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The Future is Written on the Wrist

By Laura Pratt
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The young man could never have predicted, after the day the hurtling hunk of steel forever altered his life, where he would be a year hence. But, thanks to revolutionary work conducted by a team of dedicated Sunnybrook Research Institute (SRI) scientists, the physicians who treated the severe brain injury that was the legacy of that car accident, could. He would most likely be fine, they reassured his suffering family. And today, above the din of a busy life that once again—thankfully—includes school work and varsity sports, they would tell you that he is.

Somatosensory evoked potentials, tests that measure the brain's electrical response to gentle electrical stimulation of various parts of the body, are not new. Indeed, the basic concept of these electrophysiological tests dates back to the 1940s, when they were just ideas without the technological firepower to realize their promise fully. When computers came onto the scene in the 1970s, SSEPs became more commercially available. Soon after, Dr. David Houlden, an associate scientist at SRI who today is coordinator of surgical neuromonitoring at Sunnybrook, discovered their magic.

Tests measure brain response

During SSEPs, researchers stimulate the median nerve at a patient's wrists, alternately, and record the ascending volley of electricity from the side of the brain opposite to the site of stimulation. In all, scientists conduct 500 stimulus presentations on each side during the testing. Six recording electrodes chronicle the electrode's journey, acknowledging normal and abnormal responses and, sometimes, reporting its absence altogether, an indication of brain death.

Typically, test patients have diffuse axonal injury, which means that their brains have been scrambled as a result of a severe trauma to the head, often from automotive accidents. They are comatose when they arrive at the hospital.

David Houlden and his team monitor neurological

The function-vs.-form distinction

The tests were significant, says Houlden, whose funding for this research was covered by the Ontario Neurotrauma Foundation, because they revealed brain function, as opposed to brain form. A computed tomography scan can expose the state of an injured nervous system, he points out, but that picture may not be an accurate reflection of the patient's condition.

In 1980, Houlden and his neurosurgeon colleagues published a paper that showed how a grading system based on this simple test, when performed in the first week after injury, could predict the outcome of a comatose patient with head injuries more than six months later. Since then, they've enhanced the system, the brilliance of which has—in the meantime—been acknowledged worldwide. Armed with a theory that the tests could be even more predictive of outcome if their proximity to the time of injury

was considered, he established that the third postinjury day was the optimum one for predicting functional outcome.

response to predict future brain function and recovery from trauma.

SSEPs increase physicians' powers

Houlden is proud of his work for the compassionate power it gives physicians to deal with families whose loved ones are in critical condition. "And the other reason I'm pleased," says Houlden, "is because if there are treatments available, we can see how they're working by assessing predicted outcome against actual outcome."

Last year, an Australian hospital determined that SSEPs are the best single overall predictor of outcome after brain injury. "I don't want to oversell this," Houlden demurs. "Every one of these tests adds something. But if you tease them apart, the SSEP is shown to be the most valuable. That's very satisfying."