

Unresponsive, but Aware: The Non-Behavioral Minimally Conscious State

Johan Stender¹, Ron Kupers¹, Maurice Ptito^{1,2*} and Albert Gjedde¹

¹Department of Neuroscience and Pharmacology, University of Copenhagen, Copenhagen, Denmark

²Chaire de recherche Harland Sanders, Ecole d'Optométrie, Université de Montréal, Qc, Canada

*Corresponding author: Maurice Ptito, Department of Neuroscience and Pharmacology, University of Copenhagen, Copenhagen, Denmark, Tel: 514-398-6502; E-mail: ptito.maurice@gmail.com

Rec date: Sep 24, 2014, Acc date: Sep 25, 2014, Pub date: Sep 29, 2014

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Editorial

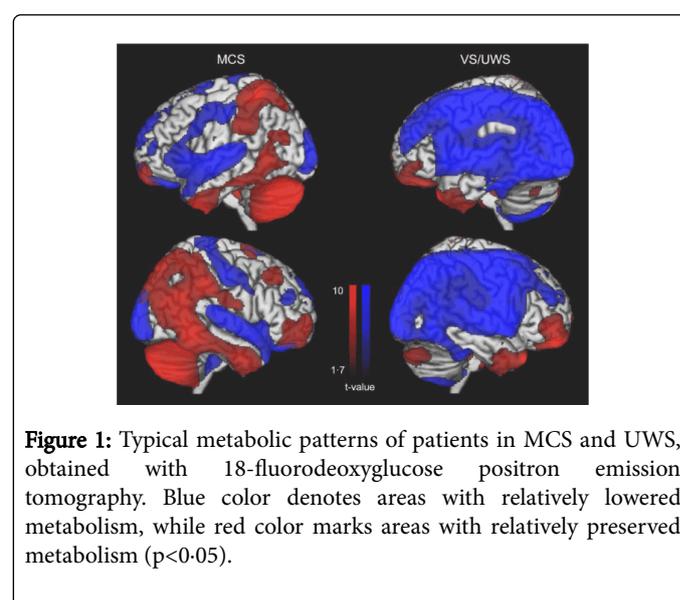
Improvements in neurosurgical and neurological intensive care have led to increased numbers of survivors from severe traumatic brain injury. Some of these suffer from prolonged disorders of consciousness, such as the minimally conscious state (MCS), or the unresponsive wakefulness syndrome (UWS). Patients in UWS retain arousal, but show no awareness of themselves or surroundings, whereas patients in MCS show fluctuating but reproducible behavioral signs of consciousness [1]. Long-term recovery of consciousness from UWS is uncertain, but progression into MCS is an important indicator of better prognosis. The distinction also has important ethical and therapeutic consequences. Incongruence of clinical presentation and residual cerebral functionality is however common.

Despite showing no overt responsiveness, severely brain injured patients may retain capacity for covert cognition. A series of seminal studies by Owen and colleagues demonstrated that patients clinically diagnosed with UWS retained a capacity for voluntary thought modulation. Functional magnetic resonance imaging of a patient revealed cortical activations similar to those of healthy volunteers, when the subject was asked to imagine playing tennis or walking through her own home [2]. Simple communication subsequently could be established with the same mental imagery as cues for “yes” or “no”. With this method, another UWS patient demonstrated knowledge of her primary caregiver’s name and her own hospitalization [3]. Recently, the same team observed complex activations of the executive networks in a patient believed to be unconscious for 16 years, in response to watching a film directed by Hitchcock [4]. These studies make it clear that some behaviorally unresponsive patients may retain consciousness, emotions, and a capacity for memory formation and higher order cognition.

The prevalence of patients with complete dissociation between behavioral and mental responsiveness is unknown. Neuroimaging tests of functional activation usually rely on preserved language comprehension, capacity for focused attention, and intact sensory apparatus, and many patients fail to respond, even with clear signs of consciousness at bedside [5].

In light of these issues, we recently examined the validity of cerebral glucose metabolic activity at rest, as a correlate of consciousness in severely brain injured patients. Metabolic patterns indicative of MCS was observed in 12 out of 37 UWS patients. Nine of those subsequently recovered responsiveness, while none in the remaining group improved clinically. This discrepancy supports the notion that the former group already was in, or progressing towards, MCS at the time of scanning [5]. The term “non-behavioral MCS” was proposed for this subpopulation (Figure 1). As these disorders represent a borderline

between awareness and unconsciousness, the distinction has important implications



The prognosis of patients in MCS dramatically is better than that of patients in persistent UWS, with long-term recovery rates of approximately 33% [6] and 0-12% [7], respectively. Furthermore, patients in MCS appear more responsive to neurostimulant attempts to promote recovery. Indeed, a double-blind sham-controlled study with transcranial direct current stimulation revealed lasting increases of responsiveness in 43% of the patients in MCS, but only 8% of the patients in UWS [8]. Deep brain stimulation with electrode placement in the thalamic intralaminar nuclei also has been shown to induce systematic behavioral improvement in one MCS patient [9]. No such effect has yet been seen in unresponsive patients.

Minimally conscious patients may feel pain [10] or experience complex emotions [11], whereas truly unconscious patients likely do neither of these. Disorders of consciousness frequently are associated with social neglect and painful effects of immobilization, such as spasticity or decubitus. Intensified interventions to improve quality of life of conscious individuals, such as analgesic treatment, intensive physiotherapy, and social care, are therefore needed [12]. Importantly, legal precedence in many countries has established the right to interrupt artificial life support of patients in UWS, while withdrawal of treatment from patients in MCS remains controversial [13]. If the diagnosis is based purely on clinical assessments, the risk of unwittingly ending treatment of non-behavioral MCS patients is evident.

Although patients in non-behavioral MCS may constitute a minor subpopulation, they represent an important clinical, ethical, and societal challenge. If covert consciousness is not recognized, appropriate adjuvant therapy may not be initiated, or the patient may face neglect by caregivers and relatives. Neuroimaging examinations to detect awareness should therefore be introduced as part of clinical routine diagnosis in this challenging patient group.

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