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Head Concussions: Causes, Prevention, Management, & Recommendations

Number of Contact Hours: 0.5 hour

Description:

Head injuries are the leading cause of death in sports. This article discusses causes, prevention, signs and symptoms, management, and future recommendations of head concussions.

List of Objectives:

1. Participants will be able to list three ways to prevent head concussions.
2. Participants will be able to list and describe the three grades of concussions.
3. Participants will be able to list three separate ways to decrease head injuries.

Outline of Content:

I. Introduction

This article discusses definitions associated with head concussions, causes of head concussions, prevention of concussions, signs and symptoms of head injuries, criteria for return to play, management of concussions, and future recommendations

II. Definition

- a. "a syndrome involving an immediate and transient impairment in the ability of the brain to function properly"
- b. retrograde amnesia
- c. anterograde amnesia
- d. second impact syndrome

III. Prevention

- a. criteria for return to play
- b. educate coaches, players, athletes
- c. implementation of physician and certified athletic trainers

IV. Management

- a. review of history
- b. inspection
- c. palpation
- d. neurological screening
- e. grades of concussions
 1. Grade I
 2. Grade II
 3. Grade III

V. Future Recommendations

- a. standardized plan for return to play
- b. education of certified athletic trainers and physicians
- c. education of coaches

Head injuries are the leading cause of death in sports. An average of eight football players a year dies from head injuries. (8) Known historically as a high-risk sport, football is responsible for the majority of sports-related concussions today. However, there has also been a growing awareness of head injuries in other sports including soccer. (4) The following will discuss definitions associated with head concussions, causes of head concussions, prevention of concussions, signs and symptoms of head injuries, criteria for return to play, management of concussions, and future recommendations.

A concussion is a syndrome involving an immediate and transient impairment in the ability of the brain to function properly. (2) There is no general agreement as to the exact definition of a concussion. Retrograde amnesia is the loss of memory for events that occurred before the injury. Anterograde amnesia is the loss of memory for events occurring immediately after awakening. (2) A subdural hematoma is a hematoma beneath the dura and this condition is the most frequent cause of death from trauma in athletics. An epidural hematoma is a hematoma outside the dura, which is usually associated with a skull fracture. An intracerebral hematoma develops when blood vessels within the brain are damaged. Second impact syndrome is an unexplained phenomenon, which occurs when an athlete sustains a second head injury before symptoms associated with a previous injury have cleared. (2) The athlete receives a second minor head trauma that results in rapid brain swelling and the primary concern with this syndrome is death. (6)

Concussions can be caused by several different mechanisms. These include coup and contracoup mechanisms, repeated subconcussive forces, and a direct blow to the head. A coup injury results when a relatively stationary skull is hit by an object traveling at a high velocity. This type of mechanism typically results in trauma on the side that was struck. A contrecoup mechanism is injury resulting from a blow on the opposite side, such as an intracranial injury. (2) The fluid within the skull fails to decrease the brain's momentum proportional to that of the skull, causing the brain to strike the skull on the side opposite the impact. This mechanism includes forces that are transmitted up the length of the spinal column, for example when falling and landing on the buttocks. (10) Athletes receiving repeated nontraumatic blows to the head have a higher degree of degenerative changes within the central nervous system. (10)

Other variables which impact the occurrence of concussions include mouth guards, playing position, playing surface, protective equipment, age, and past history. Rules requiring the use of mouth guards and facemasks have reduced the number and severity of injuries to the maxillofacial area. For maximum protection, these protective devices must be properly fitted and football players should be encouraged to use mouth guards during both practices and games. Custom fitted mouth guards provide the best protection against head injuries. (10) Concussions in football players are more prevalent in high-impact positions, for example wide receivers and special teams personnel. They are even more prevalent among linebackers, defensive backs, and offensive linemen. Contact with artificial turf appears to be associated with a more serious concussion than contact with natural grass. Players who sustain a concussion in a season are three times more likely to sustain a second concussion in the same season compared with uninjured players. (5)

