

Brain perfusion and VEP reactivity in occipital and parietal areas are associated to recovery from hypoxic vegetative state

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Abstract

Patients in a vegetative state (VS) show a spontaneous wake–sleep-cycle but no evidence of awareness, of interaction with the environment, voluntary action, and language comprehension. The neuropathological conditions underlying VS are still not fully understood. In this retrospective study we focused on VS due to hypoxia and used SPECT, VEP and event related potentials (N100, N200, MMN, and P300) to assess differences between a group of patients moving into a permanent VS ($n=13$) and a group recovering from VS ($n=8$). The two groups were matched for age, gender, duration of illness, and on the coma remission scale at admission. The patient groups differed in global uptake of ^{99m}Tc-ethylencysteine dimer (being reduced in non-recovered VS patients to 2/3 of the recovered group), and in presence of VEP and N100 (recovered patients always had a present VEP and N100). Moreover, analysis of uptake in specific brain areas showed that the recovered group had a higher perfusion in the visual cortex and in the precuneus, whereas no differences were found in the frontal pole and more ventral parts of the brain. Statistical testing revealed a strong association between occipital and parietal perfusion and the presence of a VEP, but no specific results for the N100. We conclude that occipital and parietal lobe perfusion and rudimentary vision may be critical characteristics distinguishing between VS and patients recovered from VS. Although this may just reflect haemodynamics during hypoxia leading to differences in severity of VS, it also may be regarded as a functional precondition for orientation towards stimuli and therefore for conscious actions in general.

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1. Introduction

Vegetative state (VS) is a severe neurological syndrome, which may be a result of various neurological disorders such as traumatic brain injury, hypoxia or ruptured aneurysm.

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Patients in VS show a spontaneous wake–sleep-cycle but no evidence of awareness, of interaction with the environment, voluntary action, and language comprehension. VS is generally divided into a persistent and a permanent condition, depending on the duration of unconsciousness: for patients in VS after hypoxia a permanent status is reached after 6 months of unconsciousness [1].

VS causes considerable stress for relatives, but it also raises puzzling questions for neuroscientists and for neurorehabilitation. Regaining the ability to respond voluntarily to the environment is a major step in recovery and rehabilitation