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Eyes may provide new insight into brain problems

Subtle changes in the eye could be a route to early diagnosis of brain injury in soldiers and disorders like Alzheimer's.

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The eyes may be the window to the soul, but researchers are finding they also provide a view into the brain that could help detect neurological damage from bomb blasts, sports concussions and a wide range of diseases, including Alzheimer's and multiple sclerosis.

If initial results are borne out, it might eventually be possible to use simple eye tests to evaluate soldiers, athletes or accident victims and to monitor the effectiveness of drugs and other treatments, several scientists said Sunday in Seattle at a meeting of the world's largest vision-research organization.

More than 12,000 researchers and clinicians are in town for the annual meeting of the Association for Research in Vision and Ophthalmology, which runs through Thursday.

Sunday's session brought together some of the nation's top researchers on brain injuries in veterans and athletes, including psychiatrist Elaine Peskind, of the University of Washington and the Veterans Affairs Puget Sound Health Care System.

Nearly 2.4 million U.S. troops have served in the Iraq and Afghanistan wars. About 20 percent of them were exposed to blasts from roadside bombs and other explosives, Peskind said.

The veterans she studied experienced an average of 14 blasts, though some were exposed to 100 or more.

Many reported symptoms that include memory loss, headache, muddled thinking and irritability.

Though Peskind has used sophisticated brain scans to document permanent brain damage among blast-exposed veterans, there's no easy way to tell which soldiers may go on to develop more severe problems, including dementia, as a result of their injuries.

The most definitive test for the type of advanced brain injury common to some soldiers and concussion-prone athletes can only be done after death, when brain-tissue sections reveal tangles of abnormal protein deposits.

That's why the possibility of using the eyes for diagnosis is so exciting, the scientists said.

Peskind got interested because so many blast-exposed veterans told her they had trouble reading. When she tested their vision, she noticed unusual movement patterns in their eyes.

It's not surprising that trauma severe enough to damage the brain would also affect the eyes, said, Dr. Randy Kardon, director of Neuro-Ophthalmology at the University of Iowa and leader

of a Veterans Affairs center on vision. The eyes develop from the same kind of tissue as the brain, and contain many of the same types of cells.

“By measuring things in the eye, perhaps we have a barometer for what might be happening in the brain,” he said.

Kardon used new a new type of eye scan, called optical coherence tomography, or OCT, to probe the retinas of blast-exposed veterans. He found thinner cell layers than in normal subjects.

He also developed a test that validated the most common complaint among blast-exposed veterans: that their eyes had become extremely sensitive to light.

By hooking up small electrodes to the muscles around the eye, Kardon documented higher levels of involuntary blinking and squinting among veterans with traumatic brain injury.

A third indicator is how fast the pupil contracts in response to a burst of light, he said. In studies of 140 people treated in a hospital emergency room after car accidents and other head trauma, Kardon and his colleagues found that slower pupil contraction was a sign of more serious brain injury.

The test is done with an instrument that’s already commercially available, he pointed out. “It could have a lot of implications for sports injuries, where you’d like to be able to quickly test whether a concussion might be significant.”

Dr. Lee Goldstein, of Boston University, who helped pioneer studies on brain damage in athletes, described experiments where mice exposed to a single blast exhibited damage to their retinas.

Other studies have shown an abnormal buildup of specific proteins in the lenses of people who suffer from some brain disorders, like Alzheimer’s disease and Down syndrome, said John Clark, director of the Department of Biological Structure at the University of Washington and an organizer of Sunday’s session.

“The lens is a very sensitive indicator for neurodegenerative diseases,” he said.

There now are few effective treatments for traumatic brain injury or brain disorders. Eye scans could help change that by providing a way to tell whether a treatment or therapy is leading to improvements, said Dr. Ann McKee of Boston University.

McKee and her colleagues have examined scores of brains from deceased veterans and athletes, including some like former Chicago Bears defensive back David Duerson who killed themselves. Many other athletes now live in fear that the blows they absorbed over their careers will blight their futures, she said.

“We really owe it to them, as well as to our many, many military veterans, to work on this problem as quickly as we can and with as much funding as possible,” she said.

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