

Concussions: What Are They, How they Happen and Long Term Impact

Introduction

Mental trauma, especially in the world of sports, has been a marred subject due to the fact that research is just now starting to fully flesh itself out in regards to what concussions can do to one's brain and the results have been much more alarming than previously imagined. While concussions is still somewhat of a taboo topics in many contact sports, especially American Football, the dangers of concussion and head trauma need to be discussed and this paper aims at not only describing what happens during a concussion but also symptoms that come with not only one concussion but multiple as well and then finally getting to the long term consequences and possible solutions to preventing concussions.

What Are Concussions

As defined by the CDC, concussions are a type of traumatic brain injury caused by a bump, blow or jerk of the head where there is a periodic back and forth movement after the trauma¹. Such movement can lead to the brain colliding or performing sudden movements within the skull and this can lead to chemical changes within the brain, loss of brain cells, Symptoms that can come with concussions can be a lapse in senses, confusion, dizziness, lack of awareness and surroundings, blacking out and memory loss, and then much more serious problems such as nausea and vomiting along with a sluggish feeling and haziness².

How Concussions Happen and Internal Process of Concussion

During a concussion, one's brain undergoes massive amounts of damage because due to the sudden jolt that the head and skull absorbs, the brain is knocked out of its stable environment, that of suspension over cerebrospinal fluid³, which is in essence the cushion of the brain within the skull and also delivers certain nutrients to the brain⁴. By getting knocked out of this fluid, the brain is susceptible to damage and nutrient loss which is why brain activity and haziness after a concussion and the immediate most well known concussion test is the finger test to see how severe that the patient got hit. Once the brain receives that jolt, the cerebrospinal fluid has nerve receptors that feel it throughout and even after the brain finds its way back into the fluid so there will be a nauseating feeling, also known as post-concussive syndrome. Because the brain is also now trying to heal itself again after colliding with the skull it demands more energy to do so meaning more ATP. ATP is made through the process of cellular respiration which at the last stage for the last electron acceptor requires an O₂, delivered to the brain generally through the blood that deposits the oxygen into the cerebrospinal fluid. The brain however in a concussion was blown out of this fluid to the initial external force and cannot reach the oxygen needed to repair itself so it starts to over-exert itself in anaerobic respiration and it could lead to a painful headache, dizziness, cognitive problems, and fatigue⁵.

Long Term Impact of Concussion

Concussions in a vacuum is something that seems entirely preventable, if one does not take hits to the head they remain far and away from concussions and asides from certain one-off accidents it is fairly easy to stay protected from concussions in everyday life asides from sports. In sports, there are multiple contact sports that take shots to the head including lighter sports (from a

contact perspective) in basketball and baseball where headshots are rare compared to sports that are much more heavy such as boxing and most importantly, American Football. In American Football, there is often collision of not only heads but of helmet-to-helmet contact where the colliding helmets also cause the heads to collide within the helmet leading to a very strong concussion on a few occasions and this can happen repeatedly in only a matter of weeks. For this reason a new disease was recently discovered in the brains of retired American football players among other contact sport athletes experiencing extreme head trauma from their sport and this is known as CTE or Chronic Traumatic Encephalopathy⁶. This disease is due to a large amount of concussions and traumatic brain injuries. This disease is fatal and due to the overactive brain trying to repair itself consistently due to such TBIs, CTE takes place through the misfolding of an important protein in the brain known as the Tau protein ⁷ that malfunctions and kills brain cells. Symptoms of CTE include a very clouded judgment, memory loss, a lack of impulse control, depression, anxiety, and progressive dementia, showing that these concussions really do add up to some serious, often life-threatening damage. The worst part is that CTE cannot be diagnosed while one is living; it goes undetected in any scan. It can only be found in autopsy after a patient has died so our only line of defense is really prevention above all else. In regards to prevention, banning all contact sports or anything of that nature is completely out of question not only to their health benefits but also benefits to the economy and legally it will be difficult. However, many major sports have taken measures to limit contact to the head and neck area and especially the National Football League has removed helmet-to-helmet hits altogether.

Conclusion

Concussions as a one-off while they are quite significant will be something to pass in relative time, compared to that of repeated concussions resulting in long term mental health complications so especially in the field of athletics we should look for more ways to reduce the risk of CTE development which means reducing the number of concussions for players.

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