

Title: Cooling of limbs: A cool therapy for treatment of Essential Tremor

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Objective: To determine the therapeutic effects of limb cooling in a large cohort of essential tremor patients.

Background: Standard treatment for essential tremor (ET) is oral medications but many patients show lack of efficacy or develop side effects. Deep brain stimulation surgery is an alternative treatment however potentially has long-term adverse effects. Therefore there is a merit in considering alternate modalities of treatments. Nonpharmacological therapy such as cooling of limbs is promising but only three small scale studies have been conducted.

Methods: ET patients with partial or no response to pharmacological treatments were enrolled. Demographics and baseline scores on Fahn-Tolosa-Marin Tremor Rating Scale (TRS) and SF-36 quality of life scale were obtained. Subjects were examined while they were on medications. Dominant arm affected by tremors was cooled to a desired temperature of 59°F achieved with application of icepack to the ventral and dorsal surface of forearm for a period of 10 minutes. Handwriting assessment including writing legibility and line drawing test (LDT) was used before and immediately after cooling. For LDT, subjects were asked to draw as many horizontal lines as possible between two predefined vertical lines on a sheet of paper over 20 seconds. Samples of LDT were provided and test performance was scored by a blinded rater.

Results: 42 patients (25 men and 17 women) with ET underwent evaluation. Mean age of participants was 69.1 years. Mean disease duration was 10.5 years. There were 6 patients with history of DBS. Propranolol and Mean total score on TRS was 40.6. Mean score for dominant arm (average of rest, posture and intention arm motor item) was 2.6. Mean scores on SF-36 subscales were: Physical functioning, 67.1; Role physical, 51.8; Bodily Pain, 62.5; General Health, 65.1; Vitality, 55; Social Functioning, 72.8; Role-Emotional, 70.8; and Mental Health, 74.1. 32 patients reported immediate benefits after cooling [Fig]. Objective assessment found improvements in handwriting legibility and LDT scores. LDT scores before cooling (mean 0.93) on a paired t-test differed significantly ($p=0.04$) from those after cooling (mean 0.61).

Conclusions: In this large cohort of essential tremor, preliminary evidence shows that cooling of limbs has subjective and objective clinical benefits. We plan to conduct a randomized controlled blinded study in conjunction with physiological evaluation for further elucidation.