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Rehabilitation Strategies for Traumatic Brain Injury: Current Trends and Future Directions

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Introduction

This article provides a comprehensive meta-analysis and systematic review comparing the effectiveness of Virtual Reality (VR) and transcranial Direct Current Stimulation (tDCS) in rehabilitating upper extremity function in stroke patients. Stroke significantly affects quality of life, particularly in performing Activities of Daily Living (ADL), which is a core determinant of overall well-being. While the Barthel Index (BI) is a useful tool for evaluating self-care and mobility, it does not capture cognitive, speech, visual, or pain-related impairments. Nevertheless, BI is still widely accepted as a reliable measure of functional status. Notably, the study found that BI scores improved significantly when VR was combined with tDCS compared to VR alone, suggesting enhanced recovery outcomes through combined therapy. To assess motor impairment, the Fugl-Meyer Upper Extremity (FM-UE) scale was used, which is a gold-standard evaluation for upper limb function. However, results showed no significant difference in FM-UE scores between VR-only and combined interventions. The Box and Block Test (BBT), which evaluates the number of blocks moved in a minute, provided additional insights into fine motor control. The data indicate nuanced effects of different interventions on various functional outcomes [1].

Description

Stroke survivors often suffer from impaired upper limb mobility, limiting daily functionality. A major goal of neurorehabilitation is to minimize brain damage while restoring motor function. Constraint-Induced Movement Therapy (CIMT) has demonstrated efficacy in improving affected limb function. A review of 45 studies revealed that robotic-assisted rehabilitation enhances muscle strength and motor function without increasing complications. Mirror therapy, by creating visual feedback illusions, has also shown benefits in reducing pain and enhancing motor recovery. Additionally, Neuromuscular Electrical Stimulation (NMES) improves scores on the Fugl-Meyer scale and Modified Ashworth Scale (MAS), with results lasting up to six months. A network meta-analysis confirmed cathodal tDCS as the most effective form of electrical stimulation for improving ADL performance after stroke. Ahmed et al. highlighted the promise of both tDCS and transcutaneous vagus nerve stimulation. Subramanian et al. supported the use of non-invasive brain stimulation in tandem with VR for subacute stroke recovery. However, the absence of a focused meta-analysis comparing VR alone versus combination therapy leaves a gap in evidence-based recommendations [2-3].

Spontaneous recovery plays a variable but important role in early post-stroke rehabilitation and its extent differs widely among individuals. This phase, often influenced by timely interventions, significantly affects long-term prognosis. Delays in initiating therapy can hinder optimal recovery. Kwakkel and others have suggested that FM-UE scores within the first month are strong predictors of long-term outcomes. Yao et al. reported that most participants in the subacute phase showed marked improvement in FM-UE after receiving VR and tDCS, whereas those in the chronic phase did not benefit as much. Electrode placement also influenced outcomes. In three randomized controlled trials (RCTs), the cathodal terminal was placed over the unaffected hemisphere's hand area, whereas another RCT positioned the anodal terminal over the affected motor cortex. This discrepancy may account for varied results in motor improvement. These technical considerations underscore the importance of personalized and precision rehabilitation [4-5].

Conclusion

This analysis identifies early and delayed recurrence rates of Clostridioides Difficile Infection (CDI) at 19.2% and 19.5%, respectively, among stroke patients undergoing rehabilitation. Alarmingly, early recurrence correlated with a 42.1% chance of subsequent relapse. The two-year post-CDI mortality rate stood at a high 32.5%, indicating that CDI is not only a frequent complication but also a potential prognostic marker of underlying frailty or comorbidity. These findings reinforce the importance of infection control and monitoring protocols in neurorehabilitation settings.

Acknowledgement

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Conflict of Interest

None.

References

1. Frati, Alessandro, Daniela Cerretani, Anna Ida Fiaschi and Paola Frati, et al. "Diffuse axonal injury and oxidative stress: A comprehensive review." *Int J Mol Sci* 18 (2017): 2600.

2. Geeraerts, Thomas, Lionel Velly, Lamine Abdennour and Karim Asehnoune, et al. "Management of severe traumatic brain injury (first 24 hours)." *Anaesth Crit Care Pain Med* 37 (2018): 171-186.

3. Osier, Nicole D., Shaun W. Carlson, Anthony DeSana and C. Edward Dixon. "Chronic histopathological and behavioral outcomes of experimental traumatic brain injury in adult male animals." *J Neurotrauma* 32 (2015): 1861-1882.

4. Darby, Joseph M., Howard Yonas, Donald W. Marion and Richard E. Latchaw. "Local "inverse steal" induced by hyperventilation in head injury." *Neurosurgery* 23 (1988): 84-88.

5. Oddo, Mauro, Ilaria Alice Crippa, Sangeeta Mehta and David Menon, et al. "Optimizing sedation in patients with acute brain injury." *Crit Care* 20 (2016): 128.

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