The Acute Symptoms of Sport-Related Concussion: Diagnosis and On-field Management

Margot Putukian, MD[a,b,*]

KEYWORDS

• Sport-related concussion • Sideline management
• Concussion protocol • Symptoms • Diagnosis
• Mild traumatic brain injury • Head injury • Sports

Concussion is diagnosed when an athlete presents with typical symptoms, signs, behaviors, and difficulties with cognition and/or balance after direct or indirect trauma.[1] Standard imaging modalities, such as computerized tomography (CT) and magnetic resonance imaging (MRI) scans, are typically normal, demonstrating that the injury is a functional problem more than a structural one. More sophisticated studies evaluating for structural injury, such as functional MRI, diffusion tensor imaging (DTI), along with neurochemical biomarkers and genetic markers may someday modify the methods by which the diagnosis of concussion is made. These tools remain research investigations, are not the emphasis of this article, and are reviewed elsewhere.[2–7]

Most (80%–90%) sport-related concussions resolve within 7 to 10 days, although for some athletes, the time for complete recovery takes much longer.[8–10] Why some athletes seem to recover quickly and others do not remains unclear. There do seem to be modifiers that may alter how concussion is managed and determine which athletes may have prolonged recovery patterns.[10] Given these sometimes complex and unpredictable injuries, it is useful to consider a team approach to concussion management, with a variety of tools for evaluation and diagnosis, and consultants for treatment and management.

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[a] Princeton University, University Health Services, Washington Road, Princeton, NJ 08544, USA
[b] Robert Wood Johnson, University of Medicine and Dentistry of New Jersey, 125 Paterson Street, New Brunswick, NJ 08901, USA
* Corresponding author. Robert Wood Johnson, University of Medicine and Dentistry of New Jersey, 125 Paterson Street, New Brunswick, NJ 08901.
E-mail address: putukian@princeton.edu

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WHAT IS REPORTED?

Athletes often minimize and/or do not report their symptoms because they want to play and believe that their symptoms are mild enough to safely play through them. Younger athletes seek to emulate older athletes and show that they are tough enough to play despite their injuries and not to let their teammates down. It is common that athletes, at all levels, assume that "having their bell rung" is part of the game, and do not realize the significant consequences of playing with concussion. Many athletes do not realize that their symptoms indicate concussion. Most athletes do not want to be taken out of play, and will go to great lengths to minimize or trivialize their symptoms.

In a study of high-school football players,[11] only 47.3% of players with a concussion reported their injury. Of those who did not report, 66.4% did think their injuries were serious enough to report, 41% did not want to be held out of play, and 36.1% did not realize their symptoms were consistent with concussion. In this study, when injuries were reported, they were most often reported to an athletic trainer. Given the serious nature of concussive injuries if untreated and/or repeated,[12–14] it is important that the culture of sport change such that athletes, parents, coaches, and health care providers understand the significance of unreported, repetitive concussive injury. This is most important at the youth level where sports-trained medical providers, such as athletic trainers and team physicians, are often lacking.

GRADING SYSTEMS

The idea of grading a concussion at the time of injury with the intent of then determining when it will be safe to return to play led to a variety of different grading and classification systems.[15–17] Although appealing, these grading scales have been abandoned, because they are not research based and assumed that loss of consciousness (LOC) denoted more severe injury. There is significant variability in injury and therefore a cookbook approach to managing concussion is ineffective.

The Zurich Guidelines[10] represent the most recent, internationally agreed consensus statement on the management of sport-related concussion. They recommend: (1) athletes with symptoms should be removed from play; (2) no athlete with symptoms, at rest or with exertion, should continue to play; (3) young athletes need to be treated more conservatively; (4) there is no role for CT or MRI in concussion; and (5) a multidisciplinary approach to management is useful.

PREDICTORS OF SEVERITY

Based on the research on sport-related concussion that has occurred in the past decade, there are some recognized symptoms and/or signs that may predict more severe outcome as measured by the length of time that symptoms, neurocognitive deficits, or balance dysfunction occurs. Although brief LOC does not correlate with severity, the presence of prolonged LOC (>1 minute) has been shown to be associated with more severe injury.[18] In addition, other studies have shown that amnesia, prolonged confusion, and persistent symptoms are associated with more severe injury.[19,20] A recent study in Australian football players found that headache longer than 60 hours, self-reported fatigue/fogginess, and those with more than 4 symptoms were more likely to have delayed recovery based on cognitive testing.[21] These symptoms should be evaluated during the sideline assessment of the concussed athlete. The severity of injury is likely best determined by the nature, burden, and duration of symptoms, as well as the time that cognitive and balance disturbances persist, and none of these can be determined at the time of injury.