

Prolonged Post Traumatic Headache after Repetitive Sports Related Concussions

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Abstract

Background:

Human and animal studies have shown evidence of pathological brain changes as well as increased cognitive dysfunction with repetitive injury.

Case Presentation:

We present a case of prolonged persistent post concussive symptoms after a mild concussion, in the setting of multiple prior concussions. In this case a 29-year-old man presented for a moderate persistent daily headache for one month after a minor injury due to a branch hitting his helmet while mountain biking. He had previously sustained one non-sports related concussion with loss of consciousness as well as at least two other sports related concussions in the past five years which

caused one-to-two-week intervals of headaches and dizziness. At initial evaluation he reported persistent photosensitivity, difficulty working on screens, as well as intermittent lightheadedness, insomnia, irritability, anxiety, and anhedonia. Symptoms of headache completely resolved over the course of three months with serotonin norepinephrine reuptake inhibitors (SSRI) management, but he reported some persistent anxiety and depressive symptoms.

Conclusion:

This case report highlights the long-term impact as well as the need for more specific return to activity guidelines for patients with multiple prior concussions.

Introduction

Previous studies have demonstrated an association between repetitive concussions and decreased neurological recovery, with persistent anatomical, cellular and cognitive changes. Animal models of traumatic brain injury (TBI) demonstrate significant cortical volume loss, with nearly doubled cerebral volume loss in rats sustaining more than one TBI, as well as notable behavioral changes, worse recovery and poorer cognitive performance¹⁻³. Similarly human studies have shown evidence of pathological brain changes as well as increased cognitive dysfunction with repetitive injury^{4, 5}.

Abbreviations

SSRI – Selective Serotonin Reuptake Inhibitor

SNRI – Serotonin Norepinephrine Reuptake Inhibitor

TBI – Traumatic Brain Injury

Case Report

A 29-year-old, previously healthy right-handed man, who participates in a number of active sports, presented with a persistent headache for the last month to the Stanford Headache Clinic after a minor injury while mountain biking. The patient reports that between 2015 and present day he has sustained several concussions - largely sports related. The most notable concussion was in 2015 when the patient was assaulted and lost consciousness with spontaneous recovery and without any CT findings of intracranial injury, at which time he reported headaches which persisted for about two weeks after. In 2019 the patient sustained another concussion while skiing, hitting the top of his head while wearing a helmet, without any loss of consciousness. After this event he reported some intermittent dizziness, persistent daily headache, which all resolved within two weeks as well. In between the concussions the patient denied any headaches or dizziness.

On this visit the patient presented after a smaller branch hit his helmet while he was mountain biking down a hill. He suspected that his speed downhill was moderate, and although he felt the impact of the branch, he felt that it was a minor impact, especially in comparison with previous concussive

events. He did not have symptoms immediately after the event, but within 24 hours he developed a persistent daily headache, as well as notable photosensitivity with difficulty using screens at work, irritability, and mood fluctuations, with symptoms of increased anxiety, depressive symptoms. A CT of the head and brain which was done at an outside facility did not demonstrate any acute brain changes.

His headache pain was described as thumping holocephalic pain that felt as though radiating from the center of his head and lasting most of the day. He reported some associated dizziness which felt like lightheadedness and worsened when headache worsened. He reported worse headaches in the morning, with work on screens on exercise, stress, and reported that headaches improved with rest, and breaks from screen time. He reported some sleep difficulty since the concussion, as well as daytime somnolence, with an attempt to mitigate this with multiple cups of coffee per day and had additionally started taking melatonin for sleep. He also reported some ability to return to exercise, with daily walking. He reported that his worst symptoms were headache, photosensitivity and mood disturbance, particularly with anxiety, irritability and anhedonia. For treatment he had attempted over the counter analgesics at home which provided temporary relief.

Based on his presentation, his headache symptoms correlated best with a post-traumatic headache disorder^{3, 6}. Given the constellation of symptoms including depressive, anxiety symptoms and headache, he was started on a medication trial of venlafaxine in order to address both mood and headache symptoms, which the patient was unable to tolerate due to exacerbation of anxiety symptoms and was therefore switched to escitalopram. In a follow up communication the patient reported significant reduction of symptoms within the following three months after starting escitalopram with complete resolution of headaches but some persistent anxiety and depressive symptoms, much improved from prior.

Discussion

As seen in this case, even a minor insult after prior repeated sports related concussions can cause

prolonged symptoms of headache and mood changes with decreased ability to recover. A recent study by Oyegbile et al identified 310 participants who had experienced at least 2 concussions, in comparison to 430 participants with a history of 1 prior concussion showed prolonged post-concussive symptoms, sleep disturbances, mood disturbances, and more severe headaches in those with repeat concussion⁷. The study also demonstrated a relationship between headache and other post-concussive comorbidities, with participants with sleep disturbance showing more severe headaches, and with more severe headaches associated with worse mood disturbances and cognitive dysfunction. Additionally, studies on the physiology of mild TBI show a cascade of cellular events including oxidative stress, impaired axonal transport, and altered neurotransmission which puts the patient at greater risk of permanent injury without appropriate time for healing after the previous injury⁸. The timeline of recovery though remains elusive and likely can vary based on the mechanism of injury and prior personal history of injury.

This ongoing uncertainty demonstrates the need for further studies into the implications of repetitive concussion, and the development of clear guidelines for patient preventative counselling for those who have incurred a previous concussion of the risks of repeated brain injury with activity. Cases like this illuminate the question of when and if return to high impact sports may be appropriate for all patients.

This case also opens the question of value of serotonin-based therapies as a treatment modality for post-traumatic headache. Current management of post-traumatic headache relies heavily on medications used for the management of migraine and include beta-blockers, tricyclic antidepressants, and anti-convulsants⁹. These medications confer a

number of side effects which can be undesirable in athletes, such as exercise intolerance with propranolol, and worsening of other TBI comorbidities such as dizziness and cognitive dysfunction with medications such as amitriptyline and topiramate. Previous studies have shown non-inferiority of venlafaxine when compared with amitriptyline in treating migraine, but no large studies exist on the management of either migraine or post-traumatic headache with SSRI's^{10, 11}. Therefore, given frequent relevant comorbidities of anxiety, depression, sleep disturbance and irritability with post-traumatic headache, SSRI's and SNRI's may offer a number of additional benefits on mood, sleep with a better side effect profile than other common migraine therapies, but require further study into their efficacy in this population.

Declarations/Disclosures

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