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Revitalizing movement through Range of Motion (ROM) therapy for non-hemorrhagic stroke survivors

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Abstract
Stroke is a systemic manifestation of disease, often linked to aging, characterized by disruptions in blood circulation to the brain, resulting in neurological deficits. Patients may experience motor impairments such as weakness or hemiparesis, which can lead to stiffness, paralysis, and muscle weakness, ultimately reducing joint range of motion and overall extremity function. These mobility challenges can be addressed through early physical mobilization exercises. Implementing Range of Motion (ROM) exercises and proper positioning is crucial in the rehabilitation process, effectively preventing disability among stroke patients. This study aims to explore the impact of ROM exercises on muscle strength in stroke patients facing mobility impairments. A case study methodology was employed, focusing on gradual and regular maintenance interventions. The findings indicate that the application of ROM exercises significantly enhances muscle strength. In conclusion, incorporating supine ROM exercises can effectively improve muscle strength in stroke patients with mobility challenges, highlighting the importance of early intervention in rehabilitation.

Keywords: Stroke; complementary therapy; range of motion; medical surgical nursing; rehabilitation

Introduction
Hemorrhagic and ischemic strokes are both caused by disruptions in blood flow to the brain, often linked to high blood pressure, or hypertension (Salvadori et al., 2020). Non-hemorrhagic strokes occur when blood vessels are blocked, preventing blood from reaching parts of the brain, either partially or completely (Abdu, Tadese, & Seyoum, 2021). Stroke is a leading cause of death, particularly among individuals over 60, ranking as the third most common cause overall. In Indonesia alone, there are more than 550.000 new stroke cases reported each year (Fauziyah, Sulistyanto, & Wahyuningtyas, 2023). Common signs and symptoms of non-hemorrhagic strokes include sudden weakness in the face, arms, or legs, tingling or numbness, difficulty speaking or understanding language, loss of balance, sudden headaches, and visual disturbances (Murphy & Werring, 2020). Hemiparesis resulting from a stroke can lead to significant loss of function and increased dependency on others. The physical challenges faced by stroke patients can severely impact their ability to perform daily activities. Early mobilization through physical exercises, including Range of Motion (ROM) exercises and proper positioning, is crucial for rehabilitation and can effectively prevent disability in stroke patients (Hosseini, Peyrovi, & Gohari, 2019). Such therapies aim to normalize neurological hemodynamics, promoting neuroplasticity and repairing sensorimotor functions through repetitive activation of the affected areas in the brain (Fauziyah, Sulistyanto, & Wahyuningtyas, 2023). Medical management may include thrombolytic therapy and medications like anti-platelets and anticoagulants, while nursing care focuses on mobilization techniques, particularly ROM exercises (Kuriakose & Xiao, 2020).

Implementing ROM exercises early in the recovery process has been shown to enhance muscle strength by stimulating motor units, leading to improved overall strength (Kim, Lee, & Sohng, 2014). Delaying treatment for hemiparetic patients can result in permanent disability. Therefore, appropriate nursing interventions, such as ROM exercises, can significantly influence recovery and reduce pain in stroke patients facing mobility challenges (Eng & Tang, 2007). This has motivated the author to conduct a study analyzing the effectiveness of nursing actions involving ROM exercises in non-hemorrhagic stroke patients with mobility impairments. ROM exercises play a crucial role in the rehabilitation of stroke patients, offering numerous benefits that significantly enhance recovery outcomes. One of the primary advantages of ROM exercises is their ability to prevent contractures and stiffness in affected limbs. After a stroke, patients often experience reduced mobility, which can lead to muscle tightness and joint immobility (Abdillah, Istiqomah, Kurnianto, & Khovifah, 2022). With regularly engaging in ROM exercises, patients can maintain flexibility in their joints, reduce the risk of developing contractures, and promote better overall joint health. This is particularly important for individuals with hemiparesis, as maintaining joint mobility can facilitate easier movement and improve the quality of life.

