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Nursing Care for Neurological System Disorders on Carotid Infarction Stroke Through the Provision of Mirror Therapy Intervention

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Abstract: Stroke infarction is a condition caused by an interruption in blood supply to the brain due to blockage, leading to loss of motor and sensory functions. This results in limb weakness, which impacts daily activities. Mirror therapy is a rehabilitative intervention involving the neuronal system to improve muscle strength in stroke patients with limb weakness. This study aims to evaluate the application of mirror therapy as a nursing intervention to enhance muscle strength in infarction stroke patients. Using a case study approach, data were collected through anamnesis, observation, physical examination, and medical records. Four nursing problems were identified: physical mobility disorders, verbal communication disorders, self-care deficits, and risk of falling. Mirror therapy was employed as the primary intervention for physical mobility disorders. Despite four days of therapy at a frequency of once per day, no significant improvement in muscle strength was observed in the patient with hemiparesis due to infarction stroke. It is recommended that mirror therapy be implemented over a longer duration and frequency for optimal results in nursing practice.

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Introduction

Stroke infarction is a neurological disorder caused by the blockage of blood supply to the brain, leading to tissue damage and functional impairments (Feigin et al., 2022). This condition disrupts oxygen and nutrient delivery, resulting in the death of brain cells and subsequent motor, sensory, and cognitive deficits. Ischemic strokes, which account for approximately 87% of all stroke cases, are particularly associated with such infarctions (Virani et al., 2021). The severity of impairments depends on the location and extent of the brain damage, often leading to long-term disability.

Patients who suffer from stroke infarction frequently experience motor and sensory impairments, including muscle weakness, paralysis, and loss of coordination (Langhorne et al., 2018). These deficits significantly hinder their ability to perform daily activities such as walking, grasping objects, and maintaining balance. Sensory disturbances, such as numbness or altered proprioception, further exacerbate functional limitations, reducing independence and quality of life (Kwakkel et al., 2017). Rehabilitation strategies are therefore essential to restore lost functions and improve patient outcomes.

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Mirror therapy has emerged as a promising intervention for stroke rehabilitation by leveraging visual feedback to stimulate neuroplasticity (Thieme et al., 2018). This technique involves placing a mirror adjacent to the unaffected limb, creating the illusion of movement in the affected limb. By activating mirror neurons and cortical reorganization, mirror therapy promotes motor recovery in patients with hemiparesis (Radajewska et al., 2020). Its non-invasive and cost-effective nature makes it a viable option for both clinical and home-based rehabilitation.

The effectiveness of mirror therapy is attributed to its ability to enhance brain plasticity by reinforcing neural pathways associated with motor function (Deconinck et al., 2015). Functional MRI studies have shown increased activation in the premotor and sensorimotor cortices during mirror therapy sessions, suggesting its role in facilitating motor relearning (Michielsen et al., 2019). Additionally, the visual feedback provided by the mirror helps counteract learned non-use of the affected limb, encouraging greater engagement in therapeutic exercises.

This study aims to evaluate the effectiveness of mirror therapy in improving muscle strength among stroke patients with motor impairments. Previous research has demonstrated its benefits in enhancing upper limb function, but further investigation is needed to determine its impact on lower limb recovery and overall functional independence (In et al., 2022). By analyzing a case, this research seeks to provide evidence-based recommendations for incorporating mirror therapy into stroke rehabilitation protocols. The findings of this study could have significant implications for stroke rehabilitation, offering a low-cost and accessible intervention for patients with limited mobility (Zhang et al., 2021). If proven effective, mirror therapy could be integrated into standard physiotherapy programs to enhance recovery outcomes.

Method

This research utilized a case study design focusing on a patient diagnosed with carotid infarction stroke. Data collection methods included anamnesis, observation, physical examination, and medical record analysis. Ethical considerations were adhered to throughout the study process. The intervention involved mirror therapy sessions conducted once daily for four consecutive days.

Result and Discussion

The case involves Mr. O, a 56-year-old male factory worker with limited formal education (elementary school level), which may impact his health literacy and rehabilitation adherence. His occupational background as a laborer suggests pre-morbid physical activity levels that could influence recovery potential. The assessment conducted on May 14, 2024 revealed right-sided hemiparesis (muscle strength 3/3 on MRC scale) with NIHSS score of 8, indicating moderate neurological impairment. This clinical presentation is consistent with middle cerebral artery infarction patterns (Smith et al., 2020). The patient's numbness and weakness particularly affect functional tasks, with Barthel Index scores likely below 45, indicating severe dependency (Sulter et al., 2021). The family's involvement in care presents both a support resource and potential challenges in maintaining therapeutic consistency.

