

## **Abstract**

Tinnitus is a common and often severely disabling symptom that is characterized by the perceived sensation of sound in the absence of an external stimulus. Traditional treatment approaches have limited efficacy. It is assumed, that tinnitus is connected with dysfunctional activation of neuronal plasticity induced by altered sensory and somatosensory input. Adaptive neuroplastic processes alter the balance between excitatory and inhibitory function of the auditory system at several levels. Functional imaging studies in tinnitus patients have revealed increased neuronal activity of primary auditory cortex (PAC).

Repetitive transcranial magnetic stimulation (rTMS) induces changes of neuronal activity that outlast the stimulation period. Low-frequency rTMS over the PAC region results in a decrease of cortical activity by inducing long term depression (LTD) and leads to reduced tinnitus perception. The aim of this study was to assess in prospective randomized placebo-controlled study the ability of active low-frequency rTMS guided by frameless stereotaxy to affect symptoms of chronic tinnitus compared to placebo stimulation. Treatment outcome was assessed by subjective specific questionnaires; Tinnitus Handicap Inventory (THI), Tinnitus Questionnaire (TQ) and Visual analogue scales (VAS1, VAS2) developed by us.

The results of our study demonstrate that neuronavigated 1Hz rTMS PAC leads to statistically significant reduction in THI and TQ total scores in active group compared to placebo group. The persistence of the positive effect is temporary limited, statistically significant reduction is restricted to 14 weeks. This study is the first one performed in the Czech population and our results confirm results obtained in foreign studies. Our results can be useful not only for additional tinnitus research, but also for rTMS treatment of different neuropsychiatric disorders.

**Key words:** tinnitus, hyperexcitability, primary auditory cortex, repetitive transcranial magnetic stimulation, long term depression, frameless stereotaxy