Predicting seizures: concept grows closer to reality

It may soon be possible to predict epileptic seizures hours in advance, and possibly even prevent them, according to new research.

Neurobiologist Brian Litt and colleagues teamed up with a group of electrical engineers headed by George Vachtsevanos to develop a technique for examining large amounts of intracranial electroencephalogram (EEG) data. Analyzing the data accumulated from five patients with temporal lobe epilepsy, the researchers discovered that mild energy bursts appeared on the patients' EEGs seven hours before a seizure, and small, symptomless seizures began about two hours before the seizure. In addition, accumulated energy increased compared to baseline during the 50 minutes before a seizure occurred. Litt comments, "It's like a match that keeps lighting a fuse until finally it catches."

These findings could allow researchers to develop implanted electronic devices capable of predicting seizures and possibly even preventing them. *(Editor's note: while the vagus stimulator—see adjacent article—reduces seizures, it rarely eliminates them.)* Such devices, which Litt believes may be available within a few years, could eliminate the need for daily anticonvulsant drugs, which have many unpleasant side effects.

Litt and colleagues predict that within a few years, implanted devices will predict and possibly even 'defuse' seizures.

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"Epileptic seizures may begin hours in advance of clinical onset: a report of five patients," B. Litt, R. Esteller, J. Echauz, M. D'Alessandro, R. Shor, T. Henry, P. Pennell, C. Epstein, R. Bakay, M. Dichter, and G. Vachtsevanos," *Neuron*, Vol. 30, No. 1, April 2001, pp. 51-64. Address: B. Litt, Department of Neurology, 3 West Gates, Hospital of the University of Pennsylvania, 3400 Spruce Street, Philadelphia, PA 19104.

—and—

"Epileptic seizures may be predictable," J. Netting, *Science News*, Vol. 159, May 5, 2001.

Simplified signs designed to foster communication

A university student's thesis is drawing the attention of professionals and parents seeking ways to communicate with hearing but nonverbal autistic children.

As her Distinguished Majors project, University of Virginia student Nikki Kissane developed a 500-word sign language lexicon designed for use with nonverbal autistic or retarded children, as well as individuals who cannot speak due to strokes or other disorders. The lexicon is available free of charge online at www.simplifiedsigns.org, and Kissane plans to publish it in book form as well.

In designing her signs, Kissane focused on signs that are "iconic"—that is, signs that clearly resemble the words they represent—and signs that are "transparent," or easily convey a meaning. In addition, she selected signs that do not require complicated hand shapes or movements or manual dexterity.

To test the simplicity of her signs (some of which are standard sign language signs, and some of which are modified), Kissane asked University of Virginia students to view groups of signs and their written counterparts briefly on one occasion, and then tested their recall of the signs. Any sign remembered by at least 70 percent of the students after a single viewing was considered simple enough for inclusion in Kissane's lexicon.

In addition, Kissane observed autistic students taught by her mother, an elementary school art teacher, in order to understand the motor and cognitive difficulties experienced by many autistic individuals.

Kissane's work is based in large part on previous work by John Bonvillian, a psychology instructor who conducts research on sign language communication. "We hope," Bonvillian says, "that the system will enable many mute, or essentially mute, individuals to communicate their basic needs or desires more effectively."

Kissane says she plans to continue refining her simplified signing system. "Once signs begin to be used by the autistic, mentally retarded, and aphasic individuals, as well as their caregivers, the superfluous ones will be identified and then eliminated or combined with others as signs that are more needed are developed and incorporated into the system," she says. Kissane encourages parents and professionals who try her simplified sign language system to provide suggestions and feedback.

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"Simply amazing," press release, University of Virginia, April 30, 2001.

—and—

"Memory and recall of signs: the development of a simplified sign system," Nikki Kissane, Distinguished Majors thesis, 2001. The thesis and drawings of the simplified signs are available at www.simplifiedsigns.org.

LETTERS

Letters to the Editor are welcomed. We reserve the right to edit letters for length and clarity. Letters should not exceed two pages in length, including references.

'Pacemaker' reduces seizure frequency, need for medications

Several thousand patients with intractable epilepsy are being treated with a relatively new technology called vagus nerve stimulation (see ARRI 11/4). According to recent research, the technique is proving highly successful in improving the quality of life of epileptic patients, and allowing them to reduce or discontinue the use of anticonvulsant drugs.

Vagus nerve stimulation involves implantation of a small device, similar to a cardiac pacemaker, in the chest of the patient. The device is programmed to deliver intermittent electrical pulses to the vagus nerve, a long nerve that runs from the brain to the abdomen and branches into most major organs.

W. O. Tatum and colleagues assessed the effectiveness of vagus nerve stimulation in 21 patients who used the treatment for more than a year. The researchers report that:

- Almost half of the patients were able to reduce the number of anticonvulsant drugs or doses they took, while control subjects increased the number of drugs or the dosages taken.
- Mood improvement was reported by 14 of the patients using vagus nerve stimulation, and one third of patients taking psychotropic drugs for mood disorders were able to discontinue them.
- Seizures were reduced in 17 of 21 patients, with 19 percent showing a greater than 75 percent reduction, 24 percent showing a 50 to 75 percent reduction, and 43 percent showing a greater than 50 percent reduction.
- Seventeen of the 21 patients reported that their quality of life was better or much better following implantation of the device.

The researchers conclude, "Drug and dose reduction of antiepileptic drugs is possible in patients using vagus nerve stimulation for refractory epilepsy without loss of seizure control and with improved patient satisfaction."

Side effects of vagus nerve stimulation are generally mild and include altered voice, coughing, discomfort, and shortness of breath during stimulations. The reasons for the treatment's effectiveness still are not known, although researchers speculate that vagus nerve stimulation increases levels of inhibitory neurotransmitters and/or decreases output of stimulatory neurotransmitters in the brain.

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"Vagus nerve stimulation and drug reduction," W. O. Tatum, K. D. Johnson, S. Goff, J. A. Ferreira, and F. L. Vale, *Neurology*, Vol. 56, No. 4, February 27, 2001, pp. 561-563. Address: W. O. Tatum, Tampa General Hospital Comprehensive Epilepsy Center, Tampa, FL 33606, WOTIV@aol.com.