Head trauma in aquatic sports

Written by Larry A. Drum

The short term consequences of a first or second head injury can lead to death in the unprotected athlete and early mental impairment as the athlete reaches their 40s and 50s. Physicians and trainers must err on the side of health and safety when these players are returned to action while coaches and players need to be educated and understand the rational that watchful waiting is the treatment of choice and avoid the temptation to return an athlete too early.

Not just a headache any more The last several years have brought about drastic changes in how health care workers approach head injuries. National and international sports federations are teaming up with both physicians and trainers, to not only look at the serious impact this has on the career of the athlete, but also their long term functioning after sustaining repetitive head injuries. The culture is changing on how we recognise, treat and rest an athlete that has suffered a head injury. Athletes need to be more candid in reporting the injury and medical staff need to err on the side of caution when we diagnose, treat and decide to return an athlete to play. Within the aquatic sports, water polo has most of the reportable cases of head injuries. From a fast moving ball that strikes the head directly, deflected off an arm or off the goal's cross bar these injuries happen quickly. Other causes include player-to-player contact usually during transitions. Head injuries to divers are also a common cause of concussions. There are a myriad of causes for these injuries but the most frequent include striking the springboard or platform as well as hitting the water at 30 miles per hour with the hands in a compromised position. Most of these injuries can be quite serious when it comes to striking the head during a dive. These injuries not only cause brain injury but neck injuries and fractures as well. Good diving technique is critical to decrease the likelihood of head and neck trauma. It is worthwhile to realise that entering the water with unclasped hands, hands and arms striking the head or poor entry into the water leaving the head exposed are all important causes of head trauma. Synchronised swimming has seen a recent rise in head injuries both in the pool and with dry land training. The increasing demand for complex throws and tight formations place the synchronised swimmer at greater risk than ever before. Referees, coaches, trainers and physicians should be keenly aware of how to spot and recognise a head injury, take the appropriate measures to insure the athlete's safety and be prepared to transfer the athlete to emergency medical services for further testing. **Head injuries** The brain sits within the skull of the head surrounded by water. When the head is struck the brain is still moving until it hits the inside of the skull. This can result in bleeding within the brain, bruising or swelling. All three conditions mentioned should be considered life threatening and can only be seen by different imaging techniques such as CAT or MRI scans. Once bleeding and bruising have been ruled out the swollen brain goes through a series of changes often called a concussion. This injury leads to a complex process affecting the brain induced by traumatic biomechanical forces that impairs normal neuro-phsysiological functioning. Recent literature suggests that the severity of injury may have an inverse relationship on the intensity of the concussion and that even the smallest of head injuries may carry a very poor prognosis during the recovery period. **Symptoms of a concussion** Once the head injury occurs an athlete may want to tough it out but even the mildest of concussions can be quite disabling. Headache and lightheadedness begin followed by nausea. Out of the pool they complain of poor balance, dizziness and sensitivity to light and noise. Witnesses may describe a period of unresponsiveness and the player may experience a loss of memory. The following day, fatigue, drowsiness, irritability and sleep disturbances can follow. Later, in the course of a concussion, depression can be noticed

with social isolation and withdrawal. This differentiates musculo-skeletal injuries where athletes can become angry, irritable and aggressive. The importance of witnessed accounts of the accident; the severity of the athlete's symptoms combined with physical findings should prompt a quick response from all resources to mobilise the injured athlete safely to emergency personnel. Symptoms of a concussion are similar to those of internal brain bleeding and or a contusion and warrant a quick diagnosis for the appropriate care. The listing of symptoms from the most recent Zurich Consensus (noted below) includes the following: a. Symptoms: somatic (ie, headache), cognitive (ie, feeling like in a fog) and/or emotional symptoms (ie, sadness and social withdrawal) b. Physical signs (ie, loss of consciousness, amnesia) c. Behavioural changes (eg, irritability) d. Cognitive impairment (eg, slowed reaction times) e. Sleep disturbance (eg, drowsiness) Consensus Statement of Concussion in Sport 3rd International Conference on Concussion in Sport Held in Zurich, November 2008, Paul McCrory, MBBS, PhD, Willem Meeuwisse, MD, PhD et. Al – Clin J Sport Med Vo. 19, Number 3, May 2009 **Treating a concussion** Rest is best. Work and school activities can be difficult and should not be attempted if the athlete is still symptomatic. Acetaminophen for headaches, reassurance that the fatigue will diminish, naps when needed can all help the athlete recover. These injuries are severe and take time to heal and any rush to return an athlete prematurely can have long-term consequences. Attention to symptoms relating to depression, social isolation and mood changes are important to follow and treat since this can have more of a profound impact on the life of the athlete than the initial injury. **When can an athlete return to training?** Return to training is a decision based on the severity of symptoms and the athlete's history of prior concussions. For concussions with minimal symptoms, a one-week symptom free period is recommended. Of course, this depends upon ongoing evaluation of the athlete showing complete recovery. It is important to remember the earlier notation that sometimes the simplest concussion or series of mild concussions can bring that worst long term outcomes. For athletes that are training vigorously, aerobic performance evaluations can be done on a bike or treadmill to determine if their symptoms can be brought out with exertion. If provoked during this testing, safe return to their aquatic sport should be delayed. Baseline cognitive abilities should be established during a preseason physical and then can be used as a comparison after a head injury has occurred. Any decrease from baseline can also serve as means to access severity and progress towards recovery. Age is also an important variable since adolescent brains are more prone to further concussions if a second often-trivial head injury occurs. Referred to as the second impact syndrome, sequential head injuries trivial or not can lead to the death of an athlete. For reasons unclear to the medical community a second head injury can cause vascular changes within the previously injured brain and sudden death can occur.

