



Chronic Traumatic Encephalopathy (CTE): Understanding the Degenerative Brain Disease in Athletes and Veterans

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Abstract

in neurons, become hyperphosphorylated and aggregate into neurofibrillary tangles in CTE. These tau aggregates disrupt neuronal function and spread through the brain, leading to neurodegeneration.

The progressive accumulation of tau protein in CTE leads to widespread neuronal death and brain atrophy. This neurodegeneration predominantly affects regions such as the frontal and temporal lobes, which are critical for cognitive functions, behavior, and mood regulation. The loss of neurons and brain tissue underlies many of the clinical symptoms observed in CTE.

The mechanisms driving the progression of CTE involve a complex interplay between tau pathology, neuroinflammation, and other molecular changes. Repeated brain trauma triggers inflammatory responses that exacerbate tau pathology and neuronal damage. Understanding these mechanisms is crucial for developing interventions to halt or slow disease progression [5].

Cognitive impairments are a primary symptom of CTE, often manifesting as memory loss, executive dysfunction, and difficulties with attention and concentration. These cognitive deficits can significantly impact daily living and quality of life.

Behavioral and mood disorders are also common in CTE, including symptoms such as aggression, impulsivity, depression, and anxiety. These psychiatric manifestations can precede cognitive symptoms and are often distressing for both patients and their families. Diagnosing CTE remains challenging due to the overlap of symptoms with other neurodegenerative diseases and the current reliance on post-mortem examination for definitive diagnosis. Emerging diagnostic tools, including advanced neuroimaging techniques and biomarkers, are being developed to improve the accuracy and timeliness of CTE diagnosis in living individuals [6].

CTE is notably prevalent among athletes involved in contact sports. Studies have found high rates of CTE among former professional football players, boxers, and hockey players. The prevalence highlights

the significant risk associated with repeated head impacts in these sports. Military veterans, particularly those exposed to blast injuries and repetitive head trauma, are also at increased risk for CTE. The high prevalence of CTE in this population underscores the need for targeted prevention and management strategies within military contexts.

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and management strategies. The role of genetic predisposition and environmental factors highlights the complexity of CTE's etiology and the need for a multifaceted approach to risk reduction.

Understanding the pathophysiology of CTE, especially the role of tau protein accumulation, is crucial for developing effective treatments. The spread of tau pathology and subsequent neuronal death correlate with the clinical symptoms, emphasizing the need for early intervention to mitigate these effects. Advances in neuroimaging and biomarkers