In addition to preventing physical complications, ROM exercises are essential for enhancing muscle strength and coordination. These exercises stimulate the motor units within the muscles, promoting muscle activation and improving strength over time (Gomez-Cuaresma et al., 2021). For stroke patients, regaining muscle strength is vital for restoring independence in daily activities, such as walking, dressing, and self-care. Furthermore, as patients progress with their ROM exercises, they often experience improvements in coordination and balance, which are critical for reducing the risk of falls—a common concern for individuals recovering from a stroke. Enhanced strength and coordination not only aid in physical rehabilitation but also contribute to greater confidence in performing everyday tasks. Moreover, ROM exercises have a positive impact on the neurological recovery process following a stroke. Engaging in these exercises can promote neuroplasticity, the brain's ability to reorganize itself and form new neural connections (Huang et al., 2018). With repeatedly activating the affected muscles and joints, ROM exercises help retrain the brain, facilitating the recovery of lost functions. This neuroplastic response is essential for improving sensory and motor functions, allowing stroke survivors to regain more control over their movements. Overall, the incorporation of ROM exercises into a comprehensive rehabilitation program not only addresses physical impairments but also supports the holistic recovery of stroke patients, ultimately leading to better long-term outcomes and improved quality of life. For this reason, the study was aimed to investigate the effect of ROM for stroke survivors in clinical setting.

Case Description

The study utilized a case study method, providing gradual care over three sessions of eight hours each. This approach followed the nursing process, beginning with a detailed assessment of the client's circumstances through interviews with Mr. A and his family. The collected data was then analyzed to establish nursing diagnoses, guiding the subsequent nursing actions, which were finally evaluated for effectiveness. On 27 May 2023, an assessment of Mr. A revealed significant complaint. He reported an inability to move his left hand and foot, which hindered his daily activities. Objective data indicated that Mr. A had suffered a stroke 11 years prior, resulting in hemiplegia on the left side and decreased muscle strength in that extremity. At 70 years old, Mr. A faced challenges with mobility, increasing his risk of falls. The primary etiology identified was the decline in muscle strength, leading to mobility issues and a heightened risk of falling. From the initial data analysis, two primary nursing diagnoses were established: the first was "disturbance in physical mobility related to decreased muscle strength" (D.0054), and the second was "risk of falls related to decreased muscle strength" (D.0143). For the first diagnosis, the nursing plan included implementing Range of Motion (ROM) exercises (I.05177), with the goal of improving mobility and muscle strength over the three sessions. The second diagnosis involved fall prevention strategies (I.14540), aiming to reduce the likelihood of falls. After three sessions, the expected outcomes included improved extremity movement and increased muscle strength. The implementation phase for Mr. A occurred over three days, from 28 – 30 May 2023. During this period, ROM exercises were conducted for the left extremities, with careful observation of joint movement and monitoring for discomfort. Mr. A was able to move his fingers but experienced pain rated at a level of 4. Before starting the exercises, the goals and procedures were explained to him, and he demonstrated an understanding of the process. Throughout the sessions, Mr. A remained cooperative and showed enthusiasm, despite some discomfort during the exercises.

For the risk of falls diagnosis, the intervention involved identifying risk factors and assessing Mr. A's environment using the Fall Morse Scale, which indicated a high risk of falling with a score of 65. To mitigate this risk, assistive tools like a wheelchair were provided, ensuring it was properly locked for safety. Education was given to Mr. A about calling for family assistance before attempting to stand or move. He understood the importance of this communication and learned methods to maintain balance while standing. The evaluation of the interventions showed that Mr. A experienced noticeable improvements in the mobility of his left hand and foot started from 28 – 30 May 2024. However, due to his high risk of falling, ongoing monitoring and family assistance remained essential. Mr. A and his family were well-informed about fall prevention strategies, ensuring a safer environment for his continued recovery.

Discussion

An assessment was conducted on Mr. A, revealing significant weakness in his left extremities. He reported difficulty moving his left hand and foot, which exhibited stiffness and limited mobility. As a result, Mr. A faced challenges in performing daily activities, necessitating assistance from his family, who provided a wheelchair for mobility support. Muscle strength measurements indicated a significant disparity: the right hand and foot scored 5/5, while the left hand and foot scored only 1/5. Additionally, skin turgor assessments showed decreased turgor in the left extremities, which felt cold to the touch. The Ketz Index assessment indicated a score of 6, reflecting Mr. A's dependence in daily functions such as eating, dressing, and using the bathroom. In the SMPSQ assessment, his intellectual function was intact, scoring 7. These findings align with a study that which states that hemiparesis resulting from a stroke leads to stiffness, paralysis, and weakened muscle strength, ultimately reducing joint range of motion and functional capacity in daily life (Bakara & Warsito, 2016). Furthermore, the assessment identified a high risk of falls, as measured by the Fall Morse Scale, which yielded a total score of 65. This score indicates that Mr. A's muscle weakness significantly

contributes to his fall risk, consistent with the nursing diagnosis of risk of falling related to decreased muscle strength. The impact of the stroke has led to a decline in Mr. A's productivity due to long-term sensorimotor disabilities. Sensorimotor disturbances—such as decreased muscle strength, loss of sensation, and impaired coordination—result from the stroke and can severely affect balance and coordination, with deficits ranging from 70-80%. These balance disturbances increase the likelihood of falls, making stroke patients particularly vulnerable (Syakura, Nisa'asy Shobiri NHJ, & Denta, 2021).

