

Welcome, Mario Rosanova

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ABSTRACT

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Title	PERTURBATIONAL COMPLEXITY IN CHRONIC PATIENTS WITH DISORDERS OF CONSCIOUSNESS Room: Poster Area - Session: B25 - Abstract Number: FENS-1714 - Poster Board Number: B095
Poster No:	B095
Presenter:	M. Fecchio
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Session:	B25: Poster Session - Network interactions - Other Poster boards: B087-098
Date:	Monday - July 07, 2014 11:15 - 12:15
Location:	Poster Area
Subtopic:	B.8.c Other
Topic:	B.8 Network interactions
Theme:	B. Excitability, synaptic transmission, network functions

The level of consciousness is normally assessed from the ability of a subject to interact with the surrounding environment and communicate. Transcranial magnetic stimulation combined with electroencephalography (TMS/EEG) has been recently proposed to derive objective measures of the level of consciousness, in physiological and pathological conditions. Here we tested the reliability of the algorithmic complexity of TMS-evoked potentials (Perturbational Complexity Index - PCI) in a large sample of chronic patients with severe brain injury.

Sixty chronic in-patients (22 vegetative state ? VS, 25 minimally conscious state ? MCS, 13 conscious state - CS) were evaluated with the Coma Recovery Scale-Revised (CRS-R). PCI was computed for all TMS/EEG sessions and compared with clinical assessment.

The CRS-R score was significantly lower in VS group as compared to MCS and CS groups. PCI correctly discriminated between VS and MCS/CS conditions at the single-patient level. In three VS patients the PCI was higher than expected: in the following months these patients evolved toward the MCS condition.

PCI is a promising tool to discriminate VS and MCS/CS conditions, who are difficult to evaluate in chronic patients because of a progressive decline of residual sensory and motor abilities. Future studies should involve larger populations to provide a comprehensive validation of PCI for the evaluation of consciousness in chronic patients. Moreover, it would be interesting to compare and integrate TMS/EEG results with other brain functional assessments, e.g. event-related potentials, functional magnetic resonance imaging.

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Title	LOCAL CORTICAL EXCITABILITY CHANGES IN PATIENTS WITH UNILATERAL STROKE: A TMS-EEG STUDY Room: Poster Area - Session: C23 - Abstract Number: FENS-2740 - Poster Board Number: C075
Poster No:	C075
Presenter:	S. Sarasso
Author(s):	S. Sarasso(1), F. Seregni(1), S. Casarotto(1), C. Landi(2), A. Bo(2), G. Mattavelli(3), M. Mariotti(1), M. Massimini(1), M. Rosanova(1)
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Session:	C23: Poster Session - Ischemia - Animal and human studies Poster boards: C062-080
Date:	Monday - July 07, 2014 11:15 - 12:15
Location:	Poster Area
Subtopic:	C.9.c Animal and human studies
Topic:	C.9 Ischemia
Theme:	C. Disorders of the nervous system

Functional deficit following cerebral stroke are primarily caused by the irreversible loss of brain tissue. However, they may also result from the remote dysfunction of structurally preserved cortical areas. The neurophysiological mechanisms underlying this impairment (including local changes in cortical excitability and long-range connectivity) are still poorly understood.

Here we aim at assessing local cortical excitability in unilateral stroke using a combination of navigated transcranial magnetic stimulation and high-density electroencephalography (TMS/EEG). Specifically, we performed TMS/EEG measurements in a group of ten awake patients affected by unilateral stroke and targeted, for each patient, one cortical area (either frontal or parietal) within the affected hemisphere as well as the healthy homotopic contralateral site.

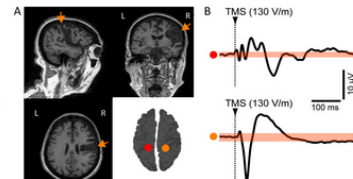
In all patients, the stimulation of the healthy hemisphere was characterized by a complex, long-lasting EEG response similar to those obtained in healthy control subjects. On the other hand, when applied over the affected hemisphere within the same patient, TMS invariably evoked a high-amplitude, positive-negative EEG response (Fig. 1) closely resembling those obtained during NREM sleep and general anesthesia.

This similarity suggests that focal brain injury may locally affect cortical excitability through similar neurophysiological mechanisms (i.e. cortical bistability). This is relevant since while anatomical lesions and disconnections cannot be reversed, it may still be possible to modulate intrinsic neuronal/network properties thus promoting functional recovery.

Fig. 1: Panel A shows the structural MR images acquired in a patient with unilateral, right-sided ischaemic stroke (orange arrows). By means of navigated, single pulse TMS, two cortical sites were stimulated: the medial portion of the right (lesion side) postcentral gyrus (orange circle on the grey cortical map) and the left (healthy side) homotopic site (red circle on the grey cortical map).

Panel B shows the TMS-evoked EEG responses recorded at the channels under the stimulator for both the left sided (red circle) and the right sided (orange circle) stimulation targets.

Note that the EEG response of the healthy hemisphere was characterized by a complex, long-lasting EEG response (upper and lower boundaries of the light red rectangles indicate the statistical significance range calculated with a baseline bootstrap method, $p < 0.01$) similar to those obtained in healthy, awake control subjects. On the other hand, when applied over the affected hemisphere within the same patient, TMS evoked a high-amplitude, positive-negative EEG response closely resembling those obtained during NREM sleep and general anesthesia (Massimini et al., Science 2005; Ferrarelli et al., PNAS 2010).



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POSTER

EEG

Moderatori: A. Amantini (Firenze) - F. Monti (Trieste)

- 1** Epileptic seizures in pediatric stroke: data from the Italian registry for childhood thrombosis
L. Baggio, S. Sartori, M. Nosadini, C. Gentilomo, P. Saracco, M. Agostini, B. Bassi, A. Palmieri, A.M. Laverda, P. Simioni, A. Suppiej per il G.I.R.T.I. (Gruppo Italiano Registro Trombosi Infantili) (Padova, Mestre, Torino, Genova)
- 2** EEG predictors of outcome in patients with disorders of consciousness
S. Bagnato, C. Boccagni, A. Sant'Angelo, C. Prestandrea, R. Mazzilli, G. Galardi (Cefalù)
- 3** Long lasting coma
S. Bagnato, C. Boccagni, A. Sant'Angelo, A.A. Fingelkurts, C. Gagliardo, G. Galardi (Cefalù, Espoo Finland, Palermo)
- 4** Reliability of the perturbational complexity index in discriminating chronic patients with disorders of consciousness
M. Fecchio, S. Casarotto, P.D. Trimarchi, A.G. Casali, C. Landi, A. Pigorini, L. Saia, M. Napolitani, S. Sarasso, M. Rosanova, G. Devalle, M. Massimini (Milano)
- 5** Involvement of different cortico-subcortical circuits in chronic tinnitus: an sLORETA-based EEG study
E. Houdayer, R. Teggi, S. Velikova, J.J. Gonzalez-Rosa, M. Bianco, M. Trimarchi, M. Bussi, G. Comi, L. Leocani (Milano)
- 6** Hyperventilation increases brain connectivity in healthy subjects and in focal cryptogenic epileptic patients
E. Mazzucchi, C. Vollono, A. Losurdo, E. Testani, V. Gnani, C. Di Blasi, N.M. Giannantoni, L. Lapenta, V. Brunetti, G. Della Marca (Roma)
- 7** Physiological and pathological aging: a cortical connectivity analysis by graph theory model applied to brain network
F. Miraglia, F. Vecchio, P.M. Rossini (Roma)
- 8** Pre-stimulus interhemispheric coupling of brain rhythms predicts cognitive-motor performance in healthy humans
F. Miraglia, F. Vecchio, G. Lacidogna, F. Ferreri, P.M. Rossini (Roma, Kuopio Finland)