

## The Dangers of CTE

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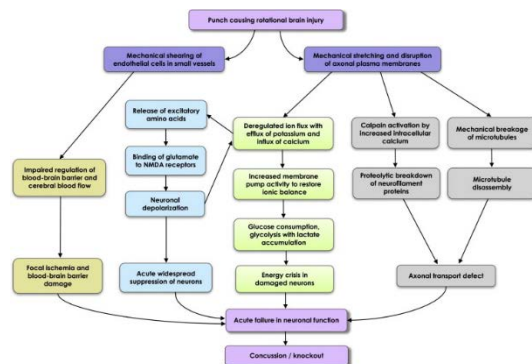
The human body works alike to a well-oiled machine, each vital organ working as a valuable gear or cog. Yet if a mechanical part is damaged the entire machine is negatively affected. Damage to the human body can work similarly to a machine. Especially when the brain, the most valuable cog is damaged. Using this analogy, three observations can be made: any damage to the human brain, whether it be great or small, has a chance to result in trauma, every time the brain receives damage it increases the risk and severity of trauma, and the results of TBIs can lead to CTE which can worsen over a larger period of time if left untreated. CTE is a disorder that can affect many adults and youths alike and is covered and separated from the public due to covering and passing of the blame by sports companies and organizations.

The human brain is an essential organ, and damage dealt to it can cause the whole body to be affected. CTE is a degenerative disease that is a result of head injury and traumatic brain injury (TBI). CTE is an acronym for Chronic Traumatic Encephalopathy, it is a “chronic degenerative brain disorder CTE, which is found in contact sports athletes, and its similarity to other neurodegenerative disorders, especially Alzheimer’s disease and Parkinson’s disease (PD).” (Sciencedirect) There are two types of TBI that can result in brain injury, focal damage and diffuse injury. Focal damage is a result of direct impact to the brain, and is seen in severe cases. Diffuse injuries are result of stretching and tearing of brain tissue and does not need any direct impact to the brain, so it is mostly associated with mild TBIs. Science direct.com says “Focal injury includes cortical or subcortical contusions and lacerations, as well as intracranial bleedings (subarachnoid hemorrhage and subdural hematoma). Focal injury is due to severe direct impact on the brain and is thus mainly seen in severe cases of TBI.” Many sports, such as football and hockey have players that experience head trauma on a regular basis, exposing them to focal damage. It was found that “[n]europsychological test data yielded significant differences

between injured athletes and controls at 2 hours and 48 hours following cerebral concussion; injured athletes performing significantly worse than controls” (Echemendia, Ruben J. PhD; Putukian, Margot MD; Mackin, R. Scott MS; Julian, Laura MS; Shoss, Naomi). Doctors and staticians have observed repetitive head injury can result in concussions, and if go untreated will worsen over time, to cause further damage, worsening the patient's condition. After an animal experiment, it was found that “Indeed, extensive animal experimental data indicate that repeated mild head injury with axonal damage increases brain vulnerability for additional concussive impacts” (Barkhoudarian et al., 2011; Laurer et al., 2001). The development and symptoms can worsen if the patient leaves it untreated and receives more TBIs.

The development of CTE is caused by a few factors. As CTE is a brain disorder, the way that it develops is through brain trauma. Too many blows to the head are of course dangerous to the athlete. As a result, “[r]epeated blows to the head are especially detrimental for the brain, because the cerebral physiology is disturbed after mild brain trauma and concussions, which makes the brain more susceptible to further injury” (The Neuropathology and Neurobiology of Traumatic Brain Injury December 5, 2012). After that brain trauma, certain symptoms may appear, such as “memory loss, confusion, impaired judgment, impulse control problems, aggression, depression, anxiety, suicidality, parkinsonism, and, eventually, progressive dementia. These symptoms often begin years or even decades after the last brain trauma or end of active athletic involvement” (Frequently Asked Questions about CTE n.d.). A study on one boxing case shows closed head impact leads to many aspects of change in neurological function. According to this study, “closed head injury with acceleration and deceleration forces to the brain causes a multifaceted cascade of neurochemical changes that affect brain function ... studies using the mild fluid percussion model support the idea that the initiating event is

stretching and disrupting of neuronal and axonal cell membranes” (The Neuropathology and Neurobiology of Traumatic Brain Injury December 5, 2012).