Graduated Return to Play Protocol

Consensus Statement of Concussion in Sport 3rd International Conference on Concussion in Sport Held in Zurich, Novemter 2008, Paul McCrory, MBBS, PhD, Willem Meeuwisse, MD, PhD et. Al – Clin J Sport Med Vo. 19, Number 3, May 2009

Long Term affects of a concussion

Coaches and athletes in the aquatic sports can learn a lesson from the experiences of older athletes from the professional football ranks as well as boxing who are advocating a look back on how we recognise and treat acute head injuries. Multiple articles are now showing that repetitive head traumas are likely to cause impaired cognitive functioning down the road. As the retired athlete ages, their mental functioning test scores deteriorate faster than

the normal population. This loss in impaired mental functioning includes difficulties with memory, abstract thinking, problem solving and the inability to learn new tasks. So what was once considered a problem during the course of an athlete's career is now a cause for disability in the future.

The medical community and international sports federations are taking head injuries seriously. A Third International Conference on Concussion in Sport was held in Zurich Switzerland in 2008 to establish guidelines on how we approach these injuries collectively. Experts from around the world updated the recommendations that were developed from the first two Consensus Statements on Concussion in Sport (Vienna in 2001 and Prague in 2004). Though there are some areas of disagreement on how the medical community should handle concussions i.e., return to play issues, there are areas of agreement in how to best serve younger athletes, the use of neuropsychological testing before and after a head injury and the long term impairment that concussions impart on the life of an older athlete. Where the panel unanimously agrees are that all athletes should be treated the same regardless of their level of participation. (For those interested in reading more about this Consensus Statement and References - .)

SUMMARY

The culture on how to treat head injuries in aquatics sports is changing. Athletes should report all injuries including simple head injuries to medical staff, parents or coaches. Symptoms of a concussion should be investigated and not simply ignored as just another headache but as a serious medical problem that can lead to short term physical and mental impairment. Later in life, concussions can lead to advanced deterioration in cognitive functioning which can further compromise an already complicated aging process. Rest is best and patience will be rewarded with the safe return of a healthy athlete.

Q and A

Question

I am an open water swimmer and hurt my head playing soccer with my friends. I never saw a doctor and it finally went away after a week. Now that I am back swimming in the ocean I get throbbing headaches and nauseated just after 5 minutes. Is this serious?

Answer

It is serious and it needs further action. A physician should investigate any minor headache if your symptoms persist longer than 48 hours. The simple fact that there are still symptoms over a week following the original trauma is quite concerning. It is dangerous to delay further in getting medical attention. Depending on the medical practitioners' evaluation, they may want to do a CAT scan or MRI imaging study. Even though your headache disappeared, this is still not a green light for you to return to training because you are having reproducible symptoms with exertion. Work with your trainer; get on an exercise bike to determine if you have reproducible symptoms. If not, you are safe to return to the water and train. In the water, train at 25% max and progress slowly and patiently.

Question

I am a water polo goalie and over the last two years I have had five really bad episodes where the ball came off the cross bar and hit me in the back of the head. I am finding it harder to concentrate and sleep and my grades are worsening. I have two more years to play in college and need to keep playing or I will lose my scholarship. Any advice?

Answer

This is one of the biggest challenges we face in college sports. I would insist that you take a year off and re-evaluate your current situation. Your symptoms are clearly from repetitive head trauma and you are at high risk for second impact syndrome. Funding for your college education can be achieved by safer means and to put your current life and your long term functioning in danger is well not worth it in this scenario.

Question
One of my swimmers injured herself in the hotel bathroom and we went to the emergency room to get checked out and was told she had a concussion and to watch her over night. Why is this so important?

Answer
It is important to check her out for decreasing levels of consciousness which could be a sign of bleeding from within the scull. This is especially true if the athlete had experienced any loss of consciousness after the head injury, had a period of memory loss or worsening symptoms at bedtime.

About the Author

Larry A. Drum, M.D. was born and raised in Long Beach California. He is a graduate of The University of Southern California and earned his Medical Degree from Northwestern University. Formally trained at UCLA and Board Certified in the field of Internal Medicine, he immediately started his Sports Medicine career by serving the athletes at Long Beach State University in 1987. In 1997, he became the team physician for USA Water Polo Inc. and is an active member for the United States Olympic Committee's Medical Staff for the last three Summer and Pan American Games caring for all aquatic disciplines. Father of three sons, he is an avid golfer and runner and continues to serve his local medical community