



Pediatric Clips

Concussions in athletes: Evaluation and management — Todd Maugans, MD

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Pediatric Clips from The Children's Medical Center are quick reviews of common pediatric conditions.

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CASE: THE STAR STRUCK ATHLETE

A 17-year-old quarterback with aspirations to play college football presents for evaluations of headaches. He states that he was "sacked" two times this week. Both times he "saw stars" but did not lose consciousness. After the second hit, two days ago, he felt

nauseous for about 20 minutes then developed a bifrontal headache which has become continuous. His medical history is unremarkable, and he has a normal neurological examination. After probing, you discover he had one brief episode of loss of consciousness following a hit

in practice two months ago. He has had "about six concussions" since starting to play football four years ago. He and his parents want evaluation and advice, and his coach wants to know when he can return to play. How do you proceed?

CASE DISCUSSION

Concussions rank high on the list of injuries sustained by athletes. It has been recently reported that between 10% to 50% of participants in football, hockey and soccer will incur one or more concussions per season. Most go unrecognized and unmanaged, largely because athletes, coaches, trainers and parents have not been educated about the spectrum of symptoms that connote a concussion.

Loss of consciousness is present in only the most severe concussions. Headache, nausea, disequilibrium, altered short-term memory, and affect changes occur most frequently. The concept of "grading" a concussion based on symptom severity and duration has become a valid method for directing evaluation, medical management and return-to-play disposition.

CONCUSSION GRADING

- Grade 1 ... Symptoms less than 15 minutes in duration; no recurrence with exertion
- Grade 2 ... Symptoms greater than 15 minutes in duration
- Grade 3 ... Any loss of consciousness

A systematic approach to the concussed athlete is required to avoid missing the rare but potentially life-threatening sequela of minor head trauma: subdural hematoma or cerebral contusion. In all cases of loss of consciousness, an immediate CT of the brain without contrast is advised. When an athlete complains of persistent (more than 24 hours) of symptoms, a CT should be performed as well. Neurosurgical evaluation would be required if abnormalities are discovered on imaging.

The most common scenario is a normal CT. In this case, symptoms are due to alterations in neurochemistry, cerebral metabolism and blood

flow. Such alterations have been characterized in laboratory animals, frequently lasting one week or more after clinical recovery. Reinjury during this period can produce exponential problems, and in rare cases, death (the second impact syndrome). Even after days of symptom resolution, athletes with grade 1 concussions frequently demonstrate impairments of memory and reaction time on neuropsychological testing. Thus a very conservative approach to returning an athlete to play is essential.

RECOMMENDATIONS FOR MANAGEMENT OF CONCUSSIONS

FIRST CONCUSSION OF SEASON

Grade 1	Return to play next day
Grade 2	Return to play after symptom free for 1 week with health care provider clearance
Grade 3	Immediate medical evaluation with non-contrast CT of brain

REPETITIVE CONCUSSIONS IN ONE SEASON*

Worst Grade	Second concussion	Third or more concussion**
1	Return to play when asymptomatic for 1 week	Consider termination for season
2	Return to play after 2 weeks if asymptomatic	Consider termination for season
3	Return to play when asymptomatic for 1 month	Termination for season

* Base decision on worse grade, regardless of chronology.

** No formal recommendations made by AAN, but these recommendations are distilled from other published guidelines.

Continued on the reverse side.

Continued from the front.

The following guidelines provide one set of accepted recommendations that you can use for your patients (1).

Most important is the edict that no athlete should be returned to play until they are symptom free — with and without exertion. A graduated return is best (running laps, then drills, then non-contact play, then full contact). Rest and OTC analgesics will abate symptoms in most patients within days to two weeks.

The deleterious effects of repetitive head injuries are especially alarming. Recently acquired data suggests about 15% of high school athletes with histories of two or more concussions developed a protracted post-concussive

syndrome (daily headaches, memory and affect alterations, etc.) after subsequent concussions. Thus any athlete with repetitive concussions should be counseled about the long-term risks of minor head injuries and encouraged to consider ceasing play. If significant symptoms linger, referral to a neuropsychologist is indicated.

Based on this discussion, I would then recommend the following for this case: 1) CT scanning; 2) analgesics for headache (assuming CT normal); 3) cessation of play for the season; 4) counseling about repetitive head injuries; and 5) referral to a neuropsychologist if

symptoms continue. Finally, I would urge you to educate the athletes, coaches, trainers, and parents in your community about this important topic.

RESOURCES

1. Practice parameter: The management of concussion in sports (summary statement). *Report of the Quality Standards Subcommittee. Neurology.* 1997; 48:581-5.

FEATURED SPECIALIST



Todd Maugans, MD, is a member of the pediatric neurosurgery team at Dayton Children's. Dr. Maugans is board certified in neurosurgery. He completed his clinical fellowship in pediatric neurosurgery at Children's Hospital in Los Angeles. He is a former board-certified family practitioner who taught and practiced family medicine. He graduated with honors from Temple University School of Medicine. Dr. Maugans is a member of the American Association of Neurological Surgeons and the Joint Section of Pediatric Neurosurgery and was named a *Who's Who in Medicine* award winner in 2003.

PEDIATRIC NEUROSURGERY

The department of neurosurgery at Dayton Children's provides evaluation and surgical care for trauma cases and a number of

disorders including epilepsy, spasticity, craniofacial malformations and craniosynostosis, spinal dysraphism, tumors, vascular pathology, infections and hydrocephalus. The department is devoted to the highest level of care for patients. A team approach assures neurosurgical services are readily available in a timely manner. The team provides 24-hour emergency consultations.

CONTACT INFORMATION

To contact to Dr. Maugans, to make a referral or to request a pocket-size version of the concussion grading and management guidelines, call pediatric neurosurgery at 937-641-3461 or e-mail mauganst@childrensdayton.org.



For further information about The Children's Medical Center or its specialists contact us at 937-641-3666 or marketing@childrensdayton.org.



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