“BUT I WASN’T KNOCKED OUT”

If you take part in contact sports you have to expect injuries. Fortunately, most of them are minor. Some of them are serious and may keep you out of play for some time. Most of these can be managed with appropriate rehabilitation and surgical treatment as required For example, fractured bones, ACL tears, shoulder dislocations. However, a few injuries may be career ending or cause serious lifelong debility or, even worse, fatality. The one injury that is potentially fatal in fighting sports is that of brain trauma or a concussion.

Concussions can occur in many sports including football, rugby, American football, ice hockey and, obviously, fighting sports. However it is always highlighted in fighting sports where one of the aims of the sport is to “knock your opponent out”, which in itself is a method of inflicting brain trauma on your opponent.

Concussions do not just occur with blows to the head, although this is the most common cause. They can occur with injuries to the face, neck or elsewhere on the body with an “impulsive” force transmitted to the head.

Sports concussion is a very controversial topic and has been for a number of years. There is now an international body that meets and discusses the definition, symptoms and management of sports concussions. They then publish a summary, an agreement statement, and the last was published in 2004 from the second international conference on concussion in sport in Prague 2004[1].

The problem with concussion in sport is not so much the effect of a single blow but more the cumulative effect of repeated brain injury, which may lead to acute sequelae, such as occurred with Michael Watson, or the effect of chronic repetitive head trauma, as has potentially occurred with Mohammed Ali.

So, what exactly is the definition of a concussion? In November 2001 the first international symposium on concussion in sport was held in Vienna and a consensus definition was proposed as follows "Sports concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces". In other words, a concussion is a complex phenomenon that affects the functioning process of the brain via many potential pathways but the inducing factors are traumatic forces to the brain.

Concussion typically results in the rapid onset of short lived impairment of brain function which usually settles down spontaneously. It can result in pathological changes in the brain by actually altering its appearance, but the acute clinical symptoms usually reflect a temporary disturbance in the function in the brain rather than changes in brain structure (appearance). To this end, if the brain is imaged, for example with an MRI scan, no usual abnormality is found with a concussion, because the structure (appearance) is not usually affected.

Concussions result in various sets of clinical syndromes which may or may not involve loss of consciousness *(being knocked out).*

It is not clearly known what happens at brain cell level in sports concussions. It is however known that in more severe head injuries, complex changes in biomechanical and brain cell function can occur.

The main issue regarding sports concussion is related to being allowed to return to play. As such, various grading scales and sub types of concussion have been suggested. It has been noted that the actual true concussion severity can only be determined retrospectively after all the symptoms of a concussion have cleared and the clinical examination is normal and brain function has returned to the baseline normal level. Various indicators have been attempted to use to try and define the severity of a concussion.

The traditional approach to severe traumatic brain injury used loss of consciousness as a primary measure of how severe the injury was. This has limitations in assessing the severity of sporting concussive injuries as very few sporting concussions result in loss of consciousness, whether in fighting sports or for example on the football field. Other factors have been looked at including the significance of amnesia (*memory loss*). Amnesia can occur in two ways. There is post-traumatic amnesia, which is loss of memory following the head injury up to a time point following the injury. There is also retrograde amnesia which is memory loss preceding the time of the head injury. However even using this assessment of amnesia does not help with attempting to classify the severity of concussion more clearly.

One of the key developments in classifying sports concussion by the Prague group was to categorise concussion as either simple or complex.

SIMPLE CONCUSSION

In a simple concussion a competitor would suffer an injury that progressively settles down without any complications over 7 to 10 days. In these cases, all playing and training must be limited while the player is symptomatic. However, no further intervention is usually required during the period of recovery and the player typically resumes the sport without a problem.

High level athletes and many teams have access to formal screening services to assess concussions with a battery of tests. These tests also rely upon assessing the function of the brain with so called “neuropsychological testing”.