To track the progression of CTE studies have been conducted on animals, “Experimental studies in animals suggest that intra-axonal tau accumulation and tau phosphorylation may be consequences of repeated brain trauma. Controlled brain trauma in animal models has been shown to increase tau immunoreactivity and tau phosphorylation in the perinuclear cytoplasm and in elongated neuritis (Tran et al., 2011).The neurochemical disturbances that trigger tau pathology ... show that TBI induces an abnormal intra-axonal activation and accumulation in kinases that can phosphorylate tau (Tran et al., 2012)” (The Neuropathology and Neurobiology of Traumatic Brain Injury December 5, 2012) (A tau is an unstable subatomic particle 3,500 times heavier than an electron).The detrimental effects of this illness could negatively affect a person's life if left untreated. These effects can include what would normally come from other brain traumas/disorders and other effects such as stretching and disrupting of neuronal and axonal cell membranes. Other effects include intra-axonal tau accumulation and tau phosphorylation, these affects negatively impact the brain tissue, without treatment, these consequences of head trauma could do some serious damage.

The treatment of TBIs and CTE is important. If left untreated, Alzheimer's disease and Parkinson's can result (Barry 2013). The conditions listed have the capability to worsen over

time or manifest if they haven't already. Unfortunately, "[c]linical diagnosis of CTE can be problematic as the development of chronic neurological sequelae is not temporally related to a single concussive event and the symptoms typically manifest in later life after a period of latency" (Barry 2013). There is no current treatment for CTE, due its most common diagnosis being in autopsy, but the best course of action is to treat brain injuries such as concussions before they become worse and to be cautious as to not receive more than one. For example, in an athlete receives a concussion, "[a]ppropriate management of concussion requires the immediate removal of a player from competition and their evaluation by a [healthcare] professional. A subsequent period of cognitive and physical rest, until the athlete becomes asymptomatic, is recommended. Once an athlete is asymptomatic and no longer receiving medications to treat or modify the symptoms of concussion, a gradual stepwise return to competition should be implemented" (Barry, 2013). The best way to avoid the consequences listed is to be as cautious as possible, because the smallest TBI can lead to permanent damage and concussions.

CTE is the result of head trauma and concussions. This degenerative brain disease, if left untreated can lead to many mental disorders and permanently damage gray matter. There are treatments, however none of them can undo the damage that's already been done. One treatment that may assist the solution to the problem is being cautious and to reduce as much head impact as possible. Until the major league sports companies find ways to prevent this excessive damage, the games that viewers enjoy will only result in tragedy and short life spans for the players.

Resources:

- Frequently Asked Questions about CTE. Retrieved December 10, 2017, from <https://www.bu.edu/cte/about/frequently-asked-questions/>
- Jordan, B. D. (2013, March 12). The clinical spectrum of sport-related traumatic brain injury. Retrieved December 10, 2017, from <https://www.nature.com/articles/nrneurol.2013.33>
- The Neuropathology and Neurobiology of Traumatic Brain Injury. (2012, December 05). Retrieved December 10, 2017, from <http://www.sciencedirect.com/science/article/pii/S0896627312010367>
- Neuropsychological Test Performance Prior To and Following... : Clinical Journal of Sport Medicine. (n.d.). Retrieved December 11, 2017, from [http://journals.lww.com/cjsportsmed/Abstract/2001/01000/Neuropsychological\\_Test\\_Performance\\_Prior\\_To\\_and.5.aspx](http://journals.lww.com/cjsportsmed/Abstract/2001/01000/Neuropsychological_Test_Performance_Prior_To_and.5.aspx)