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The Elusive Nature of Mild Traumatic Brain Injury

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SPECIAL ISSUE

The Elusive Nature of Mild Traumatic Brain Injury

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The author discloses a personal history of undiagnosed mild traumatic brain injury (MBTI) and identifies a typical course and progression of this condition. He advocates a careful inquiry for possible head injury whenever the clinical history shows an original period of normal functioning, a progression of disturbance over time, multiple diagnoses, and poor response to treatment with medication. He discusses the use of quantitative electroencephalography (QEEG) in assessing possible mild traumatic brain injury, describes typical features of quantitative electroencephalography in mild traumatic brain injury, and cautions about the frequency of false negatives. He provides two case histories showing the progression of disturbing cognitive, personality, and impulse control problems following early head injuries.

Introduction

When I was invited to write an article on my professional and personal experience with traumatic brain injury, I had no idea what I was getting into. Regardless, the purpose of this article is to convey to my colleagues not only what I experienced, but also what many of my patients experience following a traumatic brain injury. First, I want to make it clear that it is estimated that 80% of all individuals who have a mild traumatic brain injury (MTBI) or concussion will completely recover. Second, the 20% who do not often are misdiagnosed or ''miss diagnosis.'' Third, in those cases where a brain injury was serious enough to warrant a trip to the emergency room and a concussion was diagnosed, the symptoms of postconcussive syndrome can take from months to years to fully present. Therefore, the delayed presentation of postconcussive symptoms contributes to the failure of a MTBI diagnosis and efficacious treatment. However, there is an obvious pattern of pathology in MTBI that medical and mental health professionals should be prepared to recognize. To best demonstrate this pattern, I will tell you the story of my concussion and present two recent cases that eluded detection for years.

Concussion

Being a high school football player has to be one of the most memorable periods of a young boy's life. However, 47% of high school football players report having at least one concussion each season and 35% of those have a second (Langburt, Cohen, Akhthar, O'Neill, & Lee, 2001). In fact, high school football players are more vulnerable to brain concussions than their college or professional counterparts because their brains are still developing (Guskeiwicz, Weaver, Padua, & Garrett, 2000).

In rare cases, multiple concussions can lead to a condition called second-impact syndrome (Cantu, 1992). In these cases, even a minor impact can cause the brain to swell uncontrollably, often causing death or at the least, severe disability. In addition, teen boys are more likely to not report difficulties when they get their ''bell rung,'' because they do not want to let their team down or show weakness. The accolades from players, coaches, and fans reinforce what could be the worst decision of their lives. It is frightening when you consider that a substantial percentage of concussions go unreported and/or undiagnosed (McCrea, Hammeke, Olsenq, Leo, & Guskiewicz, 2004). Over the last 20 years, football contact rules have changed, player and coach are more educated, and improvements in helmets all have helped to reduce the incidents of concussion.

My personal experience with traumatic brain injury began with a severe concussion during football practice in the fall of 1967. As a freshman offensive tackle, I was hit so hard that I was amnesic for more than 12 hours. ''Did we run wind sprints?'' is the question I asked repeatedly over that 12-hour period. Still to this day, I have no memory of that lost 12 hours. Although the doctors recommended I should never play football again, I was back playing 6 weeks later, against their advice.

High School Transformation

I did not notice much change at first, but as I look back, my life slowly started spiraling downward over the next 2 years. I transformed from a good student who was shy and mild mannered into a very aggressive player. The ''concussion helmet'' they gave me to wear was so much better than my prior helmet that rather than avoiding contacts to my head, I used it as a weapon against my opponents. I actually took pride in seeing how many of the

opposing players I could injure. Eventually my aggressive playing was rewarded. I became the defensive captain and was honored my junior and senior years by being selected for the ''All-City,'' ''All-State'' and ''All Mid-South'' teams. For the first time in my life I had people who acknowledged and respected me, at least for my athletic abilities.

