

Traumatic brain injury (TBI), a complex type of injury to the brain's structure, is common among Veterans and has been called a "signature injury" of modern combat. The Department of Veterans Affairs' (VA) research related to TBI is wide-ranging.

Among the Department's goals in TBI research are shedding light on brain changes associated with the condition; improving methods of screening and diagnosis; developing drugs to treat brain injury or limit its severity; helping Veterans with TBI to reintegrate into their communities and regain maximum function; and, learning the best ways to help family members cope and provide support.

Some VA research in TBI has already led to the adoption of care standards throughout VA and the Department of Defense.

TBI can cause pain and problems with thinking, memory, mood, focus, and other functions. For Veteran Kara Wooten, vision problems accompanied her TBI after she sustained severe injuries related to an improvised explosive device (IED) blast in Iraq.

VA's research in visual impairment—a common challenge for Veterans with traumatic brain injury—allowed Wooten's research and care team "to pinpoint more precisely the types of vision problems" and "specifically address those problems," according to Gregory Goodrich, PhD, a research psychologist at the VA Palo Alto Health Care System. While acknowledging that she has far to go in her rehabilitation, Wooten says, "I'm 150 million percent better than I was."

In another example of VA's innovative research endeavors, the Boston VA Medical Center has a driving simulation project that allows TBI patients to experience life-like driving scenarios in a safe environment. Using a driving simulator reveals patients' deficits and allows researchers to train them to drive safely. "To me, the VA research program is beautiful," says Willie Goodman, a participant in VA's driving simulator research. "This gives me a lot of hope."

VA researchers are eager to put new tools for diagnosing and treating mild TBI into clinicians' hands. In a pilot study, a VA team, working with researchers from the University of California, San Diego and the United States Marine Corps base at Camp Pendleton, found that a combination of two imaging technologies—

magnetoencephalography (MEG) and diffusion tensor imaging (DTI)—can show subtle brain injuries that go undetected in conventional brain scans.

The first type of scan picks up the signals that neurons give off when they fire. The second picks up abnormalities in the brain's nerve fibers. According to lead researchers Roland R. Lee, MD and Mingxiong Huang, PhD, injured brains generate pathological low-frequency brain waves like those seen in normal patients during deep, dreamless sleep. He believes that damaged neurons may become like frayed wires, unable to conduct impulses effectively.

To keep VA at the forefront of research in the field, two new centers are being funded to focus on TBI: the Translational Research Center for TBI and Stress Disorders, which will use advanced brain-scan methods and wide-reaching exams to study how TBI and posttraumatic stress disorder symptoms interact; and the Neurons to Networks Center for Rehabilitation Research, which will focus on improving diagnosis of Veterans with mild to moderate TBI and develop and evaluate treatments involving virtual reality and neurobiofeedback.

For additional information on traumatic brain injury and how VA research is improving Veterans' lives, go to the Department's research website at www.research.va.gov.