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AWAKE SURGERY AND COGNITIVE MAPPING

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Preface

□ Awake surgery and cognitive mapping

The volume "Awake surgery and cognitive mapping" is stemming from an International meeting recently held in the magnificent frame of the city of Verona, which was chaired by two top names of the clinical and basic neurosciences like Prof.rs Gerosa and Caramazza.
The preparation of the book was followed with enthusiasm and dedication by Prof. Talacchi from the Department of Neurosurgery of the University of Verona.
The treated arguments include all the hot topics of modern research on brain function, including mapping procedures, brain plasticity, cognitive and learning mechanisms and computational neuroscience for modelling brain organization.
All the most advanced technologies for structural and functional brain exploration are treated by major experts, including those for intraoperative neuronavigation, cortical mapping of at-risk areas for surgical planning and execution, fiber dissection technique in combination with magnetic resonance imaging methods for tractography. Brain function has been investigated with integrated methods including different types of cortical stimulation and recording procedures, neurometabolic techniques and neurophysiological devices, including the most updated forms of computerized analysis with dedicated software and algorithms.
Main neurosurgical procedures are analysed as well as their clinical aspects mainly dealing with neuropsychological perspectives.
The excellent level of the contributors and speakers has been furtherly enriched by three discussants who provided their written support to this volume, namely Prof. Bizzi, Prof. Sawaya and Prof. Luders.
I am pretty confident that the reader who is interested to these themes will enjoy the way they are exposed and developed and the high level of all the contributions.

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In 1861, M.P. Broca, reporting of a case of "aphemie" (aphasia), first described the famous cortical region, defined as "La siege de la facultè du langage articule".
During the following 150 years, anatomo-physiological studies have convincingly shown that the mentioned posterior portion of the left inferior frontal gyrus in the dominant hemisphere (i.e. areas 44 & 45) currently accounts for a spectrum of additional functions, from music perception (*Maess B. et al., 2001*[4]) to motor functions as well as working memory processes (*Binkofski F. et al., 2004*[2]). Moreover, distinctive cytoarchitectonic markers of this region have been identified: the presence of a granular (area 45) or dysgranular (area 44) layer IV, characterized by large pyramidal cells (*Schleicher A. et al., 1990*[9] and *Amunts K.*

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et al., 2006[1]). The relevance of this complex in the domain of language has been further stressed recently-acquired knowledge on the role of mirror and of canonical neurons to this regard (*Rizzolatti G. et al., 2002*[7]) as well as by the fact that the neighbouring area 6, agranular, has been shown to be responsible for oro-laryngeal movements (*Rizzolatti G. et al., 2006*[6] and *Lindenberg R. et al., 2007*[3]).

Similar considerations may easily explain the limited role that has been traditionally conceived for surgical procedures within the borders of Broca's district, particularly whenever conducted under general anaesthesia, with no real-time monitoring of the speech network.

During the last decade the relevance of awake surgery has gained increasing momentum in the treatment planning both of crucially located brain tumors and in drug-resistant, surgically manageable epilepsy. Originally, the rationale of this approach was to provide the most reliable perioperative monitoring of highly functional regions, in order to maximize radicality, while minimizing the risks for the surrounding functional cortex, thereby improving patients' quality of life (*Ojemann G.A., 2003*[5]). Widespread efforts of multidisciplinary teams have gradually expanded the main potentials of the technique in terms of language mapping, verbal and visual-spatial memory (*Savazzi S. et al., 2008*[8]), neuropsychological staging, and cognitive parameterisation.

Additional, reachable goals have been targeted, including the identification of patients at risk for intraoperative mapping failure, optimisation of resources, and improvement of the cost-benefit ratio.

This volume, as well as the parental meeting held in Verona, September 2008, actually represents a further tribute to such an impressive on-going investigation. As stressed by several Authors, the rapidly-increasing amount of knowledge in this peculiar branch of neuro-physiology, may presumably result on the one side from the extensive regimen of preoperative planning (*see also: Rigolo L. et al.* and *Talacchi A. et al.*), including clinical-neuropsychological evaluation standards (*see Clusmann H. et al.* and *Santini B. et al.*), multimodality integrated neuro-imaging - functional magnetic resonance and Diffusion Tensor Imaging (DTI), Positron Emission Tomography (PET) scan, neuronavigation, etc. (*see Bizzi A. et al.*, *Catani M. et al.* and *Basso G. et al.*), and magneto-encephalography (*see Braun C. and Papadelis C.*).

On the other, by more and more advanced intraoperative settings, ranging from sophisticated anesthesiological approaches (*see Ferri E. et al.*), to dedicated neuro-psychological frameworks aimed at analysing even minimal pre-postoperative variations, to advanced panel of electrocortical mapping (*see Lubrano V. and Roux F.-E.,* and *Bertrand J.-A. et al.*), up to single-neuron recordings (*see Ojemann G.A.*).

Finally, it is probably worth stressing that, as illustrated by *Sanai N. and Berger M.S.*, a comprehensive literature review of the last two decades (1990 - to date) shows that the greater degree of resection allowed by these techniques leads to increased survival for patients with high grade gliomas, but may also delay the malignant transformation of low grade tumors. An extreme confirmation that this field of research, as a whole, adequately fulfils Harvey Cushing's definition of the leading goal in neurosurgical activity: patient first.

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