

“Sport” and “non-sport” concussions

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See related research article by Benson and colleagues on page 905 and at www.cmaj.ca/cgi/doi/10.1503/cmaj.092190 and analysis article by Johnson on page 921 and at www.cmaj.ca/cgi/doi/10.1503/cmaj.110282.

In this issue, Benson and colleagues present results from an extensive prospective study on concussions in the National Hockey League (NHL). The study was started by the NHL and the players’ union, the NHL Player’s Association, in 1997.¹ Benson and colleagues included data gathered during seven consecutive regular seasons (1997–2004). An analysis of the epidemiologic data, initial signs and symptoms, and time loss (i.e., time between the injury and medical clearance to return to competitive play) showed that headache, low energy and fatigue, amnesia and abnormal neurologic examination were significant predictors of time loss.

Concussions are a mild form of traumatic brain injury. They are very common, even outside of organized sports, and they affect people of all ages. Many people with concussion do not seek care for the condition, but the World Health Organization (WHO) has estimated the occurrence to be more than 600 per 100 000 annually.²

Over the years, however, the research and the literature began to differentiate between “sport concussions,” which occurred while a person was taking part in organized sports, and “non-sport concussions,” which occurred under other circumstances (i.e., during activities of everyday living, traffic or work-related accidents, falls, recreation, acts of violence, explosions, etc.). Thus, there are considerable differences between the two areas in terms of the focus of research, the terminology used and the preferred outcomes of investigation. This commentary attempts to outline some of the differences between these two areas of study.

When studying sport concussion, most researchers use the term concussion, but they often use their own definition of the condition (e.g., see paper by Benson and coworkers¹). Much effort has also been expended in constructing scales for grading the severity of concussion that can be used as a basis for deciding when a player may return to competition. Terms and outcomes such as “return to play” or “return to practice” were repeatedly coined. Accordingly, at the end of the 1990s, more than 20 different scales for grading sport concussions were used in deter-

mining the appropriate time for “return to play” or “return to practice,” yet none of them had been prospectively validated.³ Increasing awareness of the flaws of the different grading systems finally resulted in a recommendation to abandon such scales during the First International Conference on Concussion in Sport held in Vienna in 2001. The concepts of “simple concussion” and “complex concussion” were then introduced. Experts chose an a posteriori definition for the purpose of managing concussion. If a concussion resolved without complication within 7–10 days, then the concussion was simple. If this was not the case, the concussion was complex. However, these concepts were subsequently abandoned during the third and most recent International Conference on Concussion in Sport in 2008, and agreement has been reached on an additional new definition.⁴

Much energy has been devoted to developing instruments for the side-line evaluation of injured athletes in direct association with the trauma (e.g., SCAT, SCAT2, Maddocks’s questions).⁴ Such tools allow for the systematic and thorough assessment of the patient. The introduction and broad use of these assessment charts has had a substantial, positive impact on the quality of care for athletes with concussions.

In recent years, neuropsychological methods have been widely used to investigate cognitive deficits and their restitution after sport concussions. Using this research, several batteries of Web-based psychological tests (e.g., Impact, CogSport, CRI)⁵ have been developed and are

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KEY POINTS

- Concussions are a growing concern, not only in the National Hockey League, but in the wider community.
- Researchers differentiate between sport concussions and non-sport concussions, and there are considerable differences between the two in terms of the focus of research, the terminology used and the preferred outcomes of investigation.
- Exchange of ideas and cooperation between researchers of sport and non-sport concussion will enrich the overall knowledge and treatment of mild brain injuries.

increasingly used in high-risk sports such as hockey, football, rugby, soccer, automobile racing and skiing. These tests allow physicians to compare an athlete's pre-season and post-trauma cognitive performances to see whether he or she has regained full cognitive function and to determine whether the athlete can return to competition. Neuropsychological testing has become an important part of the evaluation and management of concussion.

Another important success in the treatment of sport concussion is the general and continuing agreement on how to manage rehabilitation after injury.⁴ Complete physical and cognitive rest is recommended immediately after the injury and should continue until the symptoms resolve. The patient should then start to increase his or her level of exercise. The patient should start with light aerobic exercise, followed by light sport-specific exercise, then more complex and heavy training and, finally, return to full practice. A patient is not allowed to increase the level of activity without being free of symptoms during or after exercise. If the athlete has symptoms, he or she must return to the previous level.⁴

In research involving non-sport concussions, the terms mild traumatic brain injury and mild head injury are preferred and the Glasgow Coma Scale is regularly incorporated into criteria for classifying the severity of the injury.⁶ A very important issue in this field was acute management, e.g., investigations of the need for admission to hospital and of indications for the use of computed tomography (CT) scans⁷ to diagnose intracranial pathology that could require neurosurgical intervention. A number of studies of different types of biochemical markers for damaged brain tissue were also analyzed for their potential use in predicting sequelae⁸ and for assessing the need for CT scans of the brain during the acute stage. Validated instruments for assessing symptoms, restrictions on activity and quality of life are regularly included during follow-up examinations 3, 6 or 12 months after the original injury.⁸ Different types of active interventions to decrease sequelae have also been investigated in several studies, but convincing positive results have yet to be seen.

Exchange of ideas and cooperation between investigators studying sport concussion and those studying non-sport concussion will enrich knowledge in both fields. For example, in studying non-sport concussion, investigating and focusing on the outcome of "time for return to work" (corresponding to "time for return to play" in sport concussion) appears promising. Randomized studies to test the use and effectiveness of a stepwise, systematic process of rehabilitation that

combines gradual increases in cognitive and physical activity may also be useful. In addition, the significance and use of biochemical markers for determining damage to brain tissue should be investigated in sport concussions. Moreover, imaging techniques, particularly magnetic resonance imaging, are not sufficiently used as methods of assessment or study in cases of sport concussion.⁹ Benson and colleagues do not present any data from imaging examinations, not even for the 28 players who were admitted to hospital.

Concussion is a potentially lethal brain injury that, regardless of the setting in which it occurs, should be managed by a specialist in neurological care as soon as there are signs that the patient's condition is worsening or not resolving. Focusing on the "time for referral to a specialist" should be a central task in both settings. Is there anybody who would accept that patients who have myocardial infarctions during intercourse would be treated exclusively by specialists in sexology and not by cardiologists?

Convincing predictors of sequelae after head trauma are lacking. The results presented in the study by Benson and colleagues of statistically significant predictors are promising and may be a starting point for further studies on concussion in both settings.

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