What is an example of VTRP-funded TBI-related Vision Dysfunction Research?

Stacey Choi, Ph.D. (New England College of Optometry) and Randy Kardon, M.D., Ph.D. (University of Iowa)

On February 22, 2011, AEVR hosted a Congressional briefing entitled Vision Research Meeting Battlefield Needs: Diagnosing Vision Problems Resulting from TBI featuring Randy Kardon, M.D., Ph.D. (University of Iowa) and Stacey Choi, Ph.D. (New England College of Optometry, NECO), who were among the twelve researchers who received a total of $11 million in VTRP grants from TATRC in its FY2009/2010 funding cycle.

Dr. Kardon, who is also funded by the VA, NEI, and private funding organizations, has applied aspects of his larger research portfolio to the problem—better diagnosing TBI-related vision problems—through his study of the brain’s natural reflexes to visual stimuli. These include the pupil’s light reflex (contractions of the pupil based on amount of light sensed by the eye), natural eye tracking of visual targets, and the activation of eyelid muscles in response to light. One goal is to develop a portable, hand-held device—perhaps even through a smartphone application—to quickly and inexpensively analyze the pupil’s reaction to light. “Since about 70 percent of the brain’s nerve connections are engaged in visual processing, a soldier could technically have 20/20 vision yet have visual disorders since the processing is perturbed. Studying the body’s natural reflexes provides one way of determining the extent of the problem.”

Dr. Choi acknowledged that the VTRP award is her first major grant, as well as the first DOD award for NECO. Her research involves in vivo retinal imaging to detect microscopic changes in the retina—the photosensitive tissue at the back of the eye—to diagnose TBI and facilitate earlier intervention to improve visual outcomes. Dr. Choi is using Adaptive Optics (AO) technology that was initially developed for the military use and was then applied to the space program. AO corrects for distortions in optical imaging systems and essentially “supercharges” it, so in combination with current retinal imaging systems such as Optical Coherence Tomography (OCT) and Scanning Laser Ophthalmoscope (SLO), it can detect changes down to the cellular level. Due to its sensitivity, AO retinal imaging may be especially valuable as a diagnostic tool in cases of mild TBI or in situations where a blast was too weak to cause damage detectable by standard screening standards, yet visual symptoms exist. As with Dr. Kardon’s research, Dr. Choi’s ultimate aim is to develop a compact battlefield-ready instrument that can diagnose TBI in-theatre.