

Roundtable Discussion

Exploring Advances in Research to Improve TBI Outcomes

Traumatic brain injury (TBI) is a significant but puzzling challenge for health care in the United States. Between 10 and 20 per cent of troops returning from Iraq and Afghanistan are estimated to have suffered a TBI, and more than 1.1 million civilians each year seek emergency room treatment for traumatic brain injury.

Yet, the ramifications of TBI remain difficult to pin down, sometimes requiring years or even decades before they manifest themselves. Diagnosing mild TBI can be difficult, and the delineations between mild, moderate and severe injury remain nebulous, lacking standardized definitions and markers.

To examine research issues that might help advance care of TBI in both the military and civilian sectors, the nonprofit Institute of Federal Health Care convened a roundtable discussion that included representatives from federal agencies, congressional staff, academia, the private sector, and professional and beneficiary organizations.

Roundtable participants agreed that characterizing TBI is difficult because there are no definitive diagnostic criteria or biomarkers. Response to an injury likely depends on the individual's mental health status before the injury as well as his or her genetic composition.

Some who seemingly suffer no consequences from a mild TBI in fact may exhibit psychosocial symptoms years or even decades later, especially if there has been a second traumatic

injury that “recalls” the first one, somehow knocking out the ability to compartmentalize. Others with mild TBI exhibit a “resilience” that seems to protect them from neuropsychological sequelae.

Roundtable participants emphasized the importance of long-term studies to tease out the latent effects of mild TBI injury, the ongoing consequences of moderate-to-severe injury, and the phenomenon of resilience. At the same time, a focus on immediate studies and their transla-

tion into patient care is imperative: “We have to look at how to reach out and offer hope *now*.”

Collaborative Efforts Urged

There are numerous agencies and organizations involved in TBI research, and some mechanism is needed to ensure that their efforts can be combined into a better picture of the injury and its consequences. Without coordination, research efforts are akin to trying to characterize an elephant by having different indi-

Research Issues Identified

- **More scientific evidence is needed on which to base diagnoses of mild to severe TBI.**
- **Consensus statements should be developed describing appropriate treatments for various stages of TBI.**
- **A definition of cognitive therapy should be agreed upon, including how frequently it should be done and who should administer it.**
- **Genomics and proteomics hold promise for determining who is at risk from mild TBI, and which therapies might work for which individuals, and should receive research emphasis.**
- **What are the value and appropriate role of alternative therapies?**
- **What level of proof is needed to consider a therapy to be effective?**
- **Ways must be found to reach veterans who receive their care outside of the Veterans Affairs system. Telemedicine and other technologies can be important tools in this effort. Outreach to community providers is essential.**
- **Better neuroprotective agents are needed to safeguard against TBI, in both military and civilian settings.**
- **Animal models are needed that can translate into the clinical setting. Thus far, there is no valid translation between animal models and bedside. Diagnostic criteria are key to developing useful animal models for TBI.**
- **Programs designed to deal with TBI must include an evaluation component: “We need to be willing to stop things that aren’t working.”**
- **There must be focus on outcomes and reintegrating patients into the workforce.**

viduals describe a tiny part of its anatomy — resulting in an incomplete and incorrect picture.

The challenge is to identify those who develop psychosocial problems in the wake of mild TBI; the goal is to return them to successful functioning in society. “We must be able to measure in order to help people [with TBI] improve; we still don’t know the magnitude of the problem.”

Issues requiring collaborative effort include: optimum screening measures; differentiating blast from blunt-impact injury; the effects of injury over time; the relationship between TBI and post-traumatic stress disorder.

Difficulty Is Inherent

There are numerous difficulties in working with TBI patients. For one thing, self-reporting tends to be unreliable in those with mild TBI, who may have lost the insight required to recognize symptoms. Consequently, it is essential to involve caregivers or significant others in the care of such individuals and in any research in which they may participate.

Among the factors that complicate TBI research:

- *Uncertainty as to what is “normal.”*

The more precise imaging becomes, the smaller the deficits that can be detected. Almost everyone has some miniscule evidence of previous head injury. Where do demarcations lie?

- *The incomplete picture.* To help elucidate the various effects of TBI, studies of the entire brain would be valuable. Consideration is being given to establishing a pathologic brain bank in the military as a research resource. To be effective, such a registry would need access to service records, so the circumstances and

types of injury could be correlated to pathologic changes detected.

Examples of Programs/Findings

- *The Defense and Veterans Brain Injury Center (DVBIC).* The DVBIC collects data on TBIs that occur in the field and has developed an in-theater screening tool. Its collaborative efforts encompass a model of blast injury in the brain, examining co-morbidities — including “blast-plus,” the confluence of several TBIs in the same incident, such as blast and trauma as a vehicle is hit by a bomb — the interplay between TBI and PTSD, and a randomized study of cognitive rehabilitation.

The DVBIC, in partnership with NIH, maintains a national data archive using cognitive and cutting-edge imaging studies. www.dvbic.org.

- *The Center for the Study of Traumatic Encephalopathy.* A joint program of Boston University, Bedford VA Medical Center and the Sports Legacy Institute, this center studies traumatic injury in the brains of amateur and professional athletes, maintaining a registry of living athletes for long-term studies and a brain bank for neuropathologic analysis.

Studies thus far indicate that most athletes begin sports activities in their teens, and even at those young ages exhibit observable changes in brain pathophysiology upon post-mortem examination. In most cases, disease seems to progress slowly over several decades. Neuropathologically, TBI appears to be characterized by extensive tau-immunoreactive neurofibrillary tangles throughout the brain — a potential biomarker.

- *National Intrepid Center of Excellence.* The NICoE, being built on the

grounds of the National Naval Medical Center in Bethesda, Md., is designed to be the a referral center for military personnel with TBI where they and their families can stay for several weeks at a time — a Mayo Clinic model. The center will offer a holistic approach to treatment and will include a network of satellites at VA and DoD sites.

- *The ongoing Vietnam veterans study at NIH.* Brain imaging studies indicate that ventromedial prefrontal cortex (PFC) damage provides resistance to depression, whereas dorsal PFC damage conveys vulnerability to depression — knowledge which may help in triage after injury.

Participants in this roundtable: Vernon Armbrustmacher of the Armed Forces Institute of Pathology; Regina Armstrong of USUHS; Brenda Bart-Knauer of the Telemedicine and Advanced Technology Research Center; Thomas Berger of Vietnam Veterans of America; Andrea Buck of the Senate Veterans Affairs Committee; René Campos of MOAA; Conrad Clyburn of the Clymer Group; Barbara Cohoon of the National Military Family Association; Victor Coronado of CDC; John Crum of Humana Military Healthcare Services; Thomas DeGraba of the Department of Defense; Dolores Dunn of the House Veterans Affairs Committee; Jordan Grafman of the National Institutes of Health; Rick Erdtmann of the Institute of Medicine; Richard Ivins, Clinical Neuropsychologist; Michael Jaffee of the Department of Defense; Frank Maguire of TriWest Healthcare Alliance; Ann McKee of the Veterans Health Administration; Gregory O’Shanick of the Brain Injury Association of America; Mark Olesen of the U.S. Marine Corps; Alex Ommaya of the Veterans Health Administration; James B. Peake, Former Secretary of Veterans Affairs; Gale Pollock of the University of Pittsburgh; Karen Lohmann Siegel of AHRQ; Steve Strobridge of MOAA; Megumi Vogt of the Department of Defense.

The roundtable was moderated by John S. Parker, Former Commander of the Army Medical Research and Materiel Command. IFHC Managing Director is Nancy Tomich (www.fedhealthinst.org).