Essentials of Sports Injury Prevention & Rehabilitation

Col (Dr.) Anup Krishnan

School of Sports, Exercise & Nutrition Sciences

D Y Patil University, Navi Mumbai

Lecture – 17

Concussion in Sports

Good morning ladies and gentlemen, and welcome to lecture 3 of week 4 of the course on Sports Injury Prevention and Rehabilitation. Today, we will be discussing a very important topic in two parts. The topic is: concussion in sports. Almost everybody who plays any sport which involves contact with another person or equipment, has at some point of time suffered a concussion, at least once in their playing career. It may not have been detected, it may not even have been registered by the athlete, but it is highly probable that they may have suffered it at some point of time. We will cover this topic under the following headlines: definition, types of brain injury, pathophysiology of concussion, grades of concussion, the signs and symptoms and conclusion. The management and other aspects will be covered in a separate lecture.

So, let us talk about sports concussion. Head injuries in sports are quite common and of these head injuries the most common head injury is a concussion. 90% or more of concussions do not involve a loss of consciousness. A concussion is defined by the American Academy of Neurology as a trauma induced alteration in mental status that may or may not involve a loss of consciousness. Before we go further, we must talk about types of brain injuries which are coup and contrecoup injuries. Now if you look at this photograph, the brain is inside the skull, but the brain is also floating in something called cerebrospinal fluid. It is enclosed in the skull and is floating in cerebrospinal fluid. Because of this peculiarity, the brain is actually mobile inside the skull.

It floats inside the fluid. So, if the skull goes and hits some object, the brain will come and hit the inner side of the skull. And, this part of the brain which hits the side of the skull which hits the body or which has the trauma, this type of injury is called a coup injury. That means, the symptoms will be seen on that part of the brain which is on the side of the body which has got the trauma. However, if the brain goes and hits the front part of the skull, rebounds back and goes and hits the posterior part of the skull, then you get something called a contrecoup injury.

That means the symptoms will be there in the opposite part of the brain from which the skull has got damaged. So coup and contrecoup are French words, and they are best describing this sort of injury.

Concussion: Concussion is defined as a complex pathophysiological process affecting the brain induced by traumatic biomechanical forces. May be caused by a direct blow to the head, face or neck or elsewhere to the body where an impulsive force is transmitted to the head.

Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. Each word in this definition is important. Rapid onset of symptoms, short-lived symptoms, neurological function impaired, but resolves spontaneously. Concussion may result in neuropathological changes, but the clinical symptoms are a reflection of a functional disturbance rather than a structural injury. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness.

And resolution of the clinical and cognitive symptoms typically follows a sequential course. That means, the symptoms appear in a particular manner and the symptoms disappear also in the similar sequence. In a small percentage of cases, post concussive symptoms may be prolonged. Please note, no abnormality on standard structural neuroimaging studies is seen in concussion. That means normal x-ray, normal CT scan and normal MRI, not the new functional MRIs, but the normal MRIs.

No abnormality is generally picked up on these three modalities. What happens in a concussion? What is the pathophysiology of concussion? The neurological dysfunction is transient, even though the athlete has sustained a significant impact to the brain. The current consensus is that it reflects a disturbance of brain function rather than a structural injury. Linear acceleration or rotational shearing forces may result in short-lived neurochemical, metabolic or gene expression changes in the body. The concussed athlete, though conscious and without obvious focal neurological signs, may have impaired higher cortical functions such as short-term memory.

Following a blow to the head, the athlete's conscious state may be altered from simply being stunned, to a significant loss of consciousness. Memory is typically affected in a concussive episode. A period of retrograde amnesia, that means the patient doesn't remember events prior to what the incident has occurred. Or anterograde amnesia, that means the patient does not remember the events which have occurred after the trauma, may follow minor head injury. Please note the duration of this amnesia does not indicate the severity of the concussive episode.

The ability to think clearly, concentrate on tasks and process information is also affected in concussion. Symptoms such as headache, dizziness, blurred vision and nausea may also be

present. Frequently, an athlete may just get his bell rung, he will be dazed and stunned for a period of seconds and he will start playing. These episodes are very, very common. The other players and coaches may be unaware that the athlete has suffered a concussion.

That is why, medical staff and coaching staff should be alert and they should closely observe the actions of a player who has received a knock to the head. And what should they look for? They should look for any signs of impaired performance. There are certain grades of concussion. Grade 1 concussion is associated with no loss of consciousness, and symptoms of confusion lasting less than 15 minutes. Grade 1: no loss of consciousness, confusion less than 15 minutes.

Grade 2 is the same, except that the symptoms last more than 15 minutes. Grade 2 means no loss of consciousness, but symptoms of confusion more than 15 minutes. In grade 3, loss of consciousness does occur. Grade 3 can be further divided into 3A and 3B. If the loss of consciousness is brief and can be measured in seconds, it is grade 3A.

If the loss of consciousness is prolonged and can be measured in minutes, it is grade 3B. Please note however, that permanent brain injury can occur with either grade 2 or grade 3 concussion. There are certain signs and symptoms of concussion. We will talk about the nonspecific ones first. Headache, nausea, dizziness and balance problems, blurred vision or other visual disturbances, confusion, memory loss, feeling of slowness or fatigue.

These are nonspecific symptoms of concussion. The specific symptoms include: loss of consciousness, convulsions due to concussion, confusion or attention deficit, memory disturbance, balance disturbance. Please note that these features may be present in all cases, or may not be present in all cases. And in some cases they may present in a delayed fashion. They may not all come consequently, they may not all come at one time and they may not all come at once.

They may come in a delayed manner and in bits and pieces. These are some of the symptoms and the signs which you must be aware of, if you are suspecting a concussion. So, symptoms are headache, dizziness, nausea or vomiting, unsteadiness or loss of balance, confusion, unawareness of the period opposition of the score of the game, feeling dinged, stunned or dazed, seeing stars or flashing lights, ringing in the ears, doubled vision or blurred vision. Any signs of loss of consciousness, poor coordination, convulsion, gait unsteadiness, slow to answer questions or follow directions, easily distracted, displaying unusual or inappropriate emotions, vacant stare or glassy eyed stare, slurred speech, personality changes, inappropriate playing behavior, significantly decreased playing ability, double vision or blurred vision. These are all the signs of concussion which you must be aware of and you must keep in mind.

So, take home message. Sports concussions are common, preventable and inevitable. Most cases they resolve spontaneously. Most cases resolve without residual neurological deficit. Please note normal standard imaging may not show any brain abnormality. You should be aware of the various signs and symptoms of concussion.

Please focus on proper technique, proper opponents and make sure you have the adequate safety equipment when playing any sport where concussion may be or head injuries may be caused. These are the references which we strongly urge you to go through in case you want to pursue this topic of study further. I thank you for your time and listening. Do let us know in case you have any comments or any queries, the email is flashing on the screen. We will get back to you as soon as possible.

Thank you for your time ladies and gentlemen, and Jai Hind.