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Abstract

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Sleep-wake behaviour and the EEG in altered states of consciousness

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Aims: Sleep-wake behaviour in patients with severe brain damage remains poorly understood. The severe brain damage seen in vegetative and minimal conscious state patients is generally accompanied by alterations in electrical brain activity. Despite this, only few studies have addressed this and generally reported large discrepancies in observations, while also suffering from methodological weaknesses. One important consideration is whether scoring sleep based on standard criteria is appropriate due to the large changes in brain activity. Therefore, in view of these shortcomings and to improve our understanding, there is an urgent need for systematic sleep-wake assessment in these patients, which was the aim of the current study.

Methods: Three ~24h polysomnographic recordings were collected as part of a collaborative project assessing the effectiveness of verticalisation treatment on various physiological parameters in vegetative and minimal conscious state patients. Nine patients (4 males, 5 females) between 18 and 63 years of age (mean ±SEM: 43.9 ± 4.5y) were evaluated at three-week intervals. Data was visually scored, however, as predicted, scoring according to standard criteria was not appropriate and therefore scoring criteria were developed based on common physiological signals seen across patients as well as spectral analysis techniques. Results: Overall, patients exhibited similar physiological patterns across all three of their recordings, whereas a high variability between patients was observed. A combination of physiological signals and video recordings were required to score sleep and wake-like states. All patients showed signs of sleep and wake-like states, however none showed a clear or typical sleep-wake rhythm. Conclusions: Sleep and waking in altered states of consciousness disorders does not show a common pattern and is different to that seen in healthy populations. Accordingly, scoring based on standard criteria seems to be inappropriate and quantitative EEG analysis provides additional important information. These aspects should be taken into account for more accurate diagnosis and prognosis, and our understanding of these conditions in the future.

Keywords: EEG, vegetative state, Consciousness Disorders, Sleep Stages, brain damage


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