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# Study Finds Signs of Awareness in 3 'Vegetative' Patients

By **BENEDICT CAREY**

Three severely brain-injured people thought to be in an irreversible "vegetative" state showed signs of full consciousness when tested with a relatively inexpensive and commonly used method of measuring brain waves, doctors reported Wednesday. Experts said the findings, if replicated, would change standards in treating such patients.

Scientists have seen meaningful, responsive brain activity in such patients before, using a high-tech [magnetic resonance imaging](#) scanner, and in at least two cases, using an electroencephalogram machine, or EEG. But the new report, posted online Wednesday by the journal *The Lancet*, is the first to test this innovative EEG strategy in a larger group of patients. The EEG is a portable, widely available unit that picks up electrical brain activity through electrodes positioned on a person's head. Clinics and homes treating people with severe brain injuries are far more likely to have access to an EEG than to an M.R.I. scanner.

An estimated 25,000 Americans with brain injuries are living in an unresponsive state diagnosed as vegetative, and friends and family members typically long for some way to reach through the empty mask — to see whether there is any life behind those familiar eyes. If the new approach holds up, an EEG could provide that, and perhaps even a way to communicate.

"My personal view is that you don't introduce anything like this into routine clinical practice until" larger trials at multiple clinics confirm its value, said Joseph T. Giacino, the director of rehabilitation neuropsychology at Spaulding Rehabilitation Hospital, who was not involved in the research. "But it sure looks as if there's not just a little bit of consciousness but a lot" in patients who had been deemed unresponsive.

Efforts to establish whether a patient has consciousness are often distressing for relatives deciding what to do with a loved one who is severely injured. The case of Terri Schiavo, a Florida woman who became unresponsive after her heart stopped and who was removed from life support in 2005, became a political and family controversy. Doctors say it is unlikely that the EEG test would have changed the diagnosis in that case.

The research team, led by Damian Cruse and Adrian M. Owen of the University of Western

Ontario, gave simple instructions to 16 people said to be “vegetative”: each time you hear a beep, imagine squeezing your right hand into a fist. The subjects were given this task and another — hear a beep, wiggle your toes — and ran through up to 200 repetitions.

In healthy people who executed these instructions, the EEG picked up a clear pattern in the premotor cortex, the area of the brain that plans and prepares movements; the electrical flare associated with the hand was distinct from that associated with the toes.

The brains of three of the supposedly vegetative people showed precisely that; the subjects were a 29-year-old, a 35-year-old and a 45-year-old, all men who had been pronounced vegetative three months to two years previously.

“That’s about 20 percent of the patient group, producing responses that were identical to healthy volunteers,” said Dr. Owen, whose co-authors included neuroscientists from the Medical Research Council, at the University of Cambridge, and the University Hospital of Liège, in Belgium. “I think it’s a strong sign of our inability to correctly diagnose people in the vegetative state.”

In recent years, brain scientists have found numerous problems with the standard bedside test for assessing conscious awareness: checking whether a person’s eyes can track moving objects, and carefully looking for any signs — finger twitches, blinks — in response to commands or questions. The exams, when not done carefully, can miscategorize people who have spells of intermittent consciousness — a transitional condition called a “minimally conscious state.” Even when done expertly, the new study and other imaging studies show, the exams can lead doctors to wrongly conclude that the patient is without awareness.

“This is one reason why we have to tread cautiously with any new diagnostic method, because wider accessibility can lead to a bigger kind of error — the assumption that if a person doesn’t do well, they must be vegetative, said Dr. Joseph J. Fins, chief of the medical ethics division at Weill Cornell Medical College in New York and author of the forthcoming book “Rights Come to Mind: Brain Injury Ethics and the Struggle for Consciousness.”

For those who do respond, however, an EEG may reveal something thus far well hidden — the subjective experience of being buried alive, in a way, by a misdiagnosis. It could, the study’s authors conclude, “enable routine, two-way communication with some of these patients, allowing them to share information about their inner world, experiences, and needs.”

*This article has been revised to reflect the following correction:*

**Correction: November 15, 2011**

An article on Thursday about a test that detected meaningful brain activity in three people thought to be in a “vegetative” state erroneously attributed a distinction to a study published in The Lancet reporting the finding. While it is the first large study to demonstrate that clear signs of conscious awareness can be

detected on an electroencephalogram machine using an innovative strategy, it is not the first study of any size to do so. (Single cases have been reported before, including one by researchers at New York University School of Medicine and a similar one by scientists at Weill Cornell Medical College.)