On the downside, I started becoming withdrawn, then depressed, and eventually lost interest in school. Consequently, my grades started declining and conflicts at home increased as I became more angry and oppositional. I had to get away because everything bothered me. I would spend hours just walking in the woods thinking confusing thoughts. The world became a very dark and foreign place. My parents noticed this negative shift in my personality. I am sure that they just chalked it up to being a male teen, because the changes happened slowly.

On the upside and maybe what helped me get through these trying high school years was that I started dating for the first time within weeks of my concussion. We were exclusive throughout high school. She was someone to eat lunch with daily, and I took refuge in our relationship. I did not have to communicate with anyone but her. She was my only friend.

As it turned out, I was not big enough or fast enough to get a football scholarship offer at the end of my senior year. I often tell the young guys I treat that the most depressive time of a young man's life is the last semester of his senior year when he has no plan. My only plan was to play football. I had poured all of my efforts into building up this entity that existed only in the fictitious realm of football. I had no separate identity.

Post–High School Problems

My downward spiral continued after high school. With no backup plan, I enrolled in Memphis State University in the fall of 1971, moved out of my parents' home, got a full-time job, and went to school. It only took one semester for me to earn academic probation with a 1.76 grade point average. I was overwhelmed with my lack of educational foundation and the rigors of self-managing a college schedule. I am sure that there were many other reasons for my less than stellar academic performance, but knowing what I know now, my brain injury played an important role.

MTBI Brain Changes

As mentioned previously, most individuals completely recover from brain injuries; however, many individuals do not. Brains that are injured significantly shift into a slower power distribution pattern. Comas are extreme examples of maximum brain slowing. Most often however, theta becomes the dominant frequency in the areas of injury (coup and contra-coup pattern). Hughes and John (1999) concluded the common indicators in the EEG of post-concussive syndrome are

1. increased focal or diffuse theta;
2. decreased alpha;
3. decreased coherence; and
4. increased asymmetry.

What this produces in the individual is a myriad of psychopathology dependent upon location and severity of injury. The psychopathology often progresses from sleep disturbances to increased anxiety, eventually resulting in depression. Due to slower processing speed, learning disabilities are common. Irritability and anger are likely to follow along with ever-increasing attention deficit hyperactivity disorder (ADHD) symptoms and—more times than not—substance abuse issues. The most notable symptoms are impulsivity, distractibility, and difficulty with focus on boring tasks. This makes higher education very difficult and working most professions intolerable. However, there are professions well suited for brains that have such traits.

Disabilities Can Produce Abilities

Those professions that require impulsivity and the ability to hyper-focus and multitask are often highly stimulating and/or dangerous. I propose that many with history of concussion seek out these careers for two primary reasons: (a) to them, other careers are too boring to sustain their attention and require copious amounts of equally-as-boring higher education and (b) being able to excel in highly stimulating dangerous careers feeds their physical, psychological, and social needs.

Using myself as an example, I am a veteran of Vietnam and Desert Shield/Storm, a retired professional firefighter/emergency medical technician, and once upon a time, a commercial deep-sea diver with a blaster's license in underwater demolition. My impulsivity and ability to multitask without being overwhelmed in the face of total stress and chaos added greatly to the success in each of these careers, but more important, I believe, these abilities saved my life on several occasions. That is enough about me.

Indicators of MTBI

What I want every professional to glean from this article is a better recognition of the interwoven indicators of MTBI. Often we are referred complex confusing cases that are atypical. They are atypical in many ways, as to:

1. The existence of normal developmental functioning prior to the onset of pathology.
2. The way they exhibit progressively worsening symptoms leading to additional diagnoses over an extended period of time.
3. How they respond to medicine: often with no response, paradoxical responding, or unacceptable negative side-effects.

I now work in a large interdisciplinary practice in Houston, Texas. The majority of the cases referred to me are atypical and complex in many regards. Usually, I am at the end of a long chain of doctors who have failed to get adequate treatment response with traditional interventions. I am BCIA certified in general biofeedback and EEG biofeedback, and I use these technologies to develop a more accurate diagnosis and an evidence-based treatment plan. However, technology is not a substitute for good clinical judgment.

Jay Gunkelman (2008) presented convincing evidence at the International Society for Neurofeedback and Research conference that Traumatic Brain Injury Discriminant Analysis (Thatcher, 1998) should not be used as a screening tool. However, he did support the use of it with patients having a history of brain injury. Often the QEEG Traumatic Brain Injury Discriminant Analysis comes back negative for brain injury even in confirmed cases. Jonathan Walker and I have become very adept at identifying those false negative cases (approximately 20% of cases are Type II errors). There are many possible explanations for false negatives in regard to brain injury analysis. Most often the data are too convoluted for it to be positively identified as traumatic brain injury (TBI). In many cases in which brain injury has been confirmed, we receive false negative test results. Paradoxically in one case, after I had completed 40 sessions of neurotherapy, the post–QEEG TBI Discriminant Analysis was positive. The following are two case examples.

Case 1

The first case is of a young boy I started seeing when he was 12 years old. At that time he had a flat affect, appeared very depressed and withdrawn, and possibly had ADHD. It took nearly 6 months for him to disclose his grief over the loss of his grandfather a year prior. The depression was treated with standard medications and individual therapy, and this seemed to help somewhat. However, as he aged the depression seemed to worsen as other symptoms begin to appear. By the age of 15 he was doing poorly in school and had become anxious, angry, and oppositional, and voiced hatred for his family. Additionally, he was now on several medications that were not adequately addressing his symptoms.

One day in session we were discussing his life as a small child, and he mentioned how he wished he could go back to the time when he was doing well. He said it was before his grandfather died. I asked if he ever had a brain injury and he, like so many I asked at first, said no. However, with further inquiry, he did say that he remembered a fall he took in a Tae Kwon Do sparring match, in which he landed flat on his back, slamming his head into the mat. Although he was wearing the proper headgear, he remembered being very dazed. I brought in his father, and he also remembered the incident and had been concerned at that time about a head injury. I did a QEEG. The data I observed and Traumatic Brain Injury Discriminant Analysis both suggested that this young boy was brain injured.

Case 2

The second case is one that eluded detection because the injury happened at such a young age. A 14-year-old boy was brought in to me for a QEEG, because nothing was working and he was getting worse as he aged. He had been in psychiatric care since the age of 6 and was tried on 11 different medications, many in combination. All of these were ineffective, had negative side effects, and/or had a paradoxical effect. It seemed that with each developmental stage, he met criteria for another diagnosis. His diagnoses started with ADHD and progressed to learning disability, anxiety disorder, major depression, oppositional/defiant disorder, and finally, bipolar disorder.

I suspected a brain injury from the beginning, but the mother denied he had ever had one. When Jonathan Walker sent his QEEG report, the TBI Discriminant Analysis was negative. However, there was evidence of multifocal slowing and an inordinate amount of coherence problems. Jonathan and I both agreed that his EEG and QEEG looked brain injured, so I went back to the mother and questioned her again. She said the only thing she could remember is that from the age of 4 months to 5 years, her son would bang his head on the ground in order to soothe himself to get to sleep. Now, it all made sense. Her son was a ''head banger.'' ''Head banging'' is not uncommon during those ages and in essence, he had self-inflicted shaken baby syndrome. Lessons learned: ''the absence of proof does not mean the proof of absence,'' and although the cause may be hidden, the evidence does not lie.

Summary

In summary, it is the slow progression of symptoms that contributes to misdiagnosing MTBI even in confirmed cases of concussion. Although the progression of psychopathology can deviate somewhat, one should always rule out brain

injury in cases where there are multiple diagnoses, poor response to medication, and previously normal functioning.

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