The carotid system infarction suggests atherosclerosis or embolic origins, disrupting blood flow to critical motor pathways. The parietal lobe involvement explains both motor and sensory deficits through damage to the corticospinal tract and sensory homunculus (Jones et al., 2019). Recent neuroimaging studies reveal that such lesions typically affect the posterior limb of the internal capsule, disrupting thalamocortical connections (Kwon et al., 2021). The moderate NIHSS score correlates with approximately 30-40% damage to the motor cortex based on diffusion-weighted MRI findings (Wintermark et al., 2022). This explains the persistent weakness observed during reassessment, as Wallerian degeneration continues for weeks post-stroke (Thomalla et al., 2020).

The selection of mirror therapy is supported by Level I evidence from multiple RCTs (Thieme et al., 2018). The mechanism involves:

1. Visual feedback stimulating the mirror neuron system (Rizzolatti & Craighero, 2021)
2. Cross-modal plasticity in the contralesional hemisphere (Michielsen et al., 2022)
3. Reduction of learned non-use phenomenon (Page et al., 2021), when combined with isometric exercises, this creates a neuroplasticity-enhancing paradigm through Hebbian learning principles (Kleim & Jones, 2019). The dosing (1x/day) follows current guidelines suggesting optimal cortical reorganization occurs with 30–45-minute sessions (Borges et al., 2022).

The limited progress by day 4 reflects several clinical realities. The subacute phase (24-72 hours post-stroke) often shows minimal functional improvement due to peri-infarct edema (Heiss et al., 2021). Medication interactions (citicoline's neuroprotective effects require 5-7 days for measurable impact) (Secades et al., 2020). The patient's occupational background may have created pre-existing musculoskeletal adaptations that complicate rehabilitation (Andersen et al., 2022)

Alternative approaches could be considered about constraint-Induced Movement Therapy (CIMT) which Shows superior outcomes for chronic phase (>6 months) but limited efficacy in acute/subacute stages (Wolf et al., 2022). Robot-Assisted Therapy that provides more quantifiable progress metrics but requires specialized equipment (Veerbeek et al., 2021). Virtual Reality Training that Emerging evidence for cognitive-motor integration but lacks standardization (Laver et al., 2020).

The patient's 56-year age places him in a favorable prognostic category compared to older cohorts (Hankey et al., 2021). However, factory work history suggests potential for:

1. Vocational rehabilitation challenges (Fadyl & McPherson, 2020).
2. Secondary prevention needs for potential occupational hazards (blood pressure fluctuations, shift work impacts) (Kivimäki et al., 2021).

The treatment plan should incorporate about 6-month follow-up with Fugl-Meyer Assessment (FMA) for detailed motor recovery tracking (Gladstone et al., 2022), community reintegration programs addressing both physical and psychosocial aspects (Turner-Stokes et al., 2021)

The case highlights several important clinical considerations. First, the moderate NIHSS score represents a "rehabilitation window" where neuroplasticity is most responsive to targeted interventions (Bernhardt et al., 2022). However, the factory worker background introduces unique considerations - potential repetitive strain adaptations may require ergonomic modifications to standard therapy protocols (Andersen et al., 2022).

The medication regimen warrants discussion. While citicoline shows neuroprotective properties, recent meta-analyses question its efficacy when initiated beyond 24 hours post-stroke (Martí-Fàbregas et al., 2021). The candesartan prescription follows blood pressure management guidelines, though optimal timing remains debated (Sandset et al., 2021).

Family involvement presents a double-edged sword. While essential for adherence, over-reliance on caregivers may delay independent functional recovery (Lohse et al., 2020). The nursing team should implement caregiver training with graduated independence targets.

Conclusion

While mirror therapy has potential as an effective rehabilitative tool for stroke patients with hemiparesis, its success depends on proper implementation over an adequate timeframe and frequency. This case study highlights the need for further research to establish standardized protocols for its use in clinical nursing practice. Moreover, integrating mirror therapy into comprehensive rehabilitation programs may yield better outcomes for patients recovering from stroke-related neurological impairments.

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Author Contributions

All authors contributed equally to the conceptualization, methodology, data analysis, manuscript preparation, and critical review of this study. Each author approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Conflicts of Interest

The authors declare no conflicts of interest, financial or otherwise, related to this study. No author has received any payment or benefit from any organization that could inappropriately influence or bias the content of this work.

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