Transcranial Brain Stimulation for Treatment of Psychiatric Disorders
Transcranial Brain Stimulation for Treatment of Psychiatric Disorders

Volume Editors

M.A. Marcolin, São Paulo
F. Padberg, Munich

34 figures, 4 in color, and 19 tables, 2007
VII Preface

Electroconvulsive Therapy

1 Electroconvulsive Therapy: Update and New Research
Eser, D.; Schüle, C.; Rupprecht, R.; Baghai, T.C. (Munich)

Repetitive Transcranial Magnetic Stimulation: Mechanisms of Action

18 Repetitive Transcranial Magnetic Stimulation Effects in vitro and in Animal Models
Keck, M.E. (Zurich)

35 Neuroimaging of Repetitive Transcranial Magnetic Stimulation Effects on the Brain

Repetitive Transcranial Magnetic Stimulation: Clinical Applications

53 Efficacy and Safety of Prefrontal Repetitive Transcranial Magnetic Stimulation in Affective Disorders
Padberg, F.; Grossheinrich, N.; Pogarell, O.; Möller, H.-J. (Munich); Fregni, F. (Boston, Mass.)
84 Repetitive Transcranial Magnetic Stimulation in Augmentation of Antidepressant Drugs
Rumi, D.O. (São Paulo); Conca, A. (Rankweil); Herwig, U. (Zurich); Gattaz, W.F.; Marcolin, M.A. (São Paulo)

97 Transcranial Magnetic Stimulation versus Electroconvulsive Therapy for the Treatment of More Severe Major Depression
Janicak, P.G.; Dowd, S.M. (Chicago, Ill.); Marcolin, M.A.; Rosa, M.A. (São Paulo)

110 Transcranial Magnetic Stimulation in Schizophrenia
Odebrecht Rosa, M. (São Paulo); Belmonte-de-Abreu, P. (Porto Alegre); Eichhammer, P.; Hajak, G. (Regensburg); Marcolin, M.A. (São Paulo)

124 Repetitive Transcranial Magnetic Stimulation in the Treatment of Obsessive-Compulsive Disorder and Other Anxiety Disorders
Pridmore, S. (Hobart); Marcolin, M.A.; Ribeiro, C.S.; Mansur, C.G. (São Paulo)

134 Repetitive Transcranial Magnetic Stimulation in Non-Psychiatric Disorders: Pain, Parkinson’s Disease, Stroke, Tinnitus
Lefaucheur, J.-P. (Créteil); Khedr, E.M. (Assiut)

Other Approaches: Magnetic Seizure Therapy, Transcranial Direct Current Stimulation

155 Magnetic Seizure Therapy for the Treatment of Depression
Lisanby, S.H.; Peterchev, A.V. (New York, N.Y.)

172 Induction and Modulation of Neuroplasticity by Transcranial Direct Current Stimulation

Recent Developments and Perspectives

187 Theta Burst Stimulation
Huang, Y.-Z. (Taipei); Rothwell, J.C. (London)

204 Transcranial Magnetic Stimulation of Deep Brain Regions: Principles and Methods
Roth, Y. (Tel Hashomer); Padberg, F. (Munich); Zangen, A. (Rehovot)

225 Author Index

226 Subject Index
Modern neuropsychopharmacology has led to important insights into the pathophysiology of mental disorders and the development of effective drugs since the 1950s. More recently, findings derived from functional neuroimaging studies have emphasized the neuroanatomical perspective in mental disorders. This is directly linked to the idea of focally stimulating distinct brain regions in order to exert therapeutic effects.

Many different brain stimulation approaches have been considered during the last decades and some of them have been developed into effective therapeutic interventions. Electroconvulsive therapy (ECT), for example, is a well-established treatment for depression and catatonia, and deep brain stimulation (DBS) is widely applied in patients suffering from severe Parkinson’s disease. Many of these methods converge in terms of underlying mechanisms of action based on fundamental principles of brain function. Sometimes they even show common neurobiological effects, demonstrated by functional neuroimaging, neurophysiology methods and molecular neuroscience techniques. One example are the effects of antidepressant interventions on regional cerebral activity demonstrated by functional neuroimaging: antidepressant drugs and ECT as well as DBS of the subgenual cingulate cortex, which has most recently been investigated [Mayberg et al., 2005], act in a similar manner on dysfunctional regional brain activity in depression, i.e. modulating limbic and paralimbic brain activity in rest towards a state normally observed in healthy volunteers and associated with mental health. However, it is often difficult or impossible to identify the key mechanisms of action and to distinguish them from epiphenomena...
purely associated with the recovery from disease, but not related to a specific action of an intervention.

The different brain stimulation methods can principally be distinguished by specific characteristics. (1) They act on neuronal circuits through various neuroanatomic ‘windows’. In some interventions these ‘windows’ can be defined in terms of neuroanatomic structures as in vagal nerve stimulation (VNS), DBS or repetitive transcranial magnetic stimulation (rTMS), and in some interventions the action on the brain is not focal at all as in ECT, magnetic seizure therapy (MST) and transcranial direct current stimulation (tDSC). (2) The methods range in terms of their invasiveness from practically noninvasive approaches (rTMS, tDCS), to ECT and MST, which provoke an epileptic seizure, require general anesthesia and may somehow be regarded as ‘more invasive’ than rTMS and tDCS, to clearly invasive techniques (VNS and DBS) where stimulation electrodes and a neurostimulator are implanted. (3) Finally, they differ in terms of the duration of the intervention, i.e. ECT, rTMS, MST and tDCS represent acute treatments normally applied over several weeks and rarely extended towards maintenance treatment, whereas VNS and DBS work through a permanent stimulator and are per se long-term treatment strategies, particularly suitable for chronic or frequently relapsing disorders.

Our book focuses on transcranially applied, non- or low-invasive interventions not requiring surgery, i.e. ECT, rTMS, MST and tDSC. Recent progress in this field has prompted us to edit this book in order to provide an overview on this spectrum of fascinating techniques – not only for scientists, but also for clinicians who are interested in these methods and who may even consider applying one or the other approach for the treatment of their patients. However, it is important to emphasize that the different methods are at different stages of development in specific disorders. To reflect this range, the book contains a state-of-the-art chapter on ECT, which still represents a kind of gold standard in this field. It reviews more recent methods, particularly rTMS, which is just about to become clinically applicable as treatment for several mental disorders and introduces the most recent achievements: MST, tDSC and two novel variants of rTMS, i.e. theta burst stimulation and deep rTMS. The latter chapters do not present ready-to-use approaches, but are thought to stimulate a wider interest in methodology and trigger a substantial discussion about options for method development which is clearly needed in this field.

We are extremely grateful to our colleagues who have spent their valuable time writing for this book, despite the large number of publication duties a scientist faces in our times. All authors have contributed to the benefit of our readers. Moreover, we thank the staff of S. Karger AG, Basel for their
excellent, accurate and speedy work during the editorial process. Finally, we particularly acknowledge the initiative and the input of the series editors (K.P. Ebmeier, W.P. Kaschka, D. Ebert and W.F. Gattaz) who made this book possible.

Marco Antonio Marcolin  
Frank Padberg  
São Paulo and Munich

Reference
