

BRIEF REPORT: LATE IMPROVEMENT IN CONSCIOUSNESS AFTER POST-TRAUMATIC VEGETATIVE STATE

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THE vegetative state is a cognitively unresponsive state in which the patient's eyes are open.¹ The diagnosis is made clinically in patients who are awake but have no behavioral evidence of awareness of self or the environment. The absence of communication, response to commands, behavioral response to stimulation, and intentional movement confirms the lack of awareness.^{2,5} The vegetative state is considered persistent if it lasts longer than 1 month after the injury,^{5,6} and permanent if it lasts for 12 months, since improvement after this time is extremely rare.^{4,6,7} We report a case of emergence from a permanent vegetative state.

CASE REPORT

An 18-year-old woman suffered a traumatic brain injury in a motor vehicle accident. A computed tomographic (CT) scan showed blood in the third ventricle and generalized cerebral edema. The score on the Glasgow coma scale⁸ and duration of coma are not known, but she emerged from coma to a vegetative state. At that time her electroencephalogram consisted of low-amplitude theta activity (4 to 6 Hz) and intermittent delta waves. Somatosensory evoked potentials reportedly showed bilateral cortical abnormalities with normal peripheral components. Brain-stem auditory evoked responses were normal.

Neurologic examination of the patient on transfer to our care (four months after injury) revealed spontaneous eye opening but no visual fixation or tracking. External stimulation caused only groaning and increased flexor posturing. The patient was not capable of speech or intentional movement and did not respond to commands. A CT scan at this time showed generalized cerebral and cerebellar atrophy. The results of quantitative topographic electroencephalography were grossly abnormal, with little activity above 3 Hz and delta waves much more prominent on the left side than the right. Auditory P300 responses were not clearly present.^{9,10} Visual evoked responses, tested with a flashing light, were low in amplitude, but greater over the left hemisphere.

Fifteen months after the patient's injury, staff members reported possible leg flexion and eye closure on two separate occasions in response to command, but the responses were rare and inconsistent during the next two months. In an attempt to improve responsiveness, the patient was treated with bromocriptine at 16 months, and dextroamphetamine was added to the regimen at 17 months. Thereafter, her responses were progressively more consistent. She became able to follow simple commands within her motor capabilities and could complete simple arithmetic problems and multiple-choice sentences using eye blinks. She wrote, "Mom, I love you."

Quantitative topographic electroencephalography at 24 months showed continued low-voltage activity with a decrease in the amount of delta- and theta-wave activity, which was still more pronounced on the left side. Auditory P300 responses were absent. Somatosensory evoked responses and visual evoked responses, tested with a flashing light, were present bilaterally.

Three years after injury the patient was communicating using eye blinks for yes or no. She accepted limited oral feedings inconsistently.

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She had no volitional movements in her legs or trunk, and spasticity and weakness limited movement in her arms.

Five years after injury, the patient could follow conversations and was communicating by mouthing words and short phrases. She enjoyed pampering, and her mood was usually euphoric. Her attention span was limited to 15 minutes, with consistent orientation to person only. Her nutritional needs were supplied by oral feeding (weight and nutritional status were good throughout her course). She remained wheelchair-bound and totally dependent for all care. Complications during the course of her illness included hypertension, heterotrophic ossification, recurrent sinusitis, a femoral fracture, and deep venous thrombosis. She was sent home from a long-term care facility 5.2 years after injury.

DISCUSSION

To our knowledge only one other well-documented case of late improvement after permanent post-traumatic vegetative state has been reported.¹¹ Our case report prompts reflection on many issues concerning the care of persons in a permanent vegetative state.

The American Academy of Neurology⁷ and the Multi-Society Task Force on Persistent Vegetative State^{5,6} consider the vegetative state permanent if it lasts for 12 months or more after traumatic injury. Irreversibility is established when the risk of prognostic error is "exceedingly small."⁵ The acceptable risk of prognostic error was defined as 0.1 percent by the American Medical Association's Council on Scientific Affairs.⁴ The Multi-Society Task Force on Persistent Vegetative State⁶ empirically estimated the risk of prognostic error at 1.6 percent (7 cases of known recovery after 12 months divided by 434 cases of vegetative state 1 month after injury).

More relevant is the risk of prognostic error in patients in a persistent vegetative state who survive for 12 months. The available data are insufficient to provide a trustworthy estimate of the incidence of late improvement, because of erratic follow-up, incomplete reporting, and uncertain diagnosis. Only the Traumatic Coma Data Bank¹² reliably defined persistent vegetative state and reported follow-up on patients after 12 months; 6 of 25 patients recovered consciousness 1 to 3 years after injury. However, the Multi-Society Task Force believed the condition of three of these six patients had improved before one year⁶ (and Ashwal S: personal communication). If we assume that there was no improvement in the condition of patients who were lost to follow-up, a conservative estimate of the incidence of improvement after permanent post-traumatic vegetative state is therefore 14 percent (3 of 22 patients), which is substantially larger than 1.6 percent.

Even in retrospect, one could not predict the eventual improvement in our patient. Among the factors influencing prognosis, her early ventilatory status and motor reactivity⁷ were unknown. Her youth, the traumatic cause of her vegetative state, and the absence of seizures and hydrocephalus were favorable prognostic factors. Treatment with dextroamphetamine and bromocriptine enhanced responsiveness but does not fully explain the recovery of awareness.

Our patient remained severely disabled and totally dependent. She had no behavioral evidence of depres-

sion or despondency over her deficits. She enjoyed humor, making jokes and teasing her caretakers. Andrews¹³ described a series of 11 patients in a persistent vegetative state who recovered awareness after four or more months. These patients, "even the most profoundly disabled, were able to take pleasure in their surroundings" and "showed no obvious distress at their condition." During the months her daughter was unaware, our patient's mother strenuously opposed any suggestion that the state was permanent and rejected any discussion of withdrawal of treatment. She was overjoyed when her daughter began to respond and delighted in each small improvement her daughter made. Judgments about the acceptability of such a level of existence vary with the context and the forum. Health care providers and the general public consider survival in a severely disabled state theoretically unacceptable,¹⁴⁻¹⁶ but it is much easier to conceptualize a "life not worth living" when speaking in generalities and on broad matters of public policy than when making such a judgment for a particular patient.

Although most physicians recognize that the diagnosis of permanent vegetative state is based on "probabilities and not absolutes,"¹⁶ the term "permanent vegetative state" undoubtedly has a very different meaning for the lay public. Although the length of time our patient was in a vegetative state was ominous, her course illustrates that clinical practicality and ethical prudence may suggest forgoing the use of the term "permanent vegetative state" altogether.³ Fully informed decisions regarding withdrawal of treatment, however, should include a discussion of pertinent information on the probability of improvement of consciousness and likely improvement of function.

Whether desirable or not, cost has become an ethical issue. Long-term and institutional care after acute hospitalization for this patient has cost well over \$1 million. Costs continue to accrue, on a lesser scale, al-

though she is cared for at home by her mother. Was it ethically correct that her mother, acting as surrogate decision maker, decided that treatment should be continued indefinitely? Does the outcome justify the cost? As Jennett stated nearly 20 years ago, the answer "will depend on who is the judge."¹⁴

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