Concussion Management
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A concussion is a mild traumatic brain injury, affecting mental status and ability of the brain to process information normally. Fortunately, the vast majority of patients with concussion recover quickly and without significant intervention. However, it is important to recognize patients who need neuroimaging and intensive symptom management.

Most concussions are sustained by head impact. However, forces can be transmitted to the head by blows to the neck or body. Symptoms of concussion can be many, but most common are headache, dizziness, and a feeling of mental fogginess or slowness. Nausea, problems with balance, vision, or hearing, irritability, increased emotionality, confusion, and amnesia (either before or after the incident) are other symptoms that may be present. On initial exam, the athlete may have difficulty answering simple questions or following directions, be easily distracted, have poor balance or coordination, slurred speech, or have 'glazed' eyes. Most pediatricians will not have the benefit of seeing the athlete immediately, so history from teammates, coaches, and parents is important. The athlete may not remember events of the injury or how she felt afterward. Presence of LOC is not as important as previously thought, but prolonged LOC (>1 minute) should warrant more careful evaluation for focal neurologic problems. Transport to an emergency department for further evaluation and possible neuroimaging is needed for athletes with focal neurologic symptoms, seizure, LOC >1 minute, or worsening symptoms.

Sport concussion management has changed in the last several years. Grading scales (e.g., American Academy of Neurology (AAN), Cantu) have been historically used to guide management, and most use loss of consciousness (LOC) as a large determinant for concussion grade and, therefore, return to play. Concussion severity has not been shown to be related to LOC. Scales also created an algorithm for rest from sport that often under or overestimated athlete recovery and readiness for return to play. In addition, many research studies have shown that children and adolescents do not recovery from concussions as quickly as college athletes or adults. In part for these reasons, the 1st and 2nd International Conferences on Concussion in Sport recommended abandoning grading scales, making diagnosis and treatment of a concussion individualized.

There are now 2 categories of concussion: simple and complex. Simple concussions resolve within 7-10 days and do not have focal neurologic complications. Pediatricians can manage these, advising rest from physical activity and strenuous cognitive activity until symptoms resolve. Neuroimaging is usually not necessary, as the injury is a

functional, not structural, one. Formal neuropsychological screening is not needed. The athlete may return to sport gradually after symptoms are gone for at least 24 hours, starting with light exercise and progressing to more intense game play.

A typical exertional return to play protocol is:

Day 1 – Fast walk/stationary bike work out for 15-20 minutes
Day 2 – Jogging/running for 20 minutes
Day 3 - Non-contact sport related drills and conditioning
Day 4 – Full participation in practice without contact
Day 5 – Full practice participation
Day 6 – Return to game play

Athletes only advance in the protocol if asymptomatic with each activity. It is best to have exercise progression occur over days because symptoms can return hours after exertion. Athletes are usually very determined to get back to play quickly, and they may not be honest about symptoms due to strong desire to play. It is important to observe the athlete during exertion to detect fatigue, nausea, and general malaise that cannot be hidden. Athletic trainers at school, coaches, and parents are useful supervisors for exertion. Alternatively, exertional testing can be done in the clinic if there is an area nearby for them to run or walk.

Complex concussions are those that do not resolve in the expected 7-10 days, have persistent symptoms (with or without exertion), or have any focal neurologic defect. These are best managed by a sports medicine physician or neurologist with experience with concussions. Managing long-lasting effects from concussion involves significant modifications to academic and athletic involvement. Symptom management is important, particularly with headache. Formal neuropsychological testing is appropriate, especially when symptoms are present for over a month.

Neurocognitive testing (ImPACT and others) has become a useful tool to objectively assess brain function. These quick tests (30 minutes) measure brain processing speed and reaction time by various tasks. Tests are computer based, and a person trained to administer testing is needed. Optimally, baseline testing is done before the season so comparison to post-concussion scores is possible. However, baseline academic performance can be used to obtain general guidelines for scoring. Some high schools have started to purchase programs, with the school athletic trainer administering the test when needed. A physician should be involved with test interpretation and incorporation into athlete return to play. Neurocognitive testing is only one aspect of management and should not be relied on for return to play decisions; physical exam, symptoms, and performance on exertional testing should continue to play the major role in returning to sport.

School accommodations play an important role in recovery and management of symptoms. For athletes with a recent concussion, staying out of school for a day or two until symptoms start to improve can help speed recovery. Athletes with severe

headaches, nausea, concentration problems, memory loss, or extreme fatigue with cognitive exertion should not continue performing mental tasks through these symptoms. Asking the school to temporarily excuse or reduce homework and classwork is helpful. Important projects and tests should be delayed if possible to avoid lower than normal scores. Outside of school, decreasing time involved playing video games, on the computer, and watching television is necessary if symptoms are exacerbated with these activities. With complex concussions, long-term school adjustments are often needed and can require significant teamwork between the physician, student/parents, and school.

References:

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2) M Lovell et al. Does loss of consciousness predict neuropsychological decrements after concussion. Clin J Sport Med 1999;9:193–8.