Unfortunately most recreational athletes do not have access to this. Fortunately simple concussions represent the most common form of this injury and do not require formal neuropsychological testing.

The cornerstone of management of simple concussion is rest, until all symptoms have resolved and then a graded programme of exertion is undertaken before return to sports. During the graded return to exertional activities there should be no recurrence of symptoms such as headaches, ringing ears, double vision, blurring of vision, nausea, vomiting and so forth.

The final thing to state about concussions is that all concussions, however minor they are considered, must be evaluated by a medical doctor qualified in assessing concussions.

COMPLEX CONCUSSION

Complex concussions occur in cases where players suffer persistent symptoms (including persistent symptom recurrence with exertion). Complex concussion can also result in specific events such as a concussive epileptic fit. Concussions are also classed as complex if there is a prolonged loss of consciousness (more than one minute) or a prolonged impairment of brain function (such as memory, concentration) after the injury. This group also includes players who suffer multiple concussions over time or where repeated concussions occur with progressively less impact force.

In this group there are additional considerations beyond just simply returning the athlete to play. This group does require formal neuropsychological testing as well as other investigations. These players would require management by a multi-disciplinary team of doctors which may include a sports medicine doctor, sports neurologist, neurosurgeon and psychologist.

PRE-PARTICIPATION PHYSICAL EXAMINATION

The importance of a history of concussion can not be over-estimated. This is especially true when it is appreciated that many athletes would not recognise all of the concussions that they may have suffered in the past. If the appropriate questions are asked, it may allow picking up an athlete who fits into the “complex” category who can then be directed for appropriate further investigation and management.

A structured concussion history should include specific questions related to previous symptoms of concussion. It should also include information about all previous head, face or neck injuries as many of the latter two injuries may miss co-existing concussive

symptoms unless they are specifically asked for. It should also be noted as to what protective equipment was used at the time of the injury.

It has been specifically recommended by the Prague group that both a baseline assessment and symptom score is performed as part of pre-participation evaluation (The Prague SCAT test can be used, which is included at the end of this article).

FINDINGS IN ACUTE CONCUSSION

It is important for all people involved with athletes and players to be aware of the potential signs and symptoms of a concussion. If one is constantly aware of the risk of concussion and the symptoms associated with this it is more likely to be diagnosed. This does not just apply to medial practitioners but also to coaches, physiotherapists, trainers, parents, friends and so on.

If any one of the following symptoms or problems is present, a head injury should be suspected and appropriate management instituted. These are summarised on the Sideline Concussion Assessment Tool (SCAT)[1] that is at the end of this article.

1. Cognitive Features These are features of brain function and include memory, attention span, infusion, memory loss, loss of consciousness and disorientation. This may manifest as being unaware of who the opposition is, the score in the game, which round or period of the game that is currently being played.

2. Types of symptoms include headache or pressure in the head, balance problems or dizziness, nausea, feeling of slowness of fatigue after impact, feeling “dinged”,

"foggy", stunned or "dazed". Visual problems can occur such as seeing stars, flashing lights or having double vision. There can be hearing problems such as ringing in the ears. A player can be irritable or undergo emotional changes.

3. There are also a number of associated physical signs that accompany concussion. These include loss of consciousness or an altered conscious state, poor co-ordination of balance, a post-concussion epileptic fit, slow to answer questions or follow directions, easily distracted, poor concentration, inappropriate emotions, vomiting, glassy eyed, slurred speech, personality changes, inappropriate playing behaviour (such as running in the wrong direction) and a significantly decreased playing ability. Some of these signs are relatively subtle but as long as it is kept in the back of the mind that the player may have sustained a brain injury these features can be picked up to indicate a concussion.

An important part of assessment of concussion injuries is to evaluate cognitive brain function with tests of attention and memory such as those shown on the SCAT test. It should however be remembered that sometimes the appearance of concussion type symptoms do not actually occur immediately but may be delayed for several hours.

