

Imaging technique could help traumatic brain injury patients: Mapping technology used to predict long-term effects

May 9 2013, by Leland Kim



(Medical Xpress)—A new application of an existing medical imaging technology could help predict long-term damage in patients with traumatic brain injury, according to a recent UC San Francisco study.

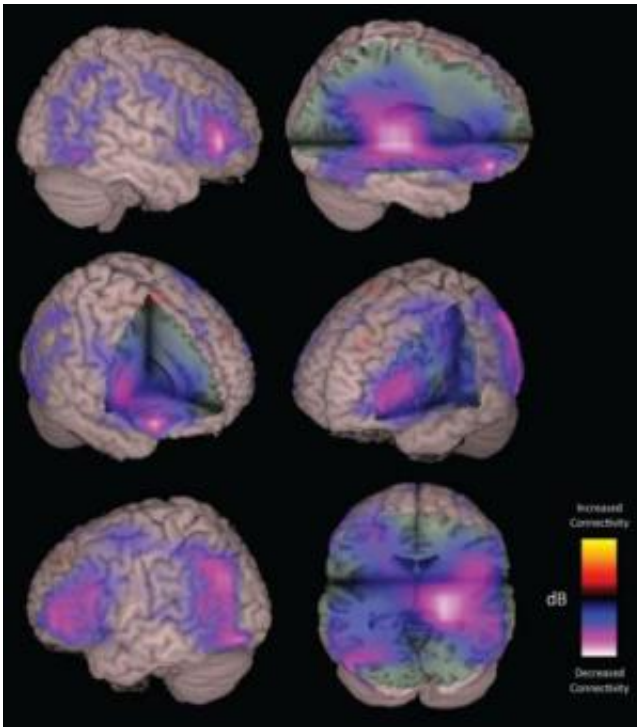
The authors of the study analyzed brain scans using applied rapid automated resting state magnetoencephalography (MEG) imaging, a technique used to map brain activity by recording magnetic fields produced by natural electrical currents in the brain. They discovered "abnormally decreased functional connectivity" – or possible long-term [brain damage](#) – could persist years after a person suffers even a mild form of traumatic [brain injury](#).

"We were hoping that areas of abnormal [brain activity](#) would match up with some of the functional measures such as patients' symptoms after injury, and we saw such correlation," said senior author Pratik Mukherjee, MD, PhD, associate professor in residence at the UCSF School of Medicine.

In a study published on April 19 in the *Journal of Neurosurgery*, UCSF researchers analyzed brain connectivity data on 14 male and seven female patients, whose median age was 29. Brain connectivity refers to a pattern of causal interactions between specific parts within a nervous system. Eleven patients had mild, one had moderate, and three had severe forms of traumatic brain injury. Six patients suffered no brain injury.

"Once we have connectivity information, we can create a template of what it looks like in a normal subject. When we have subjects that have had head injuries, we can compare their connectivity pattern to that of the normal subjects with an automated computer algorithm," Mukherjee said. "And that will automatically detect areas of abnormally low and abnormally high connectivity compared to the normal database."

MEG imaging provides much richer information than a typical [magnetic resonance imaging](#) (MRI), which uses magnetic field and radio wave energy to give a static image of the brain or other internal structures of the body.



Magnetoencephalography (MEG) imaging shows brain scans of a patient with traumatic brain injury (TBI). Areas in pink and purple show reduced connectivity between parts of the patient's brain.

"If you scan someone a couple months after the trauma with an MRI, and you scan them again a couple of years after the trauma, it's going to look the same," Mukherjee said. "With MEG, we can characterize simple systems in much more in fine grain detail. It produces the most detailed activity mapping of the brain."

Although MEG signals were first measured in 1968, the technology has not been widely used for patients with traumatic brain injury until recently.

"It takes a minute or two to complete an MEG scan and it automatically

detects the areas of abnormality using a [computer algorithm](#)," Mukherjee said. "And it seems to be fairly sensitive because it's showing us areas of abnormality even in people where MRIs missed some abnormalities."

Every year approximately 1.7 million people in the United States suffer from traumatic brain injury, which costs the U.S. health care system an estimated \$60 billion according to the U.S. Centers for Disease Control and Prevention. The most common forms of [traumatic brain injury](#) are suffered by athletes, members of the military, and those involved in motor vehicle collisions or occupational injuries.

"This is a preliminary study testing a new technique with a small sample, which makes it difficult to have enough statistical power to make such correlations," Mukherjee said. "But I think this is an important step in our quest to help people suffering from traumatic brain injuries."

Researchers reported no conflicts of interest to disclose.

Provided by University of California, San Francisco

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