

Research team tests bedside monitoring of brain blood flow and metabolism in stroke victims

March 2 2009

A University of Pennsylvania team has completed the first successful demonstration of a noninvasive optical device to monitor cerebral blood flow in patients with acute stroke, a leading cause of disability and death.

The ultimate goal of this research is to improve the management of patients with stroke and other brain disorders by providing continuous bedside monitoring of brain blood flow and metabolism.

"Our preliminary study demonstrates that blood flow changes can be reliably detected from stroke patients and also suggests that blood flow responses vary significantly from patient to patient," lead author Turgut Durduran said.

Ischemic stroke is the leading cause of morbidity and long-term disability in the United States, with projected cost of stroke care estimated at trillions of dollars during the next five decades. Stroke accounts for nearly 10 percent of deaths in the western hemisphere and about 5 percent of health-care costs.

The device being developed uses embedded optical probes that are placed over major cortical blood vessels in each hemisphere of the brain. The technology, diffuse correlation spectroscopy is a non-invasive system that uses lasers, photon-counting detectors, radio-frequency electronics, data processors and a computer monitor to display user-

friendly images of functional information to physicians and nurses.

"What we have demonstrated is a working prototype of a non-invasive brain probe that uses diffusing light to detect physiological changes such as blood flow, blood-oxygen saturation and hemoglobin concentration to inform clinicians about their treatments," Arjun Yodh, professor of physics in the School of Arts and Sciences at Penn and principal investigator of the study, said.

The study is part of a \$2.8 million, five-year Bioengineering Research Partnership grant from the National Institutes of Health and the University of Pennsylvania Comprehensive Neuroscience Center. BRP grants are awarded to interdisciplinary teams that combine basic, applied and translational research for important biological or medical problems. Yodh is joined by Rick Van Berg from the High Energy group of the Department of Physics in the School of Arts and Sciences and clinical collaborators John Detre, Joel Greenberg and Scott Kasner from the Department of Neurology in the School of Medicine at Penn.

"Stroke is caused by a reduction in blood flow to the brain, yet brain blood flow is rarely if ever measured in stroke patients because most existing methods to measure blood flow require costly instrumentation that is not portable," Detre said. "The ability to quantify tissue hemodynamics at the bedside would provide new opportunities both to learn more about blood-flow changes in patients with acute stroke and to optimize interventions to increase blood flow for individual patients, potentially even allowing these interventions to be administered before the onset of new neurological symptoms."

Source: University of Pennsylvania

Citation: Research team tests bedside monitoring of brain blood flow and metabolism in stroke victims (2009, March 2) retrieved 24 April 2024 from <https://medicalxpress.com/news/2009-03-team-bedside-brain-blood-metabolism.html>

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