It should be noted that there are various further complex assessment tools for concussion that are really beyond the scope of this article but the reference at the end of the article can direct interested readers to gain further information.

MANAGEMENT OF CONCUSSION

Acute Injury

From the Prague concensus[1], when a player shows any symptoms or signs of a concussion the following should be applied.

1. The player should not be allowed to return to play in the current game or practice.
2. The player should not be left alone and regular monitoring for deterioration is essential over the initial few hours after injury.
3. The player should be medically evaluated after the injury.
4. Return to play must follow a medically supervised step wise process.

A concussed athlete should never return to play while symptomatic. There is much truth in the old adage “when in doubt sit them out”.

RETURN TO PLAY

Fortunately, most concussions are simple concussions and recover spontaneously over a number of days. In these situations the player will proceed rapidly through a stepwise return to play. During the period of recovery in the first few days after a concussion, the player must rest both physically and mentally. Activities that require concentration and attention may exacerbate the symptoms and result in a recovery delay.

The Prague statement[1] recommendation with regard to return to play after concussion is as follows:

1. No activity, complete rest. Once asymptomatic proceed to next level.
2. Light aerobic exercise such as walking or stationary cycling, no resistant straining.
3. Sports specific exercise for example skating and hockey, running and soccer.
4. Non contact training drills.
5. Full contact training after medical clearance.
6. Game play.

During this stepwise progression, if the player develops any post concussion symptoms they should drop back to the previous asymptomatic level and attempt the progress after 24 hours. In order to progress from one level to the next they must remain asymptomatic at their current level.

In cases of complex concussion, rehabilitation will be more prolonged. More specific return to play advice will be required with this being governed and managed by a team of doctors and others with specific expertise.

Finally, it must be stated that in order to return to play, concussed athletes should not only be free of symptoms but should not be taking any medications that can affect or modify the symptoms of concussion. A number of drugs can potentially be commenced following a concussion such as antidepressants or sleeping medication. The decision on return to play while taking these medications is a complicated issue and specific advice must be sought from healthcare professionals.

PREVENTION

There is no clinical evidence that currently available protective equipment will prevent concussion, but in certain sports protective equipment can stop other types of head injuries occurring.

The role of enforcing rules of play and vigilance by officials is obviously vital to prevent unnecessary harm coming to the participants, especially in combat sports.

The use of protective equipment can paradoxically increase the risk of injury rate because participants adopt more dangerous techniques. This is more concerning in children and adolescents for whom head injury rates are often higher then in adults.

It is important that players themselves, their relatives, friends, coaches, team mates and all personnel associated with a particular sport or club are aware of the potential issues regarding concussion. This is especially true in combat and fighting sports where striking to the head is often not only desired but encouraged.

It is therefore implicit on coaches, corner men and referees to be aware and vigilant of the symptoms of concussion and not to allow repeated and unnecessary head and face strikes.

Ultimately, it must be remembered that careers and even lives have been ended from trauma to the head and brain and therefore the concepts of damage limitation must be applied so that we can “live to fight another day”.

Reference

[1] McCrory P, Johnstone K, et al. Summary and Agreement Statement of the Second International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine 2005; **39:196-204.**

Appendix 1. Sports Concussion Assessment Tool (SCAT)

In my series of articles I aim to cover various injuries, both common and uncommon and other issues relating to contact sports. I hope the articles are interesting and informative, although I cannot give specific advice to individuals, I am happy to provide some general guidelines either from myself or my colleagues at the Manchester Sports Medicine Clinic, regarding any queries that any readers may have related to injury. These can be emailed to kneedoc@sportsmedclinic.com. Alternatively, visit my website www.sportsmedclinic.com. If readers would like to make appointments for consultations these can be made through the enquiries@sportsmedclinic.com.

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These articles are only written to provide general information and should not be construed as specific advice regarding specific injuries in individuals. If you have any queries or concerns you should consult an appropriately qualified practitioner.