Clinical Reports

Physical and intellectual recovery following prolonged hypoxic coma

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Summary: Prolonged coma resulting from hypoxic brain injury is usually associated with a dismal chance of return to independent existence. In this report a case is described of a 60 year old man who recovered and returned to work as a university professor after being in a vegetative state at least 8 weeks after a prolonged cerebral hypoxic event.

Introduction

Prolonged coma following non-traumatic cerebral injury carries a very poor prognosis. Of 500 cases of non-traumatic coma prospectively studied by Levy *et al.*, 210 had hypoxic brain insults and 23 were vegetative at 1 month.^{1,2} Of these 23, only 3 subsequently regained consciousness and all remained severely disabled. Only three published case reports have described unexpected recovery from a prolonged vegetative state.^{3–5} Two of these patients remained with severe residual deficits and were unable to exist independently.^{3,4} The third patient, a 23 year old graduate student, was in a vegetative state for 7 weeks after carbon monoxide poisoning and then recovered to the level of social and economic independence. She was, however, unable to return to her studies and remained with mild intellectual and neurological impairment.⁵ This report details a case of physical and intellectual recovery after a prolonged coma due to hypoxic brain injury.

Case report

A 60 year old linguistics professor underwent coronary artery bypass grafting for unstable angina pectoris. During the operation he sustained an unsuspected inferior wall and right ventricular infarction. On termination of cardiopulmonary bypass he was profoundly hypotensive, despite intensive resuscitative measures (including re-institution of bypass) with a mean arterial pressure

under 50 mmHg. After a period of 4 hours he was eventually stabilized with pressor agents and an intra-aortic balloon pump but failed to awaken. Post-operatively his blood pressure was adequate and mild non-purposive spontaneous movements were noted but pupillary and oculocephalic reflexes were absent. Apart from the prolonged hypoxia there were no other factors which might have contributed to his coma. On day 3 he underwent re-operation to remove the intra-aortic balloon pump and to remove a large pleural haematoma.

During this period he was haemodynamically stable but on return to the Intensive Care Unit he was completely unresponsive, with weak attempts at spontaneous respiration. A computed tomographic (CT) scan of the brain showed no focal lesions and on day 6 pupillary and oculocephalic reflexes returned. Eye-opening occurred on day 10 but there was dysconjugate gaze. By 3 weeks there was spontaneous, non-purposive movement of the right arm and leg without response to pain and his eyes remained dysconjugate. Left sided movement appeared at week 6 and at week 7 he was considered to be in vegetative state, with evidence of sleep-wake cycles, spontaneous movement of all 4 limbs, intermittent visual tracking, occasional groans in response to pain but no cognition. Attempts to communicate by an eye movement code failed and there was no clinical or electroencephalographic (EEG) evidence of the 'locked in' syndrome.⁶ Two episodes of pneumonia were successfully treated by antibiotic therapy. On week 8 he was thought by his family to have spoken single words but this did not persist and on neurological assessment 2 weeks later by a second neurologist he was still considered to be in a vegetative state.

Eleven weeks after the onset of coma he showed evidence of cognition with occasional response to very simple commands, and there was evidence of

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intermittent recognition of family members. At 4 months a neurological assessment found him to be disorientated in space and time, responding inappropriately to commands with evidence of left-sided neglect. A CT scan revealed generalized cerebral atrophy which had progressed since the earlier scan. Over the following month he made a rapid improvement in language with diminution of spatial neglect. A WAIS IQ test on week 20 gave a verbal score of 86 and a performance score of 65 and on week 21 he returned home for a visit. He was able to walk with assistance but could not find his way around his small apartment and showed considerable disinhibition in speech and behaviour.

By week 30 he had returned home permanently and insisted on returning to work where he attempted to complete unfinished academic papers. Although emotionally labile with evidence of mild left hemiparesis he had regained his aptitude for speaking several languages and was editing a dictionary, as well as completing several scholarly articles and lecturing. At the time of writing, (4 years from onset of the coma) he has completed two books, written several articles, participated in international speaking engagements and completed a teaching sabbatical at a major university on the East Coast of the United States. He walks with a cane and has compensated congestive heart failure but is otherwise independent and drives a car. He remains with some degree of dyscalculia and mild spatial disability but has refused repeat formal psychometric testing. In the opinion of his peers, his writing and lecturing remains of the highest calibre.

Discussion

The prognosis of patients with coma has been a subject of careful study in recent years. Levy *et al.* described the outcome of 500 patients with non-traumatic coma seen over a 4 year period in 3 major hospitals.¹ Absence of key clinical parameters such as corneal, pupillary and oculovestibular responses were helpful in predicting subsequent outcome even when the assessment was performed within hours of coma onset. In a subgroup of 210 patients with hypoxic-ischaemic coma these authors again examined prognostic features.² Of 33 patients vegetative at one week, only 3 eventually regained independence whereas none of 15 who were vegetative at one month ever became independent.

While there have been reported cases of recovery from a vegetative state well in excess of 4 weeks, almost all such patients remained with intellectual impairment or were bed bound because of motor disabilities.³⁻⁵ Levy *et al.* have constructed an algorithm from which outcome of hypoxic-ischaemic coma can be predicted.² Recovery to a level of independence was never seen in a patient lacking pupillary reflexes or corneal reflexes after 24 hours of coma, nor in any patient who had either posturing or absent motor reflexes more than 72 hours from coma onset. In the patient described above, pupillary reflexes returned on day 6 and non-posturing limb movements began only in the third week. Thus, based on current criteria, his prognosis would have been judged hopeless at 72 hours.

While this case is certainly out of the ordinary and inexplicable in terms of his recovery it raises certain important issues. Application of clinical algorithms to predict coma outcome have been criticized on ethical grounds and the applicability to individual patients of data derived from large groups have been questioned.⁸ During the course of this patient's illness his family was extremely involved and insisted on all supportive measures being applied. Without this involvement it is unlikely that he would have survived several serious infective episodes. Information on recovery from prolonged coma was sought by the family and several such anecdotal cases were described to them, but none had been documented in the medical literature. While the absence of publication of these cases may be because the details presented to the family were distorted or exaggerated, it is possible that some were indeed true recoveries from non-traumatic major cerebral insults. Clearly the publication of details of any such cases in refereed medical journals is crucial to determine the frequency with which recovery occurs and to examine any common factors in these rare events. Perhaps an international registry of unexpected coma recoveries should be developed, which may give further insight into the physiological, pathological and external factors responsible for improvement in patients with coma.^{8,9}

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