TMS and Tinnitus: Implications for Theory and Practice

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Tinnitus remains an enigma, with no consensus on the pathophysiology or treatment of this condition. Transcranial magnetic stimulation (TMS) has recently emerged as a possible treatment modality that has shown some promise. In the paper by Plewnia et al. on p. XXX (Moderate therapeutic efficacy of PET-navigated repetitive transcranial magnetic stimulation [rTMS] against chronic tinnitus: a randomized, controlled pilot study), they report on the efficacy of delivering 10 sessions of low-frequency rTMS over the temporo-parietal association cortex to treat chronic tinnitus. Whereas rTMS is known to effect change in tinnitus perception,\(^1\)-\(^3\) it is unclear how this change occurs and what method of application is most effective. The Plewnia et al. study provides new information with implications for possible future clinical use. In contrast to previous studies,\(^2\) the Plewnia et al. study shows 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 to 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.

In order to individually adjust selection of the target area for rTMS, Plewnia et al. used \(^{15}\)O\textsubscript{H}_2\textsubscript{O} PET 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 of tinnitus following active rTMS correlated with change in regional cerebral blood flow (rCBF) in the anterior cingulate cortex (ACC) immediately following the lidocaine injection. The temporo-parietal cortex and the ACC are known components of neural systems that mediate attention.\(^4\) Interestingly, deficits in attention in tinnitus sufferers have been documented in our laboratory.\(^5\)

If rTMS is to be used clinically for the treatment of tinnitus, future studies must address the following questions. First, 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. Second, 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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BOOK REVIEW

Vascular cognitive impairment in clinical practice


In 2006, the NIH convened a conference, which attempted to establish a new concept, vascular cognitive impairment (VCI). The resulting document has been published and now, 3 years later, several of the key participants, and others, have contributed to a new book on that topic. Edited by leading authorities and joined by several eminent experts, the book addresses clinicians dealing with demented individuals in order to distribute the concept of VCI which has not been accepted unopposed.

The term VCI is supposed to cover the whole spectrum of cognitive decline which occurs as a result of vascular changes to the brain. Because these changes result from a multitude of factors (haemorrhage, ischaemia, emboli, small vessel disease, etc), VCI cannot be considered a disease, but neither is it a syndrome since there is very little in common between cognitive changes resulting from different processes (eg, leuкоaraiosis and those due to a single thalamic stroke).

In addition, the vascular lesions occurring mostly in elderly subjects rarely affect an otherwise normal brain. Alzheimer pathology is very common in the elderly, and even if changes fail to satisfy arbitrary pathological criteria of Alzheimer’s disease (AD), they cannot and should not be ignored. In fact, a growing body of evidence forces us to accept that most cases of dementia in the elderly are the result of combined lesions, and therefore the concept of (pure) VCI may be misleading. The authors of several chapters in the book acknowledge these issues, albeit in a soft voice. It seems that they try to simplify the question of the pathogenesis and manifestations of dementia in old age by resorting to a dualistic approach. Unfortunately, this entrenched position does not benefit scientific progress.

The authors do not even agree on the definition of VCI. Whereas the editors limit it to “from the earliest deficit” (p4), others ask whether VCI can be a prodrome to vascular dementia (p11). If vascular dementia is included in the spectrum of VCI, how can VCI be a prodrome to it? Still others claim that the “brain at risk stage” (ie, prior to cognitive changes) should be included (p54). Particularly dissatisfying are the chapters on treatment where data from AD are used freely without mentioning that they do not necessarily apply to other dementia types, particularly vascular dementia. The chapter on “control of vascular risk factors” contains a well structured review of the role of dementia. However, if VCI has so many underlying pathologies, preventative treatments are hard to identify to any of its subtypes. A discussion as to why none of the anti-AD drugs has been accepted by authorities for treatment of vascular dementia is missing. Is rigid control of the risk factors useful in preventing, or at least slowing, the cognitive deterioration? This important clinical question is neglected. While there is some discussion of symptomatic therapies, this is directed at manifestations of dementia in general, perhaps because the authors believe that the clinical behavioural manifestations are similar, both in underlying mechanisms and in presentation, in VCI and in other dementia syndromes. Among atypical antipsychotic agent, the most atypical, clozapine, is not mentioned.

There are a few errors, for example, the claim that “the diagnosis of dementia can be done at the bedside using global cognitive measures (eg, Mini-Mental State Examination)”, p52. Sometimes statements are made without reference (eg, “The levels of Aβ may be reduced in the users of statin and Ginko biloba”, p65).

While the authors of the different chapters have generally completed well the missions assigned to them, the editors and publisher could have done more. Each chapter has its own structure. Summaries, which are so important in such a comprehensive work, are missing in some chapters and replaced by “significance”, “conclusions”, “concluding remarks”, etc, in others. The reference list after each chapter is not always arranged correctly alphabetically, and a unified reference list at the end of the book could avoid unnecessary repetitions. Sometimes unclear references are included (eg, “BNF 2006”, p216).

A good index is a very important tool in a book such as this but, unfortunately, it is rather incomplete. For example, “Binswanger’s disease” is mentioned in the text more frequently then four times, as suggested by the index. Abbreviations are used without spelling them out first. Table 14.1, among others, has not been proofread. Surely, a distinguished publisher like Cambridge University Press could have done a better job.

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Although it could be argued that this reduction may simply be the result of reduced life expectancy in MS patients, this is unlikely, as an age-specific Cox survival model also showed a significant reduction in the risk of cancer. Similarly, it is unlikely that this would represent under-reporting because patients are typically in closer contact with health practitioners than the normal population. Explanations could include lifestyle alterations following diagnosis, genetic factors or immunological changes due to MS. Further study of mechanisms is therefore warranted, but more immediately, the results of this meta-analysis will be of use for MS patients and their care givers.

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The authors would also like to explain further the labels in figure 2C and 2D. 2C: Extensive tau pathology in DNVN composed of numerous neuropil threads and tau-positive neurons (arrows). 2D: Tau pathology of few neuropil threads in the SN (arrows).

Figure 1 The corrected version with previously misplaced number 9.

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