

rTMS IS AN EFFECTIVE THERAPY FOR APHASIA

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The left hemispheric stroke (right handed subject) is frequently connected with fluent (motor), non-fluent, conduction aphasia. After disappearing of diaschisis (cytotoxic oedema) there is a great improvement in speech disability but few months later about 50 % of patients has remained disable.

Transcranial magnetic stimulation (TMS) can induce electric current in the nervous system. TMS partly substituted the direct current stimulation. Measurement of motor evoked potential (MEP), central motor conduction time (CMCT) has been spread all over the world and went into the daily practice. The paired-stimulations were introduced to measure the intracortical excitability. The repetitive transcranial magnetic stimulation (rTMS) is able to influence on the intracortical excitability (brain plasticity), on the increment in BDNF and on the production of progenitor cells. Consequence of all of them is a change in behaviour. The after-effect of the stimulation for days is longer than the stimulation period so that it can be applied for therapy of the central nervous diseases. The rTMS was used in patients with stroke. The effect of rTMS was proved in movement induction in paretic extremities, in dysphagia, and neglect. The aphasia after stroke can be studied only in humans. The recovery of aphasia after stroke is based on the functional imagines studies (fMRI, PET), however the comparison of the trials is difficult because of the different lesions and different speech activation tasks. Although generally we can say that there is a dynamic alteration in the activity of language areas after stroke. In the acute phase of stroke there is a strongly reduced activation in the entire language network which includes the non-lesioned areas (diaschisis). The overactivity of both frontal areas after stroke for 12 days may support the involvement of them in the reorganization. The importance of the right intact side hemisphere was tested by barbiturate into the right carotid artery and later the rTMS with 4 Hz over the right inferior frontal gyrus was given. Both interventions worsened the speech assessed by different tests in patients with non-fluent aphasia. The conclusion was that the right (non-lesioned) hemisphere temporarily took part in the restoration of aphasia. The superiority of the reactivation of left (lesioned) hemisphere in the behaviour was supposed because of the better improvement of patients with non-fluent aphasia if the activity of different areas in left frontal region assessed by fMRI was significantly increased after months of onset of stroke. The increased activation in both supplementary motor areas (SMA) was assessed by fMRI and after 16 months the left side remained overactivated in the well recovered patients with non-fluent aphasia. The activation assessed by PET and fMRI in improved patients showed more and wider regions than poorly recovered patients. The right activation in homologous Broca area assessed by PET is decreased in the well improved patient with non-fluent aphasia after one year of stroke.

The goal of the stimulation techniques is to alter the excitability in the left and right hemisphere to further improve the outcome. On the basis of interhemispheric inhibition the non-lesioned hemisphere was treated with 1 Hz rTMS and the lesioned hemisphere was treated with high frequency rTMS. The treatment with rTMS for 10 days started with case studies followed them for months. All of them showed permanent improvement after rTMS. The last year the placebo controlled studies proved the superiority of rTMS above placebo. The intermittent theta burst stimulation (iTBS) above left hemisphere was accompanied with white matter regeneration assessed by diffusion tensor imaging (DTI)

rTMS is a cheap, simple method without severe side effects which promotes the improvement of patients with fluent and non-fluent aphasia assessed by different tests. The change in behaviour caused by rTMS was related with the alteration in the activity of language network assessed by PET and fMRI or the change in white matter density.