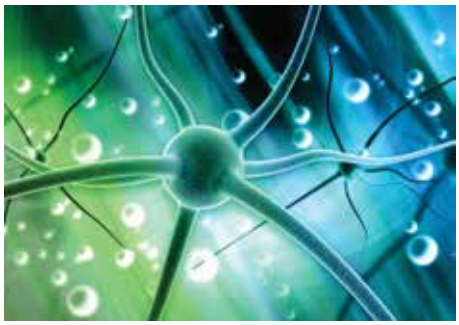
Tinnitus Treatment with Repetitive Transcranial Magnetic Stimulation

Summary by John A. Coverstone, AuD

As tinnitus is redefined as a prob-lem of the brain and not just the ear, new technologies are being considered for its treatment. Repetitive transcranial magnetic stimulation (rTMS) is one such technology. rTMS uses magnetic pulses directed at the brain to stimulate target cortical areas in the hope of correcting maladapted (malfunctioning) neural pathways. rTMS has been used as treatment for depression with varying results, and it is currently being studied for use with anxiety disorders, auditory hallucinations, and tinnitus.

In studies using rTMS for treatment of patients with chronic tinnitus, procedures have largely been the same for each subject and results have varied widely from one individual to the next. However, a group from the University of Regensburg in Germany has begun study of a more personalized approach that may improve outcomes.

Previous studies revealed positive outcomes from rTMS stimulation of the prefrontal and temporal areas of the brain. Some research has suggested that areas of the prefrontal cortex, which modulate sensory information, may act as a gating system for tinnitus. Basically, it has been theorized that the gate may be broken, and, therefore, it cannot stop tinnitus signals from reaching the auditory cortex where sound is perceived. The



temporal lobe of the brain contains the auditory cortex itself, which has shown promising results when stimulated with rTMS.

The researchers at University of Regensburg applied stimulation to each of these areas — the dorsolateral prefrontal cortex and temporo-parietal junction, to be specific — on each side of the brain. In addition, at each of these four stimulation sites, patients received stimulation at five different frequencies, providing a total of 20 different treatment protocols. After initial stimulation, researchers asked patients to rate changes in their tinnitus according to percentage of loudness. The most effective protocol for each patient was then repeated to ensure retest validity. The protocol also was repeated in a sham stimulation to provide a control.

Patients who reported changes in tinnitus were treated with stimulation to the most effective prefrontal site (right or left) and the most effective temporo-parietal site for nine consecutive (working) days. Patients who did not experience immediate tinnitus changes on the first day were treated with nine days of a more standard protocol of rTMS stimulation. Subjects were then brought back for follow-up visits two weeks and 10 weeks after treatment was concluded.

Fifty percent of the subjects reported immediate changes — or modulation — of tinnitus after the initial treatment. There were no noted differences in clinical or demographic characteristics of the group assigned to individualized treatment and those assigned to standard treatment protocols. Over the measurement period, from baseline (before initial stimulation) to 10 weeks post-stimulation, scores on a tinnitus questionnaire showed a larger decline in tinnitus severity for those receiving individualized treatment than for those receiving the standard treatment protocols.

This study included a small number of subjects and is viewed as a pilot study. It also lacked some of the controls of a larger study, such as randomly assigning patients to individualized and standard protocol groups and including a control group that receives only sham stimulation. However, the researchers demonstrated potential for an individualized protocol with rTMS, which may lead to more targeted treatment and better predictions of outcomes.

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