A Randomized, controlled clinical trial of a balance training program with cutaneous electrical stimulation to improve balance performance in patients with sub-acute stroke

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Introduction
Balance disorders after stroke is a major problem, and falls and fall-related injuries have been identified as a major complication following stroke. Results of recent studies of chronic stroke patients have shown that electric somatosensory stimulation can augment the effects of task-related training in improving lower limb strength and walking capacity. As the greatest improvements in motor function occur between 3 weeks and 6 weeks post-stroke, and as a clear plateau is reached by 90 days, the first 8 weeks since the onset of stroke are expected to be the best time to enhance the motor recovery in stroke patients. We hypothesize that this would be the best period in which to apply electrical stimulation as well.

Objectives
The aim of this study was to investigate whether or not transcutaneous electrical stimulation (TENS) combined with task-oriented balance training (TOBT) was more effective than placebo-stimulation with TOBT, in promoting the recovery of motor function and balance during recovery from a first sub-acute stroke.

Methodology
This study was a randomized, placebo-controlled clinical trial conducted in geriatric day hospitals of the Shatin Hospital and the Princess Margaret Hospital. Seventy-six subjects (n=76) within 3-11 weeks after a first stroke who fulfill our inclusion criteria. Subjects were randomly allocated to 1 of 2 groups : (1) TENS + TOBT; (2)
placebo-stimulation (P-STIM) +TOBT, 2 times per week for 8 weeks. The primary outcomes included Berg Balance Scale score (BBS) and distance covered in the Six-Minute Walk test (6 MWT). Secondary outcome measures included Modified Rivermead Mobility Index (MRMI), timed “Up & Go” scores (TUG). Subjects were assessed at baseline (A0), after 8 treatment sessions (A1) and 16 treatment sessions (A2), and 3 months after treatment ended (AFU).

**Result**

When compared with P-STIM+TOBT group, the combined TENS+TOBT group showed significantly greater improvement in BBS and MRMI scores at A1; in BBS scores and TUG scores at A2. The treatment effect on BBS scores could be maintained 3 months after treatment ended at AFU. No significant differences were found in distance covered in 6MWT between 2 groups at all time points. Implications: Sixteen sessions of rehabilitation program combining TENS with TOBT could improve balance performance and motor functions in patients with subacute stroke. TENS is particularly useful as complementary therapy to a TOBT program for subjects with subacute stroke.