Based on the assessment findings, the primary complaint was identified as weakness in the left extremities, accompanied by a general feeling of weakness and limitations in daily activities. This data informed the nursing diagnosis of "disturbance in physical mobility related to decreased muscle strength" (D.0054), highlighting a clear connection between the case and existing theoretical frameworks. The second diagnosis, "risk of falls related to decreased muscle strength" (D.0143), was also established due to the identified mobility issues. The priority nursing diagnosis was determined to be the disturbance in physical mobility. The intervention plan was designed according to the Standard Intervention of Indonesian Nursing (SIKI), incorporating observation, therapy, education, and collaboration. The target time for achieving desired outcomes was set at three sessions of eight hours each. The nursing focus was on therapeutic interventions aimed at increasing muscle strength to enhance Mr. A's independence in daily activities and improve his mobility. The planned interventions included ROM exercises and fall prevention strategies. ROM exercises are essential for maintaining joint flexibility and muscle strength in stroke patients, involving techniques such as passive and active movements to aid mobility (Purba et al., 2022).

During the implementation phase, the nursing actions were closely monitored by the nurses to ensure the outcomes achieved. Daily evaluations were conducted to assess Mr. A’s condition, including identifying any pain or discomfort and monitoring his overall tolerance to movement. Evidence-based practices were applied, particularly through the implementation of ROM exercises. These exercises included bending and straightening the elbow, grasping and releasing, and moving fingers to enhance muscle strength and mobility. Each session lasted between 3 to 10 minutes, demonstrating a gradual improvement in Mr. A's muscle strength. A study support that consistent ROM exercises could lead to significant muscle strength improvements over time (Kudadiri, Silalahi, Padang, & Sitopu, 2024). The evaluation of Mr. A's progress indicated that after three sessions of ROM therapy, there was a noticeable enhancement in his muscle strength. The initial strength scores for his left hand and foot improved from 1/5 to 2/5, with a significant reduction in movement limitations and an increase in joint range of motion. Mr. A, who initially could only move his fingers, began to demonstrate increased independence by lifting and slightly bending his left hand and foot. Although he still required assistance with many activities, the consecutive ROM exercises over three days showed promising improvements in his muscle strength. This outcome reinforces the effectiveness of ROM exercises in enhancing the physical mobility of stroke patients experiencing mobility disturbances.

Conclusion

ROM exercises offer numerous benefits for stroke survivors, significantly enhancing their recovery and quality of life. These exercises help maintain and improve flexibility in the joints, prevent muscle stiffness, and reduce the risk of contractures, which are common after a stroke. Additionally, engaging in these exercises can alleviate pain and discomfort, boost overall physical function, and contribute to emotional well-being by fostering a sense of accomplishment and progress in rehabilitation. Future studies are essential for further exploring the benefits of ROM exercises for patients with mobility impairments, particularly those in the rehabilitation phase following a stroke. While existing research highlights the positive impact of ROM on flexibility, muscle strength, and overall functional recovery, more comprehensive investigations are needed to understand the optimal frequency, intensity, and duration of these exercises tailored to individual patient needs. Additionally, examining the long-term effects of ROM interventions on quality of life, psychological well-being, and social reintegration can provide valuable insights into their holistic benefits. Studies should also consider diverse populations, including varying ages, types of strokes, and comorbid conditions, to develop inclusive rehabilitation protocols. With addressing these gaps, future research can contribute to evidence-based practices that enhance recovery strategies, improve patient outcomes, and ultimately empower stroke survivors to regain independence and enhance their daily living experiences.

References

Abdillah, A., Istiqomah, I. N., Kurnianto, S., & Khovifah, N. (2022). The Effectiveness of Range of Motion (ROM) on Increasing Muscle Strength in Stroke Patients: Literature Review. Nursing and Health Sciences Journal (NHSJ), 2(2), 137-142. https://doi.org/10.53713/nhs.v2i2.118

Abdu, H., Tadese, F., & Seyoum, G. (2021). Comparison of Ischemic and Hemorrhagic Stroke in the Medical Ward of Dessie Referral Hospital, Northeast Ethiopia: A Retrospective Study. Neurology research international, 2021, 9996958. https://doi.org/10.1155/2021/9996958

Bakara, D.M., & Warsito, S. (2016). Passive Range of Motion (ROM) Exercises on Joint Range in Post-Stroke Patients. Idea Nursing Journal, 7(2), 12–18.

