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Self-Worth Shattering: A Single Bomb Blast Can Saddle Soldiers with Debilitating Brain Trauma

Brain tissue from deceased military veterans exposed to explosions shows signs of the same neurodegenerative brain disorder that strikes football players who have sustained multiple concussions

By [Larry Greenemeier](#) | May 16, 2012



CONCUSSIVE FORCE: Soldiers are **injured by more than just the initial shock wave of very high air pressure following a blast.** An IED's secondary "blast wind," a huge volume of displaced air flooding at high pressure back into the vacuum, can also damage the brain and lead to long-term consequences such as CTE. Image: Courtesy of Craig Lathrop, via iStockphoto.com

The **stress and suffering** of combat are known to leave a lasting impact on military veterans, in some cases **triggering post-traumatic stress disorder (PTSD).** Researchers have now found an even **more serious and debilitating mental condition,** known as **chronic traumatic encephalopathy (CTE),** in veterans, particularly those **injured by the concussive force of bomb blasts.**

Whereas **PTSD** is a mental illness, marked by **unwelcome flashbacks and anguish,** **CTE is a progressive neurodegenerative brain disorder characterized by abnormal protein deposits that eventually kill brain cells and thus cause cognitive declines, including loss of memory and the ability to learn as well as depression.** The number of veterans at risk is large: traumatic brain injury caused by explosive blasts is thought to afflict about 20 percent of the 2.3 million servicemen and women deployed in combat since 2001, according to a team of researchers from Boston University, New York Medical College and the Veterans Affairs Boston Healthcare System.

These researchers say they have demonstrated that exposure to a single blast equivalent

to that generated by a typical improvised explosive device (IED) can result in CTE and long-term brain impairments that accompany the disease. The research, published online Wednesday in *Science Translational Medicine*, also indicates that soldiers are injured by more than just the initial shock wave of very high air pressure following a blast. An IED's secondary "blast wind," a huge volume of displaced air flooding at high pressure back into the vacuum, can also damage the brain and lead to long-term consequences such as CTE. The blast wind created by an IED can **reach a velocity of more than 530 kilometers per hour**. Winds from a category 5 hurricane (the most severe), by comparison, reach about 250 kilometers per hour.

For their study, the researchers analyzed postmortem brain tissue from four military service members who were known to have been injured by a blast or had a concussive injury. The scientists **compared that tissue with brain tissue samples from three young amateur American football players and a professional wrestler**, all of whom had a history of repetitive concussive injury, and with four samples from comparably aged control subjects with no history of blast exposure, concussive injury or neurological disease. **The signs of CTE (which can only be diagnosed postmortem) in the brains of blast-exposed military veterans were indistinguishable from those found in the deceased athletes**, according to the researchers, led by Lee Goldstein, an associate professor at Boston University School of Medicine (B.U.S.M.) and Boston University College of Engineering, and Ann McKee, a B.U.S.M. professor and director of the Neuropathology Service for the VA New England Healthcare System.

Growing **awareness of CTE has come primarily from its impact on the lives of former professional football players diagnosed with the condition**. Several of these former players—including Chicago Bears safety Dave Duerson, Philadelphia Eagles safety Andre Waters and Pittsburgh Steelers offensive lineman Terry Long—**ended up taking their own lives**. *Before shooting himself in the chest in February 2011, the 50-year-old Duerson sent a text message to his family specifying that he wanted his brain to be used for research at B.U.S.M.* A few months later McKee and her colleagues at B.U. confirmed that Duerson suffered from CTE, possibly caused by concussions and other repetitive head trauma sustained on the gridiron.

More recently the Brain Injury Research Institute (BIRI), which studies the impact of concussions, asked **the family of the late National Football League star linebacker Junior Seau to donate his brain so it, too, could be studied for signs of CTE**. BIRI co-founder Bennet Omalu, the forensic pathologist who discovered physical evidence tying concussions to CTE, assisted in the autopsy of Seau's brain, although the results will not be known for weeks. Seau committed suicide earlier this month by shooting himself in the chest.

When studying a brain for signs of CTE, researchers look for **abnormal deposits of the proteins tau and TDP-43**. The buildup of tau, in particular, within the brain cells is indicative of CTE. In a February 2012 Scientific American article, McKee noted that the **parts of the brain afflicted with abnormal tau correlate with the psychological problems of a person suffering from CTE**. The abnormal tau is found in the frontal cortex, which is

responsible for impulse control, judgment and the ability to multitask. She also found tau in areas of the brain associated with depression as well as memory formation and retention.

Protecting soldiers and athletes from concussions presents a huge challenge because these injuries are not necessarily the result of repeated blows to the head. A concussion can occur whenever there is a sudden acceleration or deceleration of the head. This means **helmets—whether for combat or football—actually provide little protection from concussions.**