Accelerated TMS for Depression: A Systematic Review and Meta-Analysis

Ayse Irem Sonmez, Deniz Doruk Camsari, Aiswarya L. Nandakumar, Ammar Almorsy, Jennifer L. Vande Voort, Simon Kung, Charles P. Lewis, Paul E. Croarkin
Mayo Clinic Depression Center, Department of Psychiatry & Psychology, Mayo Clinic, Rochester, MN, USA

Abstract

Background: Repetitive transcranial magnetic stimulation (rTMS) is now widely available for clinical treatment of depression, but the associated financial and time burdens are problematic for patients. Accelerated TMS (aTMS) protocols address these burdens and attempt to increase the efficiency of standard TMS. This systematic review and meta-analysis aimed to examine accelerated TMS studies for depressive disorders in accordance with PRISMA guidelines.

Methods: Inclusion criteria consisted of studies with full text publications available in English describing more than one session of TMS (repetitive or theta burst stimulation—TBS) per day. Studies describing accelerated TMS protocols for conditions other than depression or alternative neuromodulation methods, preclinical studies, and neuropsychology studies regarding transcranial stimulation were excluded. 18 articles describing 11 distinct studies (7 publications described overlapping samples) met eligibility criteria. A Hedges’ g effect size and confidence intervals were calculated.

Conclusion: Overall, the meta-analysis suggested that aTMS improves depressive symptom severity. In general, study methodologies were acceptable, but future efforts could enhance sham techniques and blinding.

Results

A total of 18 publications from 11 unique studies (6 randomized controlled trials and 5 open-label trials) met inclusion criteria (Fig. 1).

Discussion

In eleven unique studies, aTMS sessions were administered at a frequency ranging between 2 and 10 sessions per day. Intersession interval varied from 12 minutes to 2 hours. The total stimuli delivered ranged between 15,000 and 90,000.

The number of aTMS studies to date is small, and thus the results of this systematic review and meta-analysis must be interpreted with caution.

The optimal TMS dosing strategy for aTMS is unknown. Additional research is required to assess whether the total stimulus, number of sessions per day, intersession intervals, or any other stimulation parameter is the most influential in generating clinical benefit.

Common limitations were small sample size, limited statistical power, and maintaining the integrity of blinding due to sham techniques. Existing work suggests that aTMS is safe, tolerable, and feasible. Larger, systematic trials with enhanced blinding and sham delivery are urgently needed.

Methods

A systematic review of the literature on aTMS protocols in patients with depressive disorders was executed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.

Search terms: transcranial magnetic stimulation OR trans-cranial magnetic Stimulation OR rTMS or tms OR trans暨© magnetic stimulation OR trans暨© cranial magnetic stimulation OR repetitive transcranial magnetic stimulation OR theta burst stimulation OR accelerated OR accelerated stimulation OR accelerated TMS OR accelerated rTMS OR accelerated TBS OR accelerated TMS OR theta burst stimulation OR repetitive pulse stimulation OR rapid OR quick OR fast OR condensing OR rapid OR accelerated OR depolarizing OR synchronizing OR antidepresant OR accelerated.

Data Sources: EMBASE, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Ovid MEDLINE(R) Epub Ahead of Print-Process & Other Non-Indexed Citations, Ovid MEDLINE 1946 to December 29, 2017, PsycINFO, SCOPUS, and Web of Science.