Eng, J. J., & Tang, P. F. (2007). Gait training strategies to optimize walking ability in people with stroke: a synthesis of the evidence. Expert review of neurotherapeutics, 7(10), 1417–1436. https://doi.org/10.1586/14737175.7.10.1417

Fauziyah, N.N., Sulistyanto, B.A., & Wahyuningtyas, B. (2023). Case Study: Application of ROM Intervention to Increase Extremity Muscle Strength in Non-Hemorrhagic Stroke Patients. Public Health Seminar Proceedings, 1 (October), 31–34. https://doi.org/10.26714/pskm.v1ioktober.236

Gomez-Cuaresma, L., Lucena-Anton, D., Gonzalez-Medina, G., Martin-Vega, F. J., Galan-Mercant, A., & Luque-Moreno, C. (2021). Effectiveness of Stretching in Post-Stroke Spasticity and Range of Motion: Systematic Review and Meta-Analysis. Journal of personalized medicine, 11(11), 1074. https://doi.org/10.3390/jpm11111074

Hosseini, Z. S., Peyrovi, H., & Gohari, M. (2019). The Effect of Early Passive Range of Motion Exercise on Motor Function of People with Stroke: a Randomized Controlled Trial. Journal of caring sciences, 8(1), 39–44. https://doi.org/10.15171/jcs.2019.006

Huang, Y. C., Chuang, C. Y., Leong, C. P., Wang, L., Chen, H. L., & Chiang, C. W. (2018). Effect of Comprehensive Postural Instructions and Range of Motion Exercises Via Educational Videos on Motor Function and Shoulder Injury in Stroke Patients With Hemiplegia: A Preliminary Study. Journal of manipulative and physiological therapeutics, 41(8), 665–671. https://doi.org/10.1016/j.jmpt.2018.03.004

Kim, H. J., Lee, Y., & Sohng, K. Y. (2014). Effects of bilateral passive range of motion exercise on the function of upper extremities and activities of daily living in patients with acute stroke. Journal of physical therapy science, 26(1), 149–156. https://doi.org/10.1589/jpts.26.149

Kudadiri, F., Silalahi, K. L., Padang, L. & Sitopu. R. F., (2024). Efektivitas ROM (Range Of Motion) Aktif terhadap Kekuatan Otot pada Pasien Stroke Iskemik. Jurnal Penelitian Perawat Profesional, 6(3), 1355–1362. https://doi.org/10.37287/jppp.v6i3.2617

Kuriakose, D., & Xiao, Z. (2020). Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives. International journal of molecular sciences, 21(20), 7609. https://doi.org/10.3390/ijms21207609

Murphy, S. J., & Werring, D. J. (2020). Stroke: causes and clinical features. Medicine (Abingdon, England : UK ed.), 48(9), 561–566. https://doi.org/10.1016/j.mpmed.2020.06.002

Purba, S. D., Sidiq, B., Purba, I., Hutapea, E., Silalahi, K., Sucahyo, D., & Dian. (2022). Efektivitas ROM (Range off Motion) terhadap Kekuatan Otot pada Pasien Stroke di Rumah Sakit Royal Prima Tahun 2021. JUMANTIK, 7(1), 79. https://doi.org/10.30829/jumantik.v7i1.10952

Salvadori, E., Papi, G., Insalata, G., Rinnoci, V., Donnini, I., Martini, M., Falsini, C., Hakiki, B., Romoli, A., Barbato, C., Polcaro, P., Casamorata, F., Macchi, C., Cecchi, F., & Poggesi, A. (2020). Comparison between Ischemic and Hemorrhagic Strokes in Functional Outcome at Discharge from an Intensive Rehabilitation Hospital. Diagnostics (Basel, Switzerland), 11(1), 38. https://doi.org/10.3390/diagnostics11010038

Syakura, A., Nisa'asy Shobiri NHJ, A., & Denta, A. O. (2021). Resiko Jatuh pada Klien Stroke yang Menggunakan Kursi Roda di Kabupaten Pamekasan. Wiraraja Medika: Health Journal , 11 (2), 56–64. https://doi.org/10.24929/fik.v11i2.1500