

DOD CHRONIC TRAUMATIC ENCEPHALOPATHY | MARCH 2023

FREQUENTLY ASKED QUESTIONS

Traumatic Brain Injury Center of Excellence



U.S. Navy photo by Mass Communication Specialist 2nd Class Ryre Arlaga

WHAT IS CTE?

Chronic traumatic encephalopathy (CTE) refers to a specific pattern of microscopic changes in the brain. The cause of CTE is currently debated, and some researchers believe that CTE is unique and only caused by subconcussive blows to the head^{1,2} or concussions.³ However, others believe that the pathologic changes associated with CTE are not unique,^{4,5} can be found in people with other medical conditions,^{6,7} and do not meet criteria necessary to be called a disease.^{8,9}

HOW IS CTE DIAGNOSED?

The diagnosis of CTE is based exclusively on characteristic histologic findings in the brain discovered at autopsy. There is no universally accepted pre-morbid clinical syndrome or test for CTE. The histologic features of CTE were codified at an NINDS/NIBIB consensus conference as “an accumulation of abnormal hyperphosphorylated tau (p-tau) in neurons, with or without glial tau in thorn-shaped astrocytes, at the depth of a cortical sulcus distributed around small blood vessels, not restricted to the subpial and superficial region”.¹⁰ Seven additional features were reevaluated and considered supportive of CTE but were not sufficient alone to make a diagnosis. When CTE is suspected in a living person, a thorough medical and psychological examination may be used to rule out other potential causes of symptoms.

CAN CTE BE DIAGNOSED IN LIVING PERSONS?

CTE currently cannot be diagnosed in a living person. An NINDS Consensus Workshop was held in 2019 where experts agreed on the diagnostic criteria for Traumatic Encephalopathy Syndrome (TES)—a clinical syndrome associated with CTE but not diagnostic.¹¹ There are investigations underway to identify PET radioligands that could be used to detect tau deposition in the brain.¹² However, these efforts remain in the experimental phase, and much work is needed before an accurate and reliable imaging tool is available for clinical use.¹³

WHAT ARE SUBCONCUSSIVE HEAD IMPACTS OR BLOWS?

Subconcussive head impacts or blows have been described as hits to the head that do not reach the threshold of a concussion and do not cause an alteration or loss of consciousness or loss of memory for the injury event. The exact dose-response relationship between number of head injuries and CTE is currently unknown.¹⁴

WHAT ARE THE SYMPTOMS OF CTE?

Within the scientific literature, there have been several attempts to describe a clinical syndrome, or group of symptoms, for CTE which include memory loss, impaired judgement, impulse control problems, aggression, depression, anxiety, suicidality, parkinsonism, and eventually progressive dementia.^{7,15,16} However, there is no universally recognized syndrome that is unique to CTE, and these symptoms may be the result of other potentially treatable conditions.^{7,17,18}

HOW COMMON IS CTE?

Without a laboratory test, or defined premorbid clinical syndrome for CTE, it currently is unknown how many people may have the histologic features of CTE. Much of the current literature on CTE is based primarily on small samples of symptomatic individuals who experienced subconcussive blows or concussions over many years, especially American football players and other contact sport athletes, and who later donated their brains for research.^{14,15,19,20} Others have found the histologic features of CTE in the brains of those who died from natural causes and without a history of TBI or concussion, and suggest those findings may be due to other age-related tauopathies.^{4,7,21}

IS CTE A NEW DISEASE?

The histologic features of CTE were first described in 2005 by Dr. Bennet Omalu based on the autopsy of former NFL player Mike Webster.²² Since then media exposure and the scientific literature have greatly expanded,^{23,24} but much work remains to be done for researchers to gain a firm understanding about the nature, cause, prevalence, diagnostic criteria, co-occurring conditions, and possible treatments.

WHERE CAN I GET MORE INFORMATION?

Please view a current research review information paper that describes what is and is not known about CTE in the research section of the Traumatic Brain Injury Center of Excellence's website: [Health.mil/TBIResearch](https://www.health.mil/TBIResearch).

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