For example, a 1999 article concerning a new study of college football players by Barbra Murray reveals that multiple concussions can cause a decline in memory retention and mental processing. This article examines the effect of multiple concussions on memory retention and mental processing. The study reported on 393 male college football players and demonstrated athletes who had suffered two or more concussions scored lower on the tests than did players who had suffered one concussion or none at all. Also, injured athletes scored lower on the tests than did players who had not suffered concussions. The researchers recommended that injured players be administered cognitive tests to check their degree of recovery before coaches permitted them to resume playing. (9)

Another article, "Epidemiology of concussion in collegiate and high school football players," by Kevin Guskiewicz examined concussions in football and associated epidemiologic issues, incidence of injury, common signs and symptoms, and patterns in making return to play decisions. A total of 242 athletes were analyzed and showed that football players who sustained one concussion in a season were three times more likely to sustain a second concussion in the same season compared with uninjured players. The results help practitioners gain a better understanding of the epidemiology of concussion in sport and assists in managing future concussive injuries. (5)

There are several ways to prevent concussions. These include criteria for return to play, education to coaches, players, and athletes, and the implementation of physician and certified athletic trainers. Presently, a complete understanding of the pathobiology of brain injury is still lacking. There also is no treatment to aid in recovery from a concussion. The best management remains early recognition and prevention of additional concussion injury. (11)

Management of concussions includes a thorough review of the history of the athlete's injury, inspection, palpation, and neurological screening. The history includes the mechanism or cause of injury, symptoms associated with the injury, and the level of consciousness. The inspection and palpation involves the cervical vertebrae and musculature. The neurological screening includes sensory and motor testing. Several different scales exist to grade concussions. For example, the Glasgow Coma Scale (GCS), a standard guide for rating athletes' conditions, is an effective method often used to describe various states of consciousness. The advantages of the GCS are that it is a standard guide for rating different athletes' conditions; it saves time because observations are rated numerically, and it allows for easy identification of a change in an athlete's level of consciousness. The GCS evaluates three different responses: (1) eye opening, (2) motor responses, and (3) verbal responses. Each is evaluated independently of the others, and each is assigned a numerical value. Higher scores are awarded to athletes who are more responsive. The total score reflects the level of brain functioning with the highest score being 15 and the lowest score a 3. (2)

The American College of Surgeons Committee on Trauma has adopted the "AVPU" method of determining levels of consciousness. This method determines whether the individual is alert, responsive to verbal stimuli, responsive to painful stimuli, or unresponsive. Within seconds an athletic trainer can assess the athlete's pupil size and reaction and best motor response. It is also noted whether the athlete responds appropriately to commands, does so for painful stimuli, or exhibits no movement at all. This method can be used in conjunction with the Glasgow Coma Scale. (2)

There are three grades of concussions. Grade I or a mild concussion is characterized by no retrograde amnesia and no to slight mental confusion with no loss of coordination or tinnitus. Grade II or a moderate concussion is characterized by less than five minutes of loss of consciousness, retrograde amnesia, noticeable loss of coordination, and moderate dizziness. Grade III or a severe concussion is characterized by greater than five minutes of loss of consciousness and possible anterograde amnesia. Also, severe mental confusion and profound loss of coordination is present. (10)

Once an athlete is suspected of a mild concussion, return to play decisions that day of participation is crucial. If an athlete continues to play with symptoms of concussion they risk additional brain injury and catastrophic outcomes. Therefore, no player should participate while symptomatic. (7) In order to return to play, any symptoms or mental status deficits must completely resolve within 15 minutes of the injury. This includes headache, which is often a discarded symptom when making these decisions. The athlete must be asymptomatic at rest and with exertion tests. Periodic evaluations are required during the initial 15 minutes and as long as the athlete is symptomatic because some symptoms will appear in a delayed manner. (7) The objective is to monitor for deterioration in the athlete's condition, which warrants referral to the emergency room.

In a game situation pressures are high for an athlete to return to competition. For example, Heck and Rosa explain, "Frequently the loss of objectivity on the part of the athlete, coaches, sports media and spectators is an unfortunate and potentially harmful bias. In that setting, the health professional's role is to provide objective assessment of the injured athlete and guidance about the advisability of a safe return to competition". (6) If the athlete is cleared to play, periodic re-evaluations are indicated to monitor for a return of symptoms or mental status abnormalities.

