Case Report

Mild Traumatic Brain Injury in High School Athlete – Novel Method of Evaluating Clinical Progress

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The patient was a local high school male soccer player who was seen by me at a local urgent care center shortly after he was injured. This teenage male was accompanied by his mother.

He had been struck in the head after colliding with another player while competing in a high school soccer game. There was no loss of consciousness surrounding the impact. The patient had a complaint of a headache on his initial presentation. There was no nausea, vomiting, or unusual behavior.

His initial neurologic function showed a GCS of 15 with no focal neurologic deficits. He was a bright, inquisitive teenager with high intellectual function. There were no focal deficits on his examination. The patient could perform rapid alternative movements with no focal cerebellar deficits. The only significant motor/cerebellar abnormality: the patient could stand less than five seconds on each leg with his eyes closed (right and left leg standing times were symmetric). Also, during and after the examination, the patient would ask me to repeat instructions several times, with the repetition of instructions being the only unusual aspect of his examination.

The clinical diagnosis of mild traumatic closed head injury was made. No imaging studies were deemed warranted. I explained my decision to not CT image the patient due to the history of the injury and the examination showing no evidence of a focal structural neurologic defect, plus the significant radiation load of CT imaging on this patient's developing brain. The mother and the patient were comfortable with this decision not to proceed with radiologic neurologic imaging.

The patient wanted to know when he would be able to return to competitive sports. On reflecting on how to answer the patient's question, I was searching for an objective measure to show the patient and his mother that his cognitive function was not optimum now (believability/"buy in" by the patient and his mother). Also, any objective measure of cognitive function would ideally be easy to perform, easy to repeat, low in cost, and easy to independently monitor. Finally, when the patient's testing had returned to normal pre-injury optimal testing, any testing should have some reasonable correlation with clinical improvement so the patient could return to competitive athletics safely with respect to accepted clinical guidelines.

I asked a few more questions of the teenage male, and I was pleased (but not surprised based on his age) that he was an avid gamer on his computer at home. Again, his mother confirmed how avid he was. Not being current gamer (my own clinical exposure ended with PacMan in the last millennium with occasional clinical exposure from enthusiastic nieces and mostly nephews soundingly thrashing me in video games scores by orders of magnitude), I realized the complex cognitive mental tasks required of most modern video games is extensive requiring concentration and interaction of higher cortical functions.

I asked the patient to go home and monitor his score on his most popular video game. I asked him to report at the time of his re-evaluation how much his top score had decreased and if his score had improved with time. This bright patient was very agreeable to this as was his mother.

On scheduled re-evaluation with me, the patient told me that his score had dropped off 30% the evening of my initial evaluation with marked difficulty in even attempting to play the game. The finding of a marked decrease in performance plus the extraordinary effort to even try to play a video game, which was previously effortless, was quite startling to both the patient and his mother.

Over the next two weeks, his video game score continued to improve as his headaches decreased and his concentration improved. At the two-week timeframe for his scheduled re-evaluation, he showed his mother that his video game skills had returned to premorbid levels with commensurate improvement in his video games scores to his premorbid level. He felt able to return to competitive sports and his mother agreed.

My evaluation two weeks after his injury showed his concentration had improved and this was confirmed by his mother. His neurologic examination was normal. He could now stand more than 10 seconds on each leg with his eyes closed (right and left sides were the equal).

My recommendation at this point was to return him to normal activities. Both the patient and the mother were very comfortable with this. The patient was released from any specific follow up unless there was any return of symptoms. There has been no need for follow up since he was last seen four weeks ago.

PubMed and general Google searches yielded no results concerning mild traumatic brain injuries and evaluation of clinical progress using computer-based video games in lieu of formalized neuropsychological testing.

The advantage to this potential approach to clinical evaluation is there is an antecedent pre-traumatic scored evaluation for a great number of patients, such as this one, in a cohort of young athletes (i.e., most patients, especially males, have played video games on the computer, and there is a recorded score), the computer system is already in place so no extra costs are incurred, the testing can be done on an as-needed basis, the patients will readily participate in this means of testing, and the video tests are usually quite interactive requiring long periods of concentration and mental processing (brain functions normally effected by mild blunt traumatic brain injury that is normally not imaged well). For young athletes who are not video gamers (perhaps female athletes), another activity having antecedent scoring and easily followed might be cell phone messaging in a month, but further study would likely be warranted.

Unfortunately, the limitations of this case study are: first, I forgot to ask which video game he played. I assume there are differences in levels of interactivity, but to this mature medical (but non-video) practitioner, all video games are interactive beyond any level of play I could ever get out of them.

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