

# DISSOCIATION BETWEEN BEHAVIOURAL SCALES AND TRANSCRANIAL MAGNETIC STIMULATION WITH HIGH-DENSITY ELECTROENCEPHALOGRAPHY (TMS/HDEEG) IN THE LONGITUDINAL ASSESSMENT OF THE LEVEL OF CONSCIOUSNESS IN NON-COMMUNICATING PATIENTS. A CASE-REPORT.

M. Napolitani<sup>1</sup>, S. Sarasso<sup>3</sup>, A. Vargiolu<sup>2</sup>, A. Comanducci<sup>3</sup>, A. Pigorini<sup>3</sup>, M. Rosanova<sup>3</sup>, M. Massimini<sup>3</sup>, G. Citerio<sup>1,2</sup>

<sup>1</sup> School of Medicine and Surgery, University of Milan–Bicocca, Milan, Italy.

<sup>2</sup> Neurointensive Care, Department of Emergency and Intensive Care, San Gerardo Hospital, Monza, Italy

<sup>3</sup> Department of Biomedical and Clinical Sciences “L. Sacco”, University of Milan, Milan, Italy

## ***Introduction***

An accurate neurophysiological assessment of the level of consciousness in acute brain-injured patients may represent a valid support to their early clinical evaluation possibly heralding detectable behavioural signs.

## ***Objective***

To evaluate TMS/EEG as a promising tool to assess the recovery of consciousness in acute brain-injured patients with disorder of consciousness (DOC).

## ***Methods***

The recovery of consciousness in an acute DOC patient (female, 59 years old, sub arachnoid and intraparenchymal hemorrhage in posterior cranial fossa) was longitudinally assessed both clinically (Glasgow Coma Scale GCS and Coma Recovery Scale-Revised CRS-R) and by means of resting EEG and TMS/EEG. The cortico-cortical EEG responses to TMS were collected by targeting two different cortical areas (BA6-BA7) and then used to compute the corresponding perturbational complexity index (PCI) values<sup>1</sup>.

## ***Results***

Longitudinal clinical scores, PCI values and the main features of resting EEG are reported in Table 1. A marked morphological change of the cortico-cortical evoked potentials elicited by TMS was found at day 33 compared to day 15 after the injury. This change was objectively quantified in a significant increase of PCI values, in spite of a negligible change of resting EEG features and clinical scores.

## ***Discussion***

This case-report reveals a dissociation between the clinical and the neurophysiological assessment of the early evolution of consciousness in non-communicating brain-injured patients. In this perspective, by directly probing the ability of cortico-thalamic circuits to sustain long-range, complex activity patterns<sup>3</sup> TMS/EEG may disclose the capacity for consciousness before behavioral signs can be detected.

<sup>1</sup> Casali et al Sci Transl Med. 2013 Aug 14;5(198):198ra105; <sup>2</sup> Massimini et al Prog Brain Res. 2009;177:201-14

<b>DAY</b>	<b>10 – 14</b>	<b>15</b>	<b>16 – 20</b>	<b>22 – 26</b>	<b>27 – 32</b>	<b>33</b>	<b>34 – 36</b>
<b>GCS</b>	8 (0,55)	8	7 (0,84)	6 (1,58)	5 (1,03)	6	6 (0)
<b>CRS</b>		9				9	
<b>PCI (BA 6)</b>		0,23				0,41	
<b>PCI (BA 7)</b>		0,25				0,41	
<b>Resting EEG activity</b>		$\theta$ , (minor $\delta$ )				$\theta$	

Table 1: GCS, CRS, PCI values and resting EEG features. Best scores for each day are reported. For time intervals (more than 1 day), GCS average values and standard deviation are displayed. The frequency band reported represent the prevalent background activity of the spontaneous EEG at rest