If symptoms last longer than 15 minutes the athlete cannot return that day. This is an important determination because an athlete advances into a grade two classification and will result in removal from participation for at least one week. The resolution of their symptoms within this initial 15-minute period has a huge swing in the athlete's return to play time frame. (6)

The athlete then requires periodic re-evaluations that day and in the days that follow. These evaluations monitor for progressive symptoms (requiring medical referral) and also determine the first day the athlete is symptom free. An athlete with symptoms that last longer than one week warrants referral and possible imaging studies. (6) A key point to remember is return to play is one week after being asymptomatic, not one week from the injury date. All athletes with a grade two classification should receive final clearance for participation from their family or team physician.

Although the return to play guidelines provide important structures, there are several unclear areas. For example, the athlete whose symptoms resolve in 18 or 25 minutes may present difficulty in decision-making. The athlete who is symptom free at game time, may reveal a headache that evening and become asymptomatic again. There are many of these scenarios that require careful and individual decision-making. While there are several concussion guidelines and numerous gray areas there is consensus on one point: no football player should participate who still has neurological or cognitive symptoms. (6)

Several recommendations exist for decreasing head injuries. First, is the development of a standardization plan for returning to play. Secondly, education is the major key to prevention of head concussions. The physicians and certified athletic trainers need to be educated concerning the importance of the testing and assessment of concussions in athletes. The certified athletic trainer or physician needs to play an integral role in conveying the seriousness of head injuries. Also, coaches need to be properly educated in the importance of teaching fundamental skills including safe tackling and blocking techniques as well as the assessment of concussions. In a 1998 by Kenneth Clarke, it is stated that relying on protective equipment, teaching skills that minimize direct head impact, officiating rules, and properly evaluating minor concussions will all help to minimize head injuries. (3) It will take an ongoing collective effort from the medical staff, coaches, athletes, and parents to assist in preventing this critical medical condition.

Head injuries in sports are serious and can lead to death. Recognition of a life-threatening head injury is critical in athletic competition. Head injuries also can be prevented with adequate equipment. Education is necessary to decrease and attempt to eliminate head injuries in sports. The consequences of making a poor decision as to when an athlete may return to play after a concussion could be severe; therefore, researchers and practitioners need to develop safe and practical guidelines based on a multitude of objective variables. Epidemiological investigation should be coupled with basic science research to help gain a better understanding of the best way to develop the guidelines to managing head concussions.

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6. A B C D
7. A B
8. A B C D
9. A B C D
10. A B C D

Mark Answers Above.

Head Concussions: Causes, Prevention, Management, and Recommendations

1. The Glasgow Coma Scale evaluates all of the following responses except:

- A. verbal responses
- B. eye opening
- C. past history of concussions
- D. motor responses

2. Which of the following describes an injury resulting from a blow to the opposite side of the head:

- A. retrograde amnesia
- B. contrecoup injury
- C. anterograde amnesia
- D. coup injury

3. Ways to prevent concussions include:

- A. implementing physicians and certified athletic trainers
- B. education
- C. criteria for return to play
- D. all of the above

4. A Grade II concussion is characterized by:

- A. no retrograde amnesia
- B. moderate dizziness
- C. greater than 5 minutes of loss of consciousness
- D. profound loss of coordination

5. A syndrome involving an immediate and transient impairment in the ability of the brain to function properly is:

- A. concussion
- B. second impact syndrome
- C. contrecoup injury
- D. coup injury

6. The following are variables that impact the occurrence of concussions:

- A. playing position, age
- B. protective equipment, past history
- C. mouthguards, playing surface
- D. all of the above

7. Contact with artificial turf appears to be associated with a more serious concussion than contact with natural grass.

- A. True
- B. False

8. Neuropsychological testing includes:

- A. symptom questionnaire
- B. clinical history interview
- C. verbal learning test
- D. all of the above

9. A Grade 1 concussion is characterized by all of the following except:

- A. no tinnitus
- B. no loss of coordination
- C. no retrograde amnesia
- D. less than 5 minutes of loss of consciousness

10. In order to return to play, any symptoms or mental status deficits must completely resolve within ____ minutes of injury.

- A. 30 minutes
- B. 10 minutes
- C. 45 minutes
- D. 15 minutes

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