

A Top-down vs a Bottom-up Approach on Lower Extremity Motor Recovery and Balance Following Acute Stroke: A Randomized Clinical Trial

Authors : Vijaya Kumar, Vidayasagar Pagilla, Abraham Joshua, Rakshith Kedambadi, Prasanna Mithra

Abstract : Background: Post stroke rehabilitation are aimed to accelerate for optimal sensorimotor recovery, functional gain and to reduce long-term dependency. Intensive physical therapy interventions can enhance this recovery as experience-dependent neural plastic changes either directly act at cortical neural networks or at distal peripheral level (muscular components). Neuromuscular Electrical Stimulation (NMES), a traditional bottom-up approach, mirror therapy (MT), a relatively new top down approach have found to be an effective adjuvant treatment methods for lower extremity motor and functional recovery in stroke rehabilitation. However there is a scarcity of evidence to compare their therapeutic gain in stroke recovery. Aim: To compare the efficacy of neuromuscular electrical stimulation (NMES) and mirror therapy (MT) in very early phase of post stroke rehabilitation addressed to lower extremity motor recovery and balance. Design: observer blinded Randomized Clinical Trial. Setting: Neurorehabilitation Unit, Department of Physical Therapy, Tertiary Care Hospitals. Subjects: 32 acute stroke subjects with first episode of unilateral stroke with hemiparesis, referred for rehabilitation (onset < 3 weeks), Brunnstorm lower extremity recovery stages ≥ 3 and MMSE score more than 24 were randomized into two group [Group A-NMES and Group B-MT]. Interventions: Both the groups received eclectic approach to remediate lower extremity recovery which includes treatment components of Roods, Bobath and Motor learning approaches for 30 minutes a day for 6 days. Following which Group A (N=16) received 30 minutes of surface NMES training for six major paretic muscle groups (gluteus maximus and medius, quadriceps, hamstrings, tibialis anterior and gastrocnemius). Group B (N=16) was administered with 30 minutes of mirror therapy sessions to facilitate lower extremity motor recovery. Outcome measures: Lower extremity motor recovery, balance and activities of daily life (ADLs) were measured by Fugyl Meyer Assessment (FMA-LE), Berg Balance Scale (BBS), Barthel Index (BI) before and after intervention. Results: Pre Post analysis of either group across the time revealed statistically significant improvement ($p < 0.001$) for all the outcome variables for the either group. All parameters of NMES had greater change scores compared to MT group as follows: FMA-LE (25.12 ± 3.01 vs. 23.31 ± 2.38), BBS (35.12 ± 4.61 vs. 34.68 ± 5.42) and BI (40.00 ± 10.32 vs. 37.18 ± 7.73). Between the groups comparison of pre post values showed no significance with FMA-LE ($p=0.09$), BBS ($p=0.80$) and BI ($p=0.39$) respectively. Conclusion: Though either groups had significant improvement (pre to post intervention), none of them were superior to other in lower extremity motor recovery and balance among acute stroke subjects. We conclude that eclectic approach is an effective treatment irrespective of NMES or MT as an adjunct.

Keywords : balance, motor recovery, mirror therapy, neuromuscular electrical stimulation, stroke

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