TMS and tinnitus

Transcranial magnetic stimulation and tinnitus: implications for theory and practice

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Transcranial magnetic stimulation: a possible treatment modality for tinnitus?

Tinnitus remains an enigma, with no consensus on the pathophysiology or treatment of this condition. Transcranial magnetic stimulation has recently emerged as a possible treatment modality that has shown some promise. The paper by Plewnia *et al*,[1] (***see p 152***) reported on the efficacy of delivering 10 sessions of low-frequency repetitive transcranial magnetic stimulation (rTMS) over the temporoparietal association cortex to treat chronic tinnitus. Although rTMS is known to effect change in tinnitus perception,[2–4] it is unclear how this change occurs and what method of application is most effective. Plewnia *et al*[1] provide new information with implications for possible future clinical use. In contrast with previous studies,[3] Plewnia *et al* show only a temporary effect of rTMS on tinnitus, at least with currently used treatment schedules. The study also highlights the fact that blood flow asymmetries associated with tinnitus, and commonly used to target rTMS, can be quite variable among patients. In contrast with previous studies, which have focused on the primary auditory cortex, this study suggests that rTMS may attenuate tinnitus perception by influencing neural systems related to attention and emotion.

To individually adjust selection of the target area for rTMS, Plewnia *et al* used $[^{15}O]H_2O$ positron emmision tomography before and after a lidocaine-induced reduction in tinnitus loudness to obtain each patient's maximum of tinnitus-related cortical activity, as measured by regional cerebral blood flow (rCBF). A reduction in tinnitus after active rTMS correlated with change in rCBF in the anterior cingulate cortex immediately after the lidocaine injection. The temporoparietal cortex and the anterior cingulate cortex are known components of neural systems that mediate attention.[5] Interestingly, deficits in attention in people with tinnitus have been documented in the laboratory.[6]

If rTMS is to be used clinically for the treatment of tinnitus, future studies must consider the following questions. Firstly, what schedule of rTMS can promote long-term change in tinnitus perception? Consecutive, week-long treatment schedules can ameliorate tinnitus in the short run, but booster sessions may be necessary as symptoms return to effect a long-term change. Secondly, do the asymmetries in rCBF observed in association with tinnitus change as tinnitus improves? Follow-up neuroimaging is necessary to learn whether these asymmetries are relevant and to validate models of tinnitus perception that concern cortical contributions.

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