Miller School Device That Diagnoses Concussion at the Point of Care Receives U.S. Patent

The University of Miami Miller School of Medicine has received a U.S. patent for a device that diagnoses mild traumatic brain injury and concussion at the point of care.

This technology, which makes diagnosing mild traumatic brain injury — also known as concussion — accessible to the masses, has huge implications for the estimated 1.4 to 3.8 million people who suffer head injuries each year in the U.S.
Michael Hoffer, M.D., professor of otolaryngology and neurological surgery at the Miller School and an inventor of the newly patented device

“We, at the Miller School of Medicine, helped to develop the eye and pupil movement testing that helps to determine if someone has a head injury,” said Michael Hoffer, M.D., professor of otolaryngology and neurological surgery at the Miller School and an inventor of the newly patented device. “However, those tests could only be performed on a specialized piece of equipment that was very expensive, difficult to administer, and certainly not available where injuries were occurring. Few centers around the world had the technology.
“There was a great need for a less expensive, portable way to detect head injuries that could be done on the playing field, in the emergency room, and without super-specialized training, so that people suffering head injuries can get immediate care.”

**Goggles with Virtual Reality Display**

Dr. Hoffer collaborated with engineers and industry to miniaturize the technology. The new device, patented under the name “Method and Apparatus for MTBI Diagnosis Implementing Eye Movement and Pupil Movement Analysis in Objective Vergence Testing,” includes goggles that have a virtual reality display. Individuals wear the goggles and move their heads or eyes in response to moving objects in the display, which identifies those with vestibular damage after head injury. It also can be used to track patients’ recovery from head injuries.

The patent solves important challenges in the timely diagnosis of head injuries, according to Dr. Hoffer.

“Mild traumatic brain injury is a significant public health problem, affecting about 5% of the U.S. population every year,” Dr. Hoffer said.

Even the short-term consequences of a head injury, or concussion, can derail a person’s life. Many can’t concentrate or focus, work or solve problems. In the long term, head injuries have been associated with degenerative brain diseases, including chronic traumatic encephalopathy, or CTE, which has been diagnosed in NFL players, boxers, and others who suffer repeated concussions.
Need for Easier, More Accessible Diagnosing

Many people go undiagnosed or misdiagnosed because there hasn’t been an easy, accessible way to diagnose concussions at the point of care — a problem Dr. Hoffer said he hopes to solve with the newly patented technology.

Head and eye movements in response to moving objects in the virtual reality display help identify vestibular damage after head injury.

This device can be used in the military field, at sporting events, or in emergency rooms nationwide to evaluate and diagnose head injuries quickly and noninvasively. Anyone can be trained on how to deliver the testing, without the need for an on-site neuroscientist, physician, or nurse.

“We know that early diagnosis of head injuries leads to the highest rate of recovery. By using this portable testing at the point of care, we can diagnose and treat concussions and mild traumatic brain injuries early, giving patients the best chances of recovery,” Dr. Hoffer said.
“This patent is an example of how the Miller School and other universities are leveraging medical science and biomedical engineering to solve health care challenges,” said Fred F. Telischi, M.D., FACS, M.E.E., chair of the Department of Otolaryngology, professor of neurological surgery and biomedical engineering, and the James R. Chandler Chair in Otolaryngology. “In this case, physician experts, including Dr. Hoffer, developed the tests for diagnosing mild traumatic brain injury and studied it using a prototype. Armed with the science that proved the testing worked, Dr. Hoffer and colleagues collaborated with engineering and industry to create an easy-to-use, portable device that can be used where head injuries happen, anywhere in the world.”

Collaborators on this patent were Carey D. Balaban, Ph.D., at the University of Pittsburgh, and Neuro Kinetics. The U.S. Department of Defense helped to fund the project.

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