

## Chronic traumatic encephalopathy (CTE) and dementia

A topic in the Alzheimer's Association® series on understanding dementia.

### About dementia

Dementia is a general term for a decline in mental ability severe enough to interfere with daily life. Dementia is not a single disease; it is the umbrella term for an individual's changes in memory, thinking or reasoning. There are many possible causes of dementia, including Alzheimer's. Disorders grouped under the general term "dementia" are caused by abnormal brain changes. These changes trigger a decline in thinking skills, also known as cognitive abilities, severe enough to impair daily life and independent function. They also affect behavior, feelings and relationships.

Brain changes that cause dementia may be temporary, but they are most often permanent and worsen over time, leading to increasing disability and a shortened life span. Survival can vary widely, depending on factors such as the cause of the dementia, age at diagnosis and coexisting health conditions.

### CTE, brain changes and dementia

Chronic traumatic encephalopathy (CTE) is a progressive and fatal brain disease associated with repeated traumatic brain injuries (TBIs), including concussions and repeated blows to the head. It is also associated with the development of dementia.

Studies have shown that people who experience TBI in early life to middle age are about two to four times more at risk of developing dementia in late life. This risk appears to increase with the number of TBIs sustained. Studies have also found that people with a history of TBI who develop Alzheimer's disease do so at a younger age than those without a history of TBI.

Research on CTE diagnosis, cause(s), symptoms, and risk factors is still in the early stages. The disease has been associated with memory and thinking problems, confusion, personality changes, and/or erratic behavior including aggression, depression and even suicidal thinking. Other symptoms may include problems paying attention and organizing thoughts as well as difficulty with balance and motor skills. People may not experience these potential signs of CTE until years or decades after brain injuries occur.

Those at greatest risk for CTE are athletes who play contact sports (e.g., boxers, football players, etc.) and military veterans, likely due to their increased chances of enduring repeated blows to the head.

A diagnosis of CTE can only be made after death, when an autopsy can reveal whether the known brain changes of CTE are present. When CTE is suspected, a thorough medical history, mental status testing, neurological exams, brain imaging and more may be used to rule out other causes. Like Alzheimer's, CTE involves tau, a protein in nerve cells that is associated with dementia. Researchers, however, have found that CTE has a unique pattern of abnormal tau buildup in the tissues around blood vessels that is different from other brain diseases involving tau — including Alzheimer's. Moreover, people with CTE do not typically develop beta-amyloid plaques in the brain, a hallmark of Alzheimer's disease. More research is needed to fully understand the brain changes that occur in CTE and how they are related to dementia.

There is no cure or treatment for CTE, but certain medicines may be used to temporarily treat the cognitive (memory and thinking) and behavioral symptoms. Consult your doctor before taking any prescription or over-the-counter medication.

Several organizations, including the National Institute of Neurological Disorders and Stroke and Brain Injury Research Institute are investing in research initiatives to learn more about CTE. The Alzheimer's Association has also invested more than \$2 million in research grants to learn more about CTE.

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