- Name of Disorder: Concussion
- Essay Title : An overview of concussion
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- Date: 30/06/2013
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An overview of concussion

Concussion is a form of brain trauma that is mild in nature, rarely life-threatening and usually self-limiting. It occurs as a result of biomechanical forces imparted to the brain following a direct blow to the head, face, neck or even elsewhere on the body where there is an 'impulsive' force transmitted to the head. While commonly occurring in the context of motor vehicle accidents, falls and assaults, individuals engaged in sporting activity are also well-placed to sustain concussive injury. Sports such as boxing, football (rugby, soccer, Australian rules, gridiron, etc.), and hockey all have high incidence. Soldiers who have participated in active combat are also at risk. Interestingly in this group, shock-waves from blasts and explosions are acknowledged as the primary mechanism of injury – rather than any direct forceful contact.

Symptoms experienced by individuals following concussive injury are many and varied, and tend to evolve over the days, and potentially, weeks that follow the initial insult. Symptoms experienced early on (arising over the first minutes to hours), may include any or all of the following: headache, dizziness, vertigo/imbalance, lack of awareness of surroundings, exaggerated emotionality (including inappropriate crying or distraught appearance) as well as nausea and vomiting. The hallmarks of concussion, however, are confusion and amnesia which usually involves loss of memory for the traumatic event but frequently includes loss of recall for events immediately before and after the head trauma.[1, 2] While in the past, loss of

consciousness was seen as requisite for the diagnosis of concussion, this is not standard practice nowadays.[3] Indeed under current criteria, only 10% of concussed individuals experience a loss of consciousness.

With these symptoms in mind, a recent international, multi-disciplinary expert group on concussion in sport has affirmed the use of a concussion assessment tool to be used in sideline assessment of sports-related concussion.[1] The SCAT-3 is a standardised assessment battery used on the sideline for players over the age of 13 and can also be used as an approximate guide for functional recovery from an injury.[4]

Following on from sideline assessment, any individual suspected of having had a concussion should be medically evaluated. Of particular importance in the initial assessment of the concussed individual are: physical evidence suggestive of more severe traumatic injury, changes in neurological status, as well as medication (especially anticoagulant) use. Depending on symptom severity and neurological status, neuroimaging (usually CT and/or MRI) and neurosurgical referral may be sought. Surgical intervention, although rare in the context of simple concussion, may be required in instances where the brain has sustained severe bruising (contusion) or there is raised intracranial pressure.

Currently, the 'treatment' of choice for concussion is physical and cognitive rest.[1, 5] In such cases, individuals should only require analgesics in order to relieve symptoms related to pain and headache. Concussion usually sees patients experience symptomatic recovery within 2-10 days of injury.[3] However, this can vary, particularly in cases where concussion is complicated by other factors such as previous head injury as well as important comorbidities.

In a minority of individuals, symptoms may be longer lasting and persist for more than 30 days duration, a condition referred to as the Post-Concussion Syndrome (PCS).[1, 6, 7]

Of the utmost importance in the recovery phase is that the individual avoids further head trauma before recovery is complete. A second traumatic event, even of milder nature to the first, may potentially lead to life-threatening consequences (so-called 'Second Impact Syndrome') or at the very least, more severe and prolonged neuropsychological impairment. Similarly, individuals should refrain from alcohol and other neurotoxins in the recovery phase.

While the symptoms of concussion usually resolve with rest, in the setting of sports-related concussion, players are advised to seek medical clearance before re-engaging in competitive sporting activity. Although a number of sports governing bodies have enacted their own specific return to play guidelines, one set of guidelines outlined at the most recent International Consensus Statement on Concussion in Zurich sets out a six day graduated return to play (see Table 1).

Table 1. Graded return to play protocol.[1]

Rehabilitation stage	**Functional exercise at each stage of rehabilitation**	**Objective of each stage**
1. No activity	Symptom limited physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum permitted heart rate No resistance training	Increase heart-rate (HR)
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey	Exercise, coordination and cognitive load

	May start progressive resistance training	
5. Full-contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

For further, sport-specific information, please see:

AFL Concussion information and resources:
http://www.aflcommunityclub.com.au/index.php?id=66

ARU Concussion Guidelines webpage with resources:
http://www.rugby.com.au/tryrugby/administration/ConcussionGuidelines.aspx

NRL Management of Concussion webpage:
http://www.nrl.com/About/ReferenceCentre/ManagementofConcussioninRugbyLeague/tabid/10798/Default.aspx

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