findings provided a holistic picture of the intervention's impact, supporting the interpretation of clinical outcomes and the formulation of conclusions regarding the effectiveness of the nursing care provided.

Ethical Considerations

This study was conducted in accordance with ethical principles in nursing research, including respect for autonomy, beneficence, non-maleficence, and justice. Before data collection, the patient and family were given a clear explanation regarding the purpose, procedures, benefits, and potential risks of the intervention. Informed consent was obtained from the patient and family, ensuring their voluntary participation without coercion.

Confidentiality and anonymity were strictly maintained by using only the patient's initials in the study report and ensuring that all personal and medical information was kept private. The intervention was designed to avoid harm and prioritized patient safety throughout the process, with continuous monitoring by nurses to prevent injury or discomfort.

This research received ethical clearance from the Research Ethics Committee of Bhakti Dharma Husada Hospital, Surabaya, confirming that the study met the ethical requirements for research involving human subjects.

RESULTS

The implementation of combined Range of Motion (ROM) exercises and rubber ball gripping therapy in Mr. E, a 68-year-old male with non-hemorrhagic stroke and impaired physical mobility, was carried out over six consecutive days. The patient initially presented with left-sided weakness, with muscle strength of 3/5 in the upper and lower left extremities, while the right extremities were 5/5.

Daily monitoring showed progressive improvement in muscle strength, particularly in the left upper and lower extremities. No significant change was observed during the first three days; however, on the fourth day, muscle strength in the left extremities improved to 4/5 and remained stable until the sixth day. The right extremities consistently maintained a score of 5/5 throughout the intervention.

This improvement indicated that the combination of ROM and rubber ball gripping therapy effectively enhanced joint mobility and muscle strength, especially in the affected hand muscles, which received additional stimulation from the gripping exercise. The patient demonstrated better tolerance in performing activities and showed increased independence in movement by the end of the intervention period.

In addition, the family reported positive perceptions of the therapy and expressed willingness to continue the exercises at home, highlighting the feasibility of integrating the intervention into routine rehabilitation.

DISCUSSION

The findings of this case study demonstrated that the combination of Range of Motion (ROM) exercises and rubber ball gripping therapy was effective in improving muscle strength and physical mobility in a patient with a non-hemorrhagic stroke. Muscle strength in the affected extremities increased from 3/5 at baseline to 4/5 after six consecutive days of intervention. This result supports the premise that structured rehabilitation strategies focusing on both gross and fine motor functions contribute to faster recovery and greater independence in stroke patients.

ROM exercises are widely recognized as an essential intervention to prevent joint stiffness, muscle contracture, and immobility-related complications in stroke patients (Hidayatullah et al., 2024). By facilitating repeated and guided joint movement, ROM helps maintain neuromuscular activity and stimulates local circulation, which in turn enhances muscle function and flexibility (Nugraheni & Anita, 2025). In this study, consistent application of ROM was associated with gradual improvement in muscle strength, suggesting its effectiveness as a core rehabilitation approach in the acute and sub-acute phases of stroke recovery.

The addition of rubber ball gripping therapy provided further benefits by specifically targeting fine motor function of the hand and strengthening upper extremity muscles. Previous studies have reported that repetitive gripping exercises stimulate neuromuscular pathways, improve coordination, and reduce the risk of muscle atrophy in stroke patients (Andayani & N, 2025; Banihani & Choukou, 2024). The observed improvement in hand muscle strength in this case supports these findings and highlights the role of simple, low-cost interventions in enhancing rehabilitation outcomes.

Another important aspect of this study was family involvement. The patient's family not only provided support during hospitalization but also expressed commitment to continuing the therapy at home. This aligns with evidence suggesting that home-based rehabilitation, when supported by caregivers, increases adherence, reduces hospital readmissions, and promotes long-term recovery (Marliana et al., 2023). Therefore, family education and empowerment are critical components of nursing care for stroke patients.

Although the results of this case study were positive, the findings are limited to a single patient and cannot be generalized to all stroke populations. Factors such as age, comorbidities, severity of stroke, and patient motivation may influence rehabilitation outcomes. Future studies should involve larger samples, include control groups, and explore the integration of ROM and ball gripping therapy with modern rehabilitation technologies, such as robotics or virtual reality, to enhance motor recovery.

In summary, this study emphasizes that the combined use of ROM and rubber ball gripping therapy is an effective, feasible, and affordable nursing intervention to improve muscle strength and physical mobility in stroke patients. Its implementation can be recommended as part of a comprehensive rehabilitation program, particularly in resource-limited settings where advanced rehabilitation devices may not be available.

CONCLUSION

This case study concludes that the combined application of Range of Motion (ROM) exercises and rubber ball gripping therapy is effective in improving muscle strength and

physical mobility in a patient with non-hemorrhagic stroke. Progressive improvement was observed in the affected extremities after six days of intervention, indicating the benefits of integrating both gross and fine motor exercises in rehabilitation. In addition to enhancing motor recovery, the intervention also promoted patient independence and was well-accepted by the family, allowing for continued practice at home. Given its simplicity, low cost, and feasibility, this combined therapy can be recommended as a nursing intervention for stroke patients with impaired mobility. However, further studies with larger samples are needed to validate these findings and explore their effectiveness across different patient populations and clinical settings.

SUGGESTION

Based on the results of this study, it is suggested that nurses incorporate the combination of Range of Motion (ROM) exercises and rubber ball gripping therapy as part of routine nursing interventions for stroke patients with impaired physical mobility. Families should be actively involved and educated to continue the exercises at home in order to sustain functional recovery and prevent complications related to immobility. For future research, it is recommended to conduct studies with larger sample sizes, diverse stroke populations, and longer follow-up periods to strengthen the evidence regarding the effectiveness of this intervention. Furthermore, exploring the integration of ROM and gripping therapy with advanced rehabilitation technologies such as robotics or virtual reality could provide additional insights into optimizing motor function recovery in stroke patients.

LIMITATIONS

This study was limited by its single-case design, which restricts the generalizability of the findings to wider stroke populations. The short duration of observation, only six days, may not fully capture long-term outcomes or potential complications that could arise during extended rehabilitation. In addition, the study did not involve a control group or comparison with other rehabilitation methods, which limits the ability to attribute improvements solely to the combined intervention of Range of Motion (ROM) exercises and rubber ball gripping therapy. Other factors, such as patient motivation, family support, and individual physiological conditions, may also